THE FAUNA OF BRITISH INDIA,

INCLUDING

CEYLON AND BURMA

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EDITED BY LT.-COL. R. B. S. SEWELL, C.I.E., Sc.D., F.R.S., I.M.S. (*ret.*).

MAMMALIA.—Vol. I.

PRIMATES and CARNIVORA (in part),

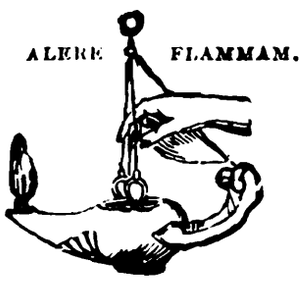
Families FELIDÆ and VIVERRIDÆ.

BY

R. I. POCOCK, F.R.S.

With 31 plates and 106 text-figures. Illustrations by the author, unless otherwise stated.

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PREFACE.

BLANFORD'S volume on the Mammals of British India, published in two parts in 1888 and 1891, fulfilled satisfactorily the purpose for which it was compiled, and was for many years the standard work on the subject. The material at his disposal*, however, was entirely insufficient according to modern standards, and the book has admittedly been long out of date. Various factors, such as general increase in our knowledge of Indian mammals and the use of other characters than those supplied by dried skins and skulls, contributed to this end; but perhaps the greatest was the new impetus given towards the end of the last century to the study of systematic mammalogy the world over by Hart Merriam's introduction of his scheme for investigating the mammalian fauna of the United States by means of intensive collecting and accurate labelling, with measurements, dates, and altitudes, of long series of specimens, where available, of every species from carefully selected localities. This threw a flood of light upon the variations of individuals of a species from the same locality and environment with age and season or irrespective

* It is needless to repeat the sources whence he derived his information, since they are fully acknowledged in his introduction. Incidentally, however, he candidly admitted that, on account of the numerous inaccuracies they contained, he referred as little as possible to the work of J. E. Gray, who described a very large number of alleged Indian species. This was a pity, because the inaccuracies called for correction, and Gray, in spite of his errors, showed now and again unexpected perspicacity in his determinations, with the result that Blanford, in dismissing his opinions, was not infrequently wrong. In those days, too, authors assumed greater latitude in adopting names they preferred, and were less strictly adherent to the law of priority.

of those factors, and also upon the adaptive modifications a species may locally exhibit when distributed over a wide geographical area with diversified physical features.

To the older school of systematic mammalogists, who adopted the Linnæan binominal method of indicating a supposed species by its generic and specific names, such modifications were more or less vaguely known, and were given full specific status if held to be important enough to warrant that rank, or were cited as " varieties " if falling short of that standard. But with the new method of studying mammals the term " variety " was restricted to such individual aberrations from the normal as are illustrated by melanism or albinism, for example, and the term "subspecies" was invented to symbolize the geographical and environmental variants of a species. At the same time the trinominal system of nomenclature, now in vogue, was introduced to designate the " subspecies," or " local races " as they are often called, into which most widely distributed species can be divided.

This system is particularly useful in supplying additional machinery for achieving the main purpose of nomenclature, namely, the expression of the degree of kinship between related animals. This may be illustrated by a very simple instance taken from Blanford's volume. The three best-known British Indian foxes were cited by Blanford as distinct species, the hill-fox, the desert-fox, and the Bengal fox. This method of treating them suggests that the three are equally different from each other, and entirely conceals the close affinity between the hill-fox and the desert-fox and the more remote kinship between them and the Bengal fox. The facts are now expressed by regarding the first two as subspecies of the so-called common fox and by citing them as *Vulpes vulpes montana* and *Vulpes vulpes pusilla* respectively, and the Bengal fox as *Vulpes bengalensis*.

In theory this system appears simple, but it is by no means always so in practice. Where a complete series of examples of a species spread over a wide diversified area is available,

it is the custom to select for subspecific denomination the best differentiated local races, leaving the equally interesting intermediate forms without the trinominal symbol. But the number of names introduced will depend upon the judgment of the systematist; and in this respect there is often great diversity of opinion. Actual proof, moreover, of the intergradation of different forms is by no means always available. In this case decision as to the specific or subspecific status of a distinguishable form is also a matter for the judgment of the individual systematist, and considerable discrepancy of view on this point may arise. At present there is no unanimity; and several of the forms I have treated as subspecies in this volume may be regarded by others as species or held to be unnecessarily named*

Mr. Oldfield Thomas, then in charge of the collection of Mammals in the British Museum, was at once impressed by the interesting results achieved in North America by Merriam and his staff of collectors and students. He conceived the idea of extending the same scheme to all possible countries of the Old World, and lost no time in putting it in practice. When Mr. R. C. Wroughton, I.F.S., on retiring from office and coming to England, offered his services as voluntary assistant to Mr. Thomas, they speedily discovered the poverty of the National Collection in Oriental mammals, and decided, if possible, to inaugurate a collecting campaign in British

* The modern method has, however, been by no means an unmixed benefit. It attracted into systematic mammalogy on both sides of the Atlantic amateurs to whom the determination of species was child's play, comparable to the matching of samples of silk or wool, and whose sole qualification for the work was ability to detect differences in the colour or pattern of skins and the shapes of skulls, without the training and judgment required to assess their value. It engendered the idea that a difference of locality was sure to be accompanied by a difference in colour, coat or some other part, and that if such could be perceived it was worth symbolizing by a new name, no regard being paid to the great possibility of age or season being the cause, thus bringing the distinguishing feature within the range of individual variation. The late Mr. R. C. Wroughton once humorously expressed this conception to me by saying that two hundred miles was a good specific character! The net result of this influx of inexperienced workers on the new lines has been the addition of large numbers of names which, although without real significance, have to be reckoned with and investigated by the serious student, thus leading to waste of time and making his task, difficult enough already, still more exacting and arduous.

India, with the ultimate object of issuing a new edition of Blanford's volume. The first and, as it proved, the wisest step was to get in touch with Mr. W S. Millard, the Honorary Secretary of the Bombay Natural History Society. With characteristic energy and enthusiasm Mr. Millard at once took the matter in hand and, with the sanction of the Committee of the Society, proceeded to collect funds to defray the cost of sending collectors to various districts of the Indian Empire and also to interest sportsmen, forest officers, and other members of the Society in the enterprise. Thus was started, at first in a small way, in 1911 the Mammal Survey of India, Ceylon, and Burma, which, owing to the generosity of numerous subscribers and the diligence of the employed and voluntary collectors, yielded in the following years results which far exceeded expectations. The outbreak and duration of the world war temporarily suspended the activities of the Survey; but they were later resumed, and after April 1920, when Mr. Millard retired and came to England, they were carried on by Mr. R. A. (now Sir Reginald) Spence, who succeeded him as Hon. Secretary to the Society.

Donations to the fund were duly acknowledged, as received, in the Society's 'Journal'; but since the present volume on the Mammals of British India, and those that are to follow, are based to a very great extent upon the results of the Survey, it is fitting that the names of the individuals, Governments, Societies, and other bodies that contributed to its success should be put permanently on record.

The principal subscribers were as follows:—The Governments of India, Ceylon, and Burma, of Bihar and Orissa, Bombay, the Central Provinces, the United Provinces, Madras, the Federated Malay States, and Junagadh State; the Trustees of the British Museum, the Royal and Zoological Societies of London, and the Trustees of the late N. M. Wadia, C.I.E.; H.H. the Maharaja of Alwar, Sayarijao Gaikwad of Baroda, the Maharaja of Bhavnagar, the Maharaja of Bikanir, the Rao of Cutch, the Raja of Dhar, the Nizam of Hyderabad, the Maharaja Tukojirao Holkar of Indore, the Maharaja of Jodhpur, the Maharao of Kotah, the Maharaja of Mysore,

and the Maharaja Sir Madhowrao Scindia of Gwalior; the Most Hon. the Marquis of Bute, Sir Dorab J Tata, the Hon. N. C. Rothschild, the Hon. E. S. Montagu, M.P., Sir Ratan J. Tata, and Messrs. E. Comber, W S. Millard, H. M. Phipson, and Oldfield Thomas. Finally, the last of the expeditions, sent out by the Society in 1929 to the Eastern Ghats, where large numbers of birds as well as mammals were secured, was generously financed by Mr. A. S. Vernay.

Of the collectors, the first to be employed by the Society for the Mammal Survey was Mr. C. A. Crump, and when sufficient money had been received, Mr. Oldfield Thomas sent out to India Mr. G. C. Shortridge and, later on, Major A. W Mayor. In addition to these collectors, Messrs. S. H. Prater, C. McCann, and N. A. Baptista—who were employees on the staff of the Society—also assisted in collecting for the Survey. In 1914—owing to the War—Major Mayor, Mr. Shortridge, and Mr. Crump "joined up" in France, but Messrs. C. Primrose, Ryley O'Brien, and H. W Wells were still able to give their assistance; and when in Burma Mr. Shortridge availed himself of the services of the late Capt. MacMillan. But the work of the collectors was greatly helped by influential residents in various districts, by H.H. the Maharao Sahib in Kutch, H.H. the Maharaja Sir Madhowrao Scindia in Gwalior, Messrs. H. Stevens and R. S. Lister in Darjeeling, the late A. P. Kinloch in Malabar, A. H. A. Simcox in Khandesh, and in Burma by the late Sir Harvey Adamson, the Governor, and Sir Godfrey Fell.

Many valuable and interesting specimens were also contributed to the Survey by voluntary collectors. Of these the principal were Col. A. E. Ward in Kashmir, Col. C. H. Stockley in the Punjab and western Himalayas, Mr J P. Mills in Assam, Col. J. E. B. (now Sir Ernest) Hotson in Baluchistan, Mr. W W A. Phillips in Ceylon, and by Mr. J M .D. Mackenzie, Mr. Kingdon Ward, and Lord Cranbrook in Burma. Of special moment were the extensive collections made by Mr. J. M. D. Mackenzie and Sir Ernest Hotson.

The importance of the survey material was due not only to the large numbers of specimens secured, but also to the

accurate information supplied regarding the dates, localities, altitudes, sex, and measurements of most of the skins. The collections from each district were packed in Bombay and sent to the British Museum of Natural History to be identified by the official staff and the voluntary helpers, Mr. R. C. Wroughton, Mr. T. B. Fry, Miss Ryley, and Mrs. Lindsay. It was arranged that the British Museum should keep the "types" of new forms discovered*, as well as a reasonable number of other specimens required, the remainder to be returned to Bombay to be dealt with as the Natural History Society thought fit. The carrying out of the scheme involved a vast amount of work at both ends, and in this respect the services of Mr. R. C. Wroughton in London and of Mr. N. B. Kinnear in Bombay cannot be overestimated. The reports were published *seriatim* in the 'Journal' of the Bombay Society, with the scientific names and localities of the species and such notes regarding habits and the vernacular names as were supplied by the collectors.

It was the intention of Mr. Hinton and Mr. Wroughton finally to collate the results as a basis for a new edition of Blanford's volume. When Mr. Wroughton's untimely death brought this scheme to a close, Mr. Hinton invited me, on my retirement from the Zoological Society in 1923, to collaborate with him in the work, each of us doing such groups as we had previously particularly studied. This I undertook, little realizing the length of time that would be required owing to the vast amount of material to be handled, the numbers of skulls to be measured, the extent to which the names and characters of the described genera, species, and subspecies called for revision, and the necessity for studying the mammals of all the adjoining districts of Asia before those of British India could be adequately dealt with.

One of the first things that came to light was the general poverty of the British Museum collection in representatives

* It was agreed that the types should be kept in London because the climatic conditions in Bombay are not so favourable for their preservation.

of such familiar Indian animals as lions, tigers, panthers, snow-leopards, bears, wolves, and, as has been subsequently proved, of nearly all the species usually understood by the phrase "big game" *. These deficiencies had to be made good, as far as was possible, for the first two volumes of the Mammalian Fauna. Appeals published in the 'Journal of the Bombay Natural History Society,' begging-letters to many of its members, and requests to personal friends for specimens met with immediate response, and I am especially appreciative of the generosity of those who sent to me for the work in hand valuable and handsome skins, as well as skulls, of the larger Carnivora, of which the British Museum was particularly in need. A point has been made of citing the names of the donors where the specimens are referred to in the text; but in addition I take this opportunity of recording my indebtedness to the following sportsmen not only for the animals from India, Ceylon, Burma, and adjoining countries, but also in many cases for information regarding their habits and occurrence :—

H.H. The Maharaj Kumar of Bikanir.
Col. F M. Bailey, C.I.E.
The late Sir Charles Bell.
Major G. Burrard, D.S.O.
Mr. C. E. Capito, O.B.E.
Sir R. Dane, K.C.I.E., and Col. R. Dane.
Mr. A. Dunbar Brander, O.B.E.

* Several factors contributed to this end. For many years there was a widespread opinion that such beasts were of comparatively little zoological interest and were not wanted by the National Collection. Sportsmen also are very naturally loth to part with handsome skins and heads, preferring to preserve them as trophies and cherished mementoes of the chase. Finally the Survey collectors were requested to concentrate upon the smaller members of the mammalian fauna and to leave big game unmolested so as to avoid trespassing upon what might be considered to be the sportsman's privilege. This decision, if wise, was regrettable because tigers and panthers show environmental adaptations as well as rats and mice, and because, with the progressive reclaiming of the country from the wild and bringing it under cultivation, the larger species will be the first to disappear, and well-preserved representatives of them are required by the museums of the world before that fate overtakes them. As an instance may be cited the now irretrievable loss to the British Museum of examples of the two finest races of lions, from the Cape and Algeria respectively, owing to the authorities in the past being uninterested in these animals and not foreseeing their inevitable extinction.

Mr. E. C. Fernando.
Mr. R. Kaulback.
Mr. N. B. Kinnear.
Major Donald Lowndes.
Mr. R. C. Morris.
Col. A. H. E. Mosse, C.I.E.
Mr. Fenwick Owen.
Mr. E. H. Peacock.
Mr. W W A. Phillips.
Major E. G. Phythian Adams.
Capt. A. H. K. Sangster.
Mr. H. C. Smith, with the assistance of Mr. P. F Garthwaite.
Col. C. H. Stockley, D.S.O., O.B.E.
Mr. H. J. Todd.
Col. W R. F Trevelyan.
Mr. H. Whistler.

I am also indebted to Mr. N. B. Kinnear for advice and suggestions on various points, and very particularly to Mr. W S. Millard, a personal friend of many years, who has consistently and sympathetically helped me in too many ways to mention in detail *.

For permission to use many blocks for illustrations I am indebted to the Bombay Natural History Society, and for the loan of "types" or other interesting specimens I am under great obligations to the Hon. Secretaries and other officials of the Bombay Natural History Society, to Col. Seymour Sewell, C.I.E., F.R.S., and Dr. Baini Prashad, who succeeded him as Director of the Indian Museum, Calcutta, to the Smithsonian Institution, Washington, and to the Field Museum, Chicago.

For the purely zoological part of this volume, with its avoidable and unavoidable mistakes, I take full responsibility.

* As an instance I may say that it was owing to his kind offices that Col. A. H. E. Mosse secured for the British Museum the first skulls of wild-killed examples of the Indian lion.

The vernacular names of the species have been accepted on trust ; and since my personal knowledge of the habits of the animals is limited to observations on captive specimens in the Zoological Gardens of London, I have been compelled to borrow the information on this head from the writings of others. But the literature on this subject in the way of books and stray notes in periodicals is now so extensive that it has been impossible to become acquainted with it all or to acknowledge in every case the authority for statements made. It will, I trust, be understood that the omission to quote the observations of many sportsmen was due, not to inappreciation of their value, but to the bar to their inclusion imposed by the limit of time and the size of the volume.

This volume includes the Apes, Monkeys, and Lemurs of the order Primates and the first two families, the Cats and Civets, of the order Carnivora. It is hoped that the second volume, containing the remaining families of the Carnivora, and some at all events of the groups of Hoofed Mammals, will be issued in about a year's time.

R. I. POCOCK.

March 4th, 1939.

INTRODUCTION.

THE GEOGRAPHICAL DISTRIBUTION OF THE MAMMALS OF BRITISH INDIA.

FROM the zoological standpoint the greater part of British India is a portion of the so-called Oriental Region, one of the primary subdivisions into which the land-surface of the world has been divided, mainly on the evidence of the average distinctiveness of their mammalian and avine faunas. In south-eastern Asia the usually accepted boundary of this region is "Wallace's line," passing between the islands of Bali and Lombok to the east of Java, and continued northward between Borneo and Celebes, a line marked by deep sea indicating a long-continued marine barrier which prevented most of the highly organized Oriental mammals, like the apes, leaf-monkeys, cats, mongooses, members of the dog and weasel families, bears, banteng cattle, rhinoceroses, and many others which were later comers to that part of Asia, from reaching Celebes and other islands to the east of the line, and similarly prevented the lowly organized marsupial mammals, characteristic of the Australian Region, from entering Borneo and Java. But some of the typically Oriental mammals, like macaque monkeys, palm-civets, deer, buffalo, pigs, and pangolins, were sufficiently early migrants from the west to get a footing in Celebes or other islands to the east of what is now Wallace's line, so that there is here a blend of the faunas of the two regions.

Still less satisfactory are the boundaries of the Oriental Region to the north, where, owing to its complete land-continuity with south-western, central, and northern Asia, which, with Europe and North Africa and most of North America, constitutes the Holarctic Region, the faunas of the two so intimately intergrade that the line defining them can only be arbitrarily drawn roughly from Central China along the Himalayas and thence southwards through the deserts of north-western India to the Arabian Sea.

In the extreme variety of its physical features India proper, or Hindustan, is surpassed by no country of similar extent in the world. It is divided into three main areas, the Himalayas in the north, the great Indo-Gangetic Plain in the centre, and the table-land of Peninsular India in the south.

Although usually described as a continuous mass of mountains, the Himalayas are composed of numerous ranges lying roughly parallel to each other and separated and intersected by river valleys. The principal ranges are the following *:—The Great Himalayan Range, lying almost in its entirety in British India, and stretching from the southward bend of the Brahmaputra in the east to that of the Indus in the west. In the west of Nepal it gives off a northern range, the Zaskar, which extends nearly as far to the west as the main axis; and from its southern side come two ranges, the Dhauladhar, rising in Tehri Garhwal and dying out near Chamba, and farther to the west the Pir Panjal, starting near the source of the Chenab and stretching south of it, and of Srinagar as far as the Jhelum, where it gradually decreases in altitude. North of the Zaskar Range in Kashmir come in order from south to north the Ladak Range, which eastward forms part of the northern boundary of British India in Nepal and Bhutan, the rest of it being in Tibetan territory; the Kailas Range, which sweeps across Tibet to the north of Lhasa, forming the northern boundary of the lower-lying open country traversed by the Brahmaputra and, in the west, by the upper waters of the Sutlej and Indus, an area bounded on the south by the Ladak Range; and the Karakorum Range running from the Tibet boundary to the Hindu Kush, the two forming the extreme northern boundary of British India in the north-west. The northern slopes of the Himalayas pass by means of a stretch of upland grass into the high plateau of Tibet, and it is along the Tibetan frontier that the Holarctic element of open-country species enters the extreme north of Hindustan. On the southern slopes of the mountain range the conditions are different, ranging from arctic in the higher summits to tropical below the foothills, the vegetation passing gradually from alpine through temperate to evergreen forests and jungles.

All the numerous rivers which intersect and form passes through the main Himalayan Range, except in the extreme east, are tributaries of the Indus and Ganges which give their name to the Indo-Gangetic Plain stretching across India from Sind to the north of the Bay of Bengal. In the lower Punjab and Sind this plain has low humidity and characteristic

* These particulars are taken from Major Burrard's map in his book 'Big Game Hunting in the Himalayas and Tibet,' 1925.

desert vegetation. Westward it extends through Baluchistan and Persia to Mesopotamia; but eastward, with increasing humidity, it gradually changes its character, passing finally into forest and into the jungly swamps and islets of the Sundarbans about the mouths of the Ganges and Brahmaputra. The Vindhya Hills and other northern ranges mark the rise of Peninsular India from the Indo-Gangetic Plain. The greater part of it is a table-land consisting of hills and grass-covered plains intersected everywhere by the tributaries of its main rivers, which cross it from side to side, the Narbada and the Tapti in the north flowing from east to west, the Mahanadi, the Godaveri, the Kistna, and the Kauveri in a general way from west to east. Near the Carnatic and Malabar coasts it is flanked respectively by the Eastern and Western Ghats and outlying ranges. The Western Ghats, supplemented by the Nilgiri, Animalai, and other hills, have a profound effect upon the general features of the Peninsula. They intercept the south-west monsoon, causing exceptionally heavy rainfall, mainly on their seaward slopes, depriving the country to the east of much moisture and converting it into a comparatively dry zone. Naturally the vegetation of the two areas is very different in accordance with the rainfall; where it is moderate to the east of the Ghats there are grass-covered plains, with clumps of acacias and stunted, mostly deciduous, trees, here and there forming copses or small forests. The seaward slopes of the Western Ghats, on the contrary, are mostly covered with dense forests of lofty evergreen trees, festooned with creepers, and accompanied by luxuriant growths of bamboo. In the Nilgiris and other South Indian hill ranges there are wide, open, grass-covered areas broken up by thickly forested gorges or sholas *.

Ceylon in its physical features is like Southern India, of which it formed a part before the age of mammals. It is divided into three intergrading zones †:—(1) A dry zone occupying roughly the whole of the northern, eastern, and south-eastern parts of the island, and consisting principally of low-lying, jungle-covered country with an annual rainfall of from 25 to 75 inches, falling mostly during the north-east monsoon. This zone in its physical features and mammalian fauna recalls the south-eastern area of Southern India. (2) A central hill zone consisting of plateaus and mountains, sometimes over 8000 feet, covered with virgin forest and grassland, with a rainfall of from 80 to 200 inches, generally

* An excellent summary of the main physical features of India, illustrated with good photographs, was given by S. H. Prater in his "The Wild Animals of the Indian Empire," published in the Journ. Bomb. Nat. Hist. Soc. xxxvi. no. 1, pp. 15–21, 1933.

† See Phillip's Man. Mamm. Ceylon, 1935.

distributed throughout the year. (3) A small, low country, wet zone to the south-west of the hill zone, consisting of low, forest-covered hills and broken country, with a rainfall of about 200 inches, falling mainly during the south-west monsoon, although there are heavy storms during the north-east monsoon. This and the hill zone tolerably closely resemble the Malabar tract of southern India.

Burma *, which for long ages has formed a continuous land-area with China to the north and what is now the Malay Peninsula to the south, is less varied in its physical features than India and differs from it in some respects. It is intersected by rivers running mainly from north to south and separated by higher and lower hill-ranges forming the watersheds of the tributaries that feed them. The central part, occupying about one-fourth of the country, with a rainfall of only about 20 inches in the year, and vegetation that has been described as " scrub-forest," is called the " Dry Zone." The greater part of the rest of the country has a much higher rainfall, reaching as much as 200 inches in the extreme south, and is mostly covered with heavy evergreen forests ; but there are extensive areas of jungle grass, up to about 12 feet high, along the banks of the larger rivers and in other places subject to inundations. Where the soil is poorer the grasses grow to about half that height ; and many of the hill-tops, at an altitude of about 5000 feet or so, are often treeless and covered with comparatively short grass.

The general trend of the rivers and hill-ranges from north to south offers no obstacle to the migration of the mammalian fauna in either direction ; and the general uniformity of the forest conditions to the north and south of the dry zone results in corresponding similarity in the fauna throughout the forested areas. But the forested area of lower Tenasserim and the northern part of Peninsular Siam differs somewhat, and some of its mammals are Malayan in type.

Of the Oriental Mammals, restricted, or nearly so †, to the region, the following are the principal genera and species which occur in British India :—The Asiatic tapir (*Acrocodia*), rhinoceroses (*Rhinoceros*, *Dicerorhinus*), elephant (*Elephas*), buffalo (*Anoa*) ‡, gaur and banteng (*Bibos*), nylghai (*Boselaphus*)

* See E. H. Peacock's 'A Game-Book for Burma and adjoining Territories' (Witherby, 1933).

† A few of the genera encroach on areas assigned to the Holarctic Region, like the goral in Korea and the black bear in Manchuria and Baluchistan, whereas Temminck's cat and the macaque monkeys have outlying, isolated representatives in tropical Africa and Morocco respectively. The smaller mammals, needing revision, are for the most part omitted from this account.

‡ The American tapirs and the African rhinoceroses, elephant, and buffalo belong to distinct genera.

four-horned antelope (*Tetracerus*), blackbuck (*Antilope*), serow (*Capricornis*), goral (*Næmorhedus*), takin (*Budorcas*), sambhar (*Rusa*), chital and hog-deer (*Axis*), swamp-deer and thamin (*Rucervus*), muntjac (*Muntiacus*), mouse-deer (*Meminna*, *Tragulus*), gibbons (*Hylobates*), leaf-monkeys (*Semnopithecus*, *Presbytis*, and two other genera), macaques (*Macaca*), lorises (*Loris*, *Nycticebus*), clouded leopard (*Neofelis*), marbled cat (*Pardofelis*), Temminck's cat (*Profelis*), leopard-cat, fishing cat, rusty-spotted cat (*Prionailurus*), civets (*Viverra*, *Moschothera*, *Viverricula*), palm-civets (*Paradoxurus*, *Paguma*, *Hemigalus*, *Arctogalidia*), binturong (*Arctictis*), linsang (*Prionodon*), several species of mongoose (*Herpestes*), smooth-coated otter (*Lutrogale*), clawless otter (*Amblonyx*), hog-badger (*Arctonyx*), ferret-badger (*Helictis*), panda (*Ailurus*), sloth-bear (*Melursus*), black bear (*Selenarctos*), sun-bear (*Helarctos*), pangolins (*Manis*, *Paramamis*, *Phatages*), flying lemur or colugo (*Galeopterus*), tree-shrews (*Tupaia* and others), and many squirrels (*Ratufa*, *Funambulus*, *Callosciurus*, etc.), as well as many additional rodents and several kinds of bats.

Mixed with the above-mentioned mammals, which help to stamp the distinctness of the Oriental Region, are many others identical with, or closely related to, species widely distributed in districts of central or south-western Asia, or both, assigned to the Holarctic Region, or even in Africa. Many, indeed, of the most prominent members of the British Indian mammalian fauna come into this category. Some, like the tiger, panther, jungle-cat, wild dog, jackal, and wild boar, occur in Burma as well as in Hindustan and, except the tiger and wild dog, in Ceylon also. Others, found only to the west of the Bay of Bengal, but not in Ceylon, are the lion, hunting leopard, caracal, desert-cat, hyæna, ratel, and chinkara (gazelle), which are very nearly allied to similar types occurring in south-western Asia and Africa, the smaller Indian wolf, which ranges into Persia and Mesopotamia, and the tahr (*Hemitragus*), of which the three isolated species are found respectively in the Himalayas, the Nilgiri Hills, and southern Arabia. To this series should be added the desert fox, the wild ass or ghorkha, the Sind ibex, and the wild sheep or gad, which spread from Persia for a short distance into the plains and mountains of Baluchistan and north-western India at least to the valley of the Indus.

A considerable number of the mammals, both strictly Oriental and partly Holarctic, inhabiting Peninsular India and the Gangetic Plains are found in the Tarai, the foothills and the forest slopes of the Himalayas, some of them ascending to tolerably high altitudes. Of these the most important are the elephant, buffalo, gaur (bison), nylghai, four-horned antelope, blackbuck, sambhar, chital, hog-deer, swamp-deer,

muntjac, wild boar, ratel, tiger, leopard, jungle-cat, leopard-cat, common palm-civet (toddy-cat), little civet, grey mongoose, Bengal fox, rhesus macaque, and entellus langur. They overlap several Oriental forms not found elsewhere to the west of the Bay of Bengal which have passed along the Himalayas from southern China and Upper Burma, as recorded below. But although the dominance of Oriental forms puts this mountain range within the Oriental Region, there is a strong Holarctic infusion from Central Asia, especially in the western Himalayas, where typical Oriental types gradually disappear, although a few, like the leopard-cat, toddy-cat, yellow-throated marten, rhesus macaque, entellus, langur, and serow, occur in the hills of Kashmir.

Of these northern Holarctic immigrants into British Indian territory the most interesting are the Siberian ibex, the barasingh or Kashmir stag, and the shou, these two, representing the genus *Cervus*, not found elsewhere within our limits, the musk-deer, blue sheep or bharal, the snow-leopard or ounce, the lynx, Pallas's cat, the hill-fox, Tibetan or woolly wolf, the red bear (*Ursus*), and several members of the weasel family, including the pine-marten and Siberian mink *.

Some of these, like the snow-leopard, bharal and musk-deer, and Siberian mink, occur apparently throughout the Himalayan Range, the two first above the tree-line, the two last below it; but most of them are restricted to the western portions, west of Nepal, although the hill-fox reaches Sikkim. A few species, like the markhor, the hoary fox, and the ermine, penetrate British India for a comparatively short distance from Afghanistan and the Hindu Kush. On the open, undulating plains to the north of the mountains, and as far west as Ladak, are found the yak, the chiru, the Tibetan gazelle, Hodgson's argali, the kiang, the Tibetan sand-fox, and the Tibetan polecat.

As stated above, the mammals of the Indo-Gangetic Plain overlap those of the Himalayas, and in the west the desert types, which pass into Baluchistan. Southwards they similarly blend with those of Peninsular India, especially with those inhabiting the dry zone of this area. But, as might be expected, the hill ranges of the western and southern parts of the Peninsula, characterized by heavy rainfall and mostly by luxuriant forests, have some peculiar features in their mammalian fauna. The lion-tailed macaque, John's leaf-monkey, the stripe-necked and brown mongooses, Gwatkin's yellow-throated marten, and the Nilgiri ibex are typical forms. Of these the macaque is restricted to this district,

* Characteristic Central Asiatic rodents that reach British India are the marmots and mouse-hares or picas.

the leaf-monkey and mongooses are the same as, or closely akin to, forms found in Ceylon, whereas the marten and the ibex have no allies in any part of Hindustan but the Himalayas.

There is no proof that Ceylon derived its mammalian fauna from any source but India. Within the mammalian era there is geological evidence of two unions with that country. There may have been a connection during the Pliocene, which admitted some early types; but the first of the two unions above mentioned probably occurred during the Pleistocene Ice Age when the mammals of northern India were driven southwards and entered the Ceylonese area (see p. xxvi). Here, by the subsequent conversion of the area into an island, they were isolated for a time, and some of them at least became differentiated into the peculiar forms now characteristic of Ceylon. The second connection took place much later, and enduring until comparatively recently, possibly into historic times, admitted a fresh influx of Indian species and the northward migration of some Ceylonese forms into southern India. Theoretically the most differentiated of the existing Ceylonese species are the descendants of the earlier immigrants, whereas those that are at most slightly different from Indian species or indistinguishable from them probably came in on the second occasion.

The mammal fauna of the island is interesting from many points of view, not the least being the light it throws on the period, earlier or later, of the occupation of southern India by the species now found there. Some were sufficiently early, others were too late to avail themselves of the land-bridge over what is now Palk Strait. Of the better-known Ceylonese forms that are identical with those found in S. India, or nearly allied to them, the following are the most important: the leaf-monkeys, macaques, loris, leopard, fishing-cat, rusty-spotted cat, jungle-cat, little civet, palm-civets, mongooses, jackal, otter, sloth-bear, pangolin, black-naped hare, porcupine, many squirrels and other Rodents, and Insectivores of the Shrew family, wild boar, mouse-deer, muntjac, hog-deer, chital, sambhar, buffalo, and elephant. Some of these forms, like the monkeys, loris, rusty-spotted cat, palm-civets of the *zeylonensis* type, mongooses, bear, pangolin, hare, porcupine, mouse-deer, and chital, are restricted to Ceylon and India proper; and a few of them, namely, the leaf-monkey (*Kasi*), macaques, loris, rusty-spotted cat, palm-civets, two at least of the species of mongooses, hare, and mouse-deer, are found solely or mainly in the southern part of Peninsular India and Ceylon.

Of the Indian species that do not occur in Ceylon it is needless to refer to the northern types mostly restricted to

the Himalayas. But there are many southern species, some found far to the south in Peninsular India, which arrived there after the final separation of the island or were excluded from it by other factors. The principal species are: the lion-tailed macaque, tiger, leopard-cat, caracal, hunting leopard, Malabar civet, hyæna, wild dog, fox, marten, ratel, tree-shrew, Nilgiri ibex, gazelle, blackbuck, four-horned antelope, nilghai, and gaur or bison.

Although a considerable number of familiar Indian mammals, like elephant, buffalo, gaur (bison), sambhar, hog-deer, barking deer (muntjac), wild boar, tiger, leopard, jungle-cat, fishing-cat, leopard-cat, small civet, common palm-civet (toddy-cat), jackal, wild dog, smooth-coated and clawless otters, and rhesus monkey, occur both in Burma and India, the mammalian fauna of Burma differs from that of India south of the Himalayas both on the negative and positive sides. On the negative side it is characterized by the absence of such species as the lion, hunting leopard, caracal, wolf, hyæna, ratel, wild ass, sheep, goats, and gazelle, which came into India from the west, and of such typically Indian species as the nylghai, four-horned antelope, blackbuck, chital or spotted deer, swamp-deer, entellus-langur, sloth-bear, and pangolin. On the positive side Burma has a large number of genera which in India are not found south of the Himalayas, its fauna resembling especially that of the eastern part of these mountains and of the hills of Assam and also that of China, Indo-China, and the rest of south-eastern Asia as far as Wallace's line. This resemblance is apparently due very largely to the migration of typically Chinese forms westwards along the Himalayas sometimes as far as Kashmir, and southwards through Burma, Indo-China, and Siam to Malaya and beyond *. The following are the principal genera and species, with their geographical distribution, which are found in Burma and mainly in the mountainous parts of northern India, but not in the plain of the Ganges or southward of it in India: gibbons, Assam to Borneo; pig-tailed macaque, Assam to Borneo; Assamese macaque, Nepal to Upper Burma and Tongking; stump-tailed macaque, Assam to Malaya; leaf-monkey (*Trachypithecus*) and slow loris, Assam to Borneo; Temminck's cat, Nepal to Burma, China, and Sumatra; the marbled cat from Nepal to Borneo; the clouded leopard from Nepal to China and to Borneo; the spotted linsang from Nepal to Tongking; the large civet from Nepal and China to Malaya; the large spotted civet from Burma to Malaya;

* The mammalian faunas of Malaya, Sumatra, Java, Borneo, and the Philippines have certain peculiarities which are beyond the scope of this volume.

the palm-civet (*Paguma*) from Nepal to Borneo ; the binturong from Sikkim to Palawan ; the three-striped palm-civet from Assam to Borneo ; the little mongoose from Kashmir to Java * ; the crab-eating mongoose from Nepal to China and to Malaya ; the yellow-throated marten from Kashmir to China and Borneo ; the Siberian mink from Kashmir to China and Sumatra ; the striped weasel from Nepal to Indo-China and Lower Burma ; the yellow-bellied weasel from Kashmir to China and Indo-China ; the hog-badger from Sikkim to China and Sumatra ; the ferret-badger from Nepal to China and Borneo ; the Himalayan black bear from Baluchistan through Kashmir to China and Burma ; the Malayan or sun-bear from Burma to Borneo ; the panda, Nepal to China ; the two-horned rhinoceros from Bhutan to Borneo ; the lesser one-horned rhinoceros from Sikkim and the Sundarbans to Borneo ; the banteng or tsain, Burma to Borneo ; takin, Bhutan to China and Upper Burma ; serow, Kashmir to China and Sumatra ; the goral from Kashmir to China and Lower Burma ; thamin or Eld's deer, Burma, Indo-China, Malaya † ; pangolins, one from Nepal to China and Burma, the other from Burma to Borneo and Celebes.

In Tenasserim, as far north as the Yé River, the fauna has a marked, so-called Malayan element, represented by the tapir, Mergui to Sumatra ; mouse-deer (*Tragulus*), Tenasserim to Borneo ; flying-lemur or colugo, Mergui to the Philippines ; banded palm-civet, Tenasserim to Borneo ; banded linsang, Tenasserim to Borneo ; the leaf-monkey (*Presbytis*) Tavoy to Borneo. To these should probably be added as essentially southern types, although spreading into Lower Burma north and west of Tenasserim, the lar-gibbon, which is closely related to similar gibbons spreading as far as Borneo, and the crab-eating macaque, which under a variety of forms reaches to the Philippine Islands.

Since most of these mammals have no allied species in India south of the Himalayas, the contrast between the faunas of the two areas is profound. It is, however, lessened in a measure by kinship in a few instances. The pig-tailed macaque, for example, has its nearest ally in the lion-tailed macaque of Malabar ; the leaf-monkey (*Trachypithecus*) is nearly as closely akin to the leaf-monkey (*Khasi*) of south-western India and Ceylon, and the slow loris and the Ceylonese and South Indian slender loris are the only genera of the lemurs found in the Oriental Region. Similarly, the mouse-deer or chevrotain (*Tragulus*) of Tenasserim and the related

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* This species extends to Persia and to Gujerat in India.

† Schomburgk's deer from Siam is also a member of this fauna, although not recorded from Burma.

genus (*Meminna*) of Peninsular India are the sole examples of that group of ruminants occurring within British Indian limits. The thamin or Eld's deer, and, incidentally, Schomburgk's deer, have their nearest ally in the swamp-deer of parts of Northern India ; the large-spotted Burmese civet is closely related to the Malabar civet ; and the common yellow-throated marten is represented by an allied species in Southern India.

The Andamans and Nicobars, a chain of mainly forested islands in the eastern part of the Bay of Bengal, and marking the site of an ancient land-bridge between the Pegu district of Burma and the northern point of Sumatra, are also included in British India, and may be granted the status of a separate tract, characterized negatively by the absence of all the larger typically Oriental mammals and positively by the presence of between thirty and forty species or subspecies, mostly rats and bats, but all of them peculiar to the Archipelago, with the exception of a few, including the pig-tailed macaque (*M nemestrina leonina*), comparatively recently introduced by Europeans.

The islands are separated from the mainland of the Malay Peninsula by very deep sea, indicating long isolation dating back to a period before the Malayan Region was occupied by its present mammalian fauna. But the species and subspecies inhabiting the islands belong to genera now found on the mainland, and are comparatively slightly differentiated. From these facts Miller * inferred that, with the exception of the bats, which reached the islands by flight, the forerunners of the rest of the mammals were imported by the early native settlers and, like them, have become modified in the interval, into the existing types. Of these, setting aside the Bats and Rats, there is a long-tailed macaque (*M. irus*) in the Nicobars related to Malayan and Sumatran races ; a palm-civet (*Paguma*) in the Andamans ; a wild boar (*Sus*), two shrews (*Crocidura*), one from the Andamans, the other from the Nicobars, and a tree-shrew (*Tupaia*) from the Nicobars which is more distinct from its mainland congeners than are the other peculiar forms.

Reviewing the main above-described facts connected with the distribution of mammals in British India, with others supplied by the rodents and other orders of smaller species, Blanford † assigned two areas of it to the Palæarctic section

* Proc. U.S. Nat. Mus. xxiv. pp. 790–1, 1902. This paper on the Mammals of the Andamans and Nicobars has supplied me with the information about the islands and their species given above.

† Proc. Roy. Soc. lxvii. pp. 484–92, 1900, and Trans. Roy. Soc. cxciv, p. 335, 1901.

of the Holarctic Region. These were the Punjab tract, including the deserts of Baluchistan, Sind, the Punjab, and western Rajputana up to a line running roughly from Cutch to the Himalayas nearly due north of Delhi, and the Tibetan tract, comprising the area to the north of the Himalayas through which the Indus and the Brahmaputra flow, and extending westward through Ladak to Gilgit.

The rest of British India he referred to the Oriental Region, and divided it into two subregions named, not very appropriately, the Cisgangetic and the Transgangetic. The Cisgangetic extends westwards from the ill-defined boundary of the Punjab tract to the Bay of Bengal and the hills forming the eastern limit of the alluvial deposits of the Ganges and Brahmaputra and, from north to south, from the base of the Himalayas to Cape Comorin, with the addition of Ceylon. This subregion was further subdivided into several subordinate tracts, of which the only one that calls for special notice is the Malabar tract, the wet zone running along the western side of the Peninsula from the Tapti to Cape Comorin. To this the wet zone of Ceylon is affiliated, the dry zone of the island belonging to the tract of southern Peninsular India of which the Kistna is the northern boundary.

The Transgangetic subregion is composed of the Himalayas from Kashmir to Bhutan, Assam, Manipur, Tipperah, Chittagong, and the whole of Burma *.

This subregion, like the Cisgangetic, is subdivided into several tracts, of which the Andaman and Nicobar Islands are one, but the most distinct perhaps is the Malayan tract, including Tenasserim from the Yé River, as Mr. H. C. Smith tells me, not Mergui, as thought by Blanford, southwards to Victoria Point.

Blanford sought to explain the peculiarities in the distribution of the existing mammals of British India as resulting from the Pleistocene Ice Age and the subsequent return of warmer conditions. At the present time the glaciers in Sikkim do not extend below about 14,000 feet; but there is proof that during that cold spell they descended as low as 7,000 feet in that district, and even to lower levels in the western Himalayas. Hence this mountain range was evidently at that time much colder than it is now, and a considerable area of Northern India to the south of it must have been correspondingly affected, giving rise to conditions unsuitable for the survival of the tropical forms that swarmed there before the onset of the Ice Age, and were either exterminated or driven southwards as it progressed. Later, with the gradual return of the warmer conditions such as now prevail

* It is impossible to exclude southern China, Indo-China, Siam, and Cambodia from this subregion.

over all the areas affected by the cold, facilities were afforded for the reoccupation of the higher levels of the Himalayas by such species as had survived at the base and by others from the four main points of the compass, and for the return to Northern India of the descendants of the species that had taken refuge in Southern India.

Some such theory as this affords apparently the most plausible explanation of certain features in the distribution of mammalian life in British India, especially of those supplied by the wide geographical separation between some related forms in the Transgangetic subregion and in the southern part of the Cisgangetic subregion, which are severed by a large tract of Central and Northern India—species and genera of which the ancestors formerly, it may be assumed, were continuously distributed in the northern portions of the Oriental Region. Instances of this phenomenon have already been cited. The most important illustrations of it are the following :—The pig-tailed macaque, ranging from Assam to Borneo, and the lion-tailed macaque of the Malabar tract ; the common leaf-monkey of Assam and Burma, which also spread to Borneo, and John's leaf-monkey of the Malabar tract and its related Ceylonese species ; the slow loris, another species ranging from Assam to Borneo, and the slender loris of South India and Ceylon ; the large-spotted Burmese and Indo-Chinese civet and the Malabar civet; the mouse-deer, ranging from Tenasserim to Borneo, and its related genus of Southern India and Ceylon. Finally, the common yellow-throated marten, found practically all over the Transgangetic subregion, and the thar of the Himalayas are represented in some of the hill ranges of Southern India respectively by Gwatkins's marten and the Nilgiri ibex. These species in particular, and especially the ibex, might perhaps be cited as cogent evidence of the truth of Blanford's hypothesis regarding the effects of the Ice Age on the distribution of the mammalian fauna of British India.

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MAMMALIA.

A CLASS of vertebrated animals distinguished from the Reptilia, its next of kin and ancestral stock, by a number of characters of which the most important perhaps are the presence of hairs, instead of scales, in the skin, and of mammary or milk-glands in the female for the nourishment of the young after birth. Other differences are the separation of the cavity of the chest or thorax from that of the abdomen by a complete respiratory muscular sheet or diaphragm, the division of the heart into four chambers, and the presence of a single great blood-vessel, the aorta or aortic arch, by which the blood is driven from the heart to the various organs; these modifications of the respiratory and circulatory apparatus being accompanied by warm blood, which normally keeps the body-temperature at a uniform level and above that of the surrounding medium, air or water, however cold. In the skull the most important difference lies in the lower jaw, which consists of a single bone jointed directly to the skull, the subsidiary intervening bones, present in existing reptiles, being taken into the ear, some as auditory ossicles subservient to hearing.

To explain the technical terms used for defining the orders and subordinate groups into which mammals have been classified it is necessary to describe some of the external and skeletal characters.

The normal hairy covering, occasionally represented to a certain extent by spines, still more rarely by plate-like scales, and lost in the CETACEA, usually consists of two elements, the superficial (contour) hairs and the underwool. On the head the hairs of certain definite areas are modified as tactile bristles (*vibrissæ*) arranged in tufts on the upper lip (mystacial), over the eye (superciliary), on the cheek (genal), on the chin (submental), and on the fore-throat (interramal). These are found in so many orders that they may be regarded as primitive. Two additional, probably primitive, organs on the head are (i) the area of moist naked skin round the nostrils (*rhinarium*), which generally has a narrow extension (*philtrum*) running to the edge of the upper lip in front and dividing it into a right and left portion,

and (ii) the external ear (*pinna*), a hollowed extension of the skin supported by cartilage, and generally strengthened by ridges or lobes of the same material. It varies greatly in size, shape, and other particulars, and may be altogether lost. The edges of its cavity below typically meet to form a notch (*intertragal*); just above this in front there is commonly a lobe (*tragus*), and behind another lobe (*antitragus*), and the principal strengthening ridge (*supratragus*) lies longitudinally above these within the cavity. Further modifications will be described under the different headings where necessary.

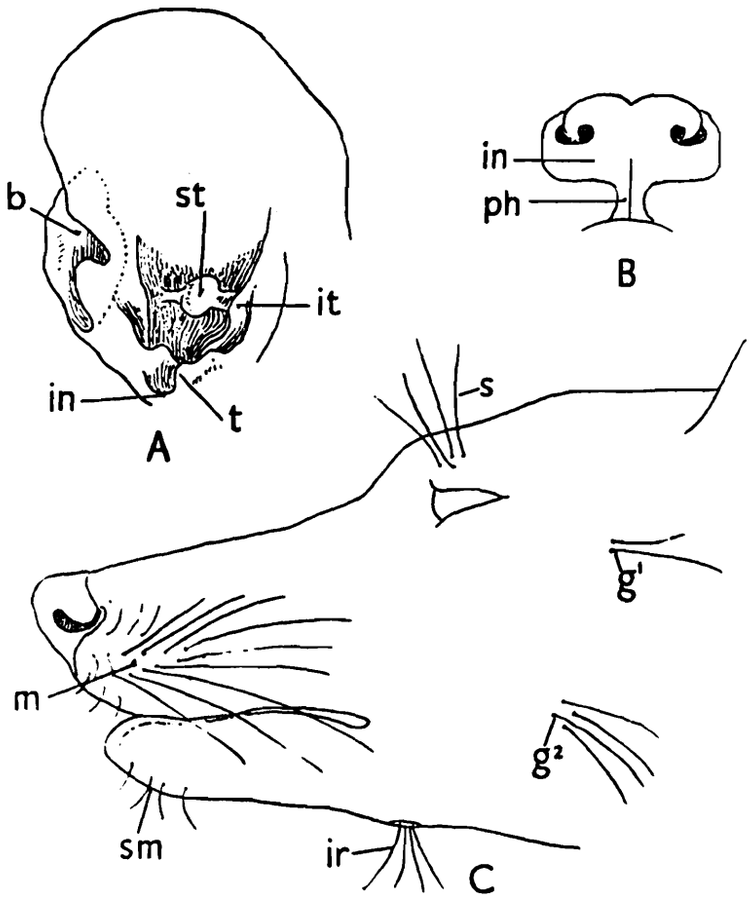


Fig. 1.—A. Right ear of Hunting Leopard: *b*, bursa; *st*, supratragus; *it*, intratragus; *t*, tragus; *in*, intertragal notch. B. Rhinarium of Large Indian Civet, from the front: *in*, infranarial portion beneath nostril; *ph*, philtrum. C. Side view of head of Indian Jackal, showing tufts of facial vibrissæ: *s*, superciliary; g^1 and g^2, upper and lower genal; *m*, mystacial; *sm*, submental; *ir*, interramal.

The modifications of the feet supply important systematic characters. The primitive type of foot has five toes or digits (pentadactyle), the inner digit being the first, the outer the fifth. The terminal segment of each is provided above with a compressed claw, a flattish nail or a hoof, an expanded nail embracing the front and generally the sides of the segment. The sole in the primitive foot is naked from the tips of the

digits to the wrist and ankle or heel, and is supplied with paad On the digits the pads (*digitals*) are restricted to the terminal segment. The rest of the pads, six in number, are on the sole. Four of them (*interdigitals*) are just behind the spaces between the digits. Frequently three of them, sometimes four, coalesce to form a large submedian pad (*plantar*). The remaining two, an outer and an inner, are near the wrist of the fore foot (*carpal*) and towards the heel of the hind foot (*metatarsal*). When the sole is overgrown with hair the pads may be wholly lost. The gait of a mammal walking on the greater part of the sole is called plantigrade, on the toes, with the heel and wrist well off the ground, digitigrade, and on the hoofs alone, unguligrade ; but there is no sharply defined difference between these methods.

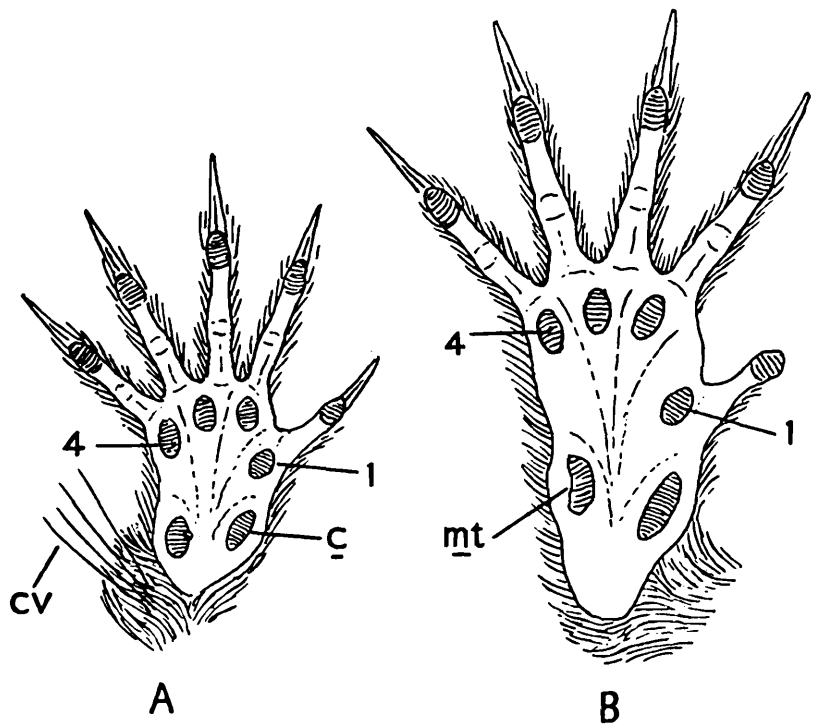


Fig. 2.—Lower surface of the feet of a Pouched Mouse (*Phascogale*), an Australian marsupial mammal, to show the primitive arrangement of the pads. A. Right fore foot, showing the digital pads at the tips of the toes: 1 and 4, the internal and external interdigital pads ; *c*, the internal carpal pad ; *cv*, tuft of carpal vibrissæ, a primitive mammalian feature. B. The hind foot, with similar pads ; *mt*, the external metatarsal,

The generative organs are also extensively used in classification, but only recently to the extent their importance demands. The area between them and the anus is the perinæum. In the male the intromittent organ or penis frequently has a thickened termination, the glans ; and it may be strengthened by an internal, rod-shaped bone, the *baculum*. The sack of skin into which the testes may descend is the scrotum. In the female the generative orifice has tumid lips or labia,

and between these and above the urinary orifice is an organ, the clitoris, which corresponds to the penis of the male.

In the skeleton the skull is the most important part. It consists of a large number of bones, the lines of contact between them being the *sutures*. As age advances and the bones fuse the sutures tend to become obliterated. For convenience the skull may be divided into two parts: (i) the facial, including the muzzle and the eye-sockets or orbits, and (ii) the cranial, which lodges the brain. The muzzle is made up of the lower and upper jaws. The two halves of the lower jaw or *mandible* meet in front in a symphysis ; behind they are jointed to the skull by a condyle ; below the condyle there is usually a process, the angular, and above it a wide flange, the coronoid, to which

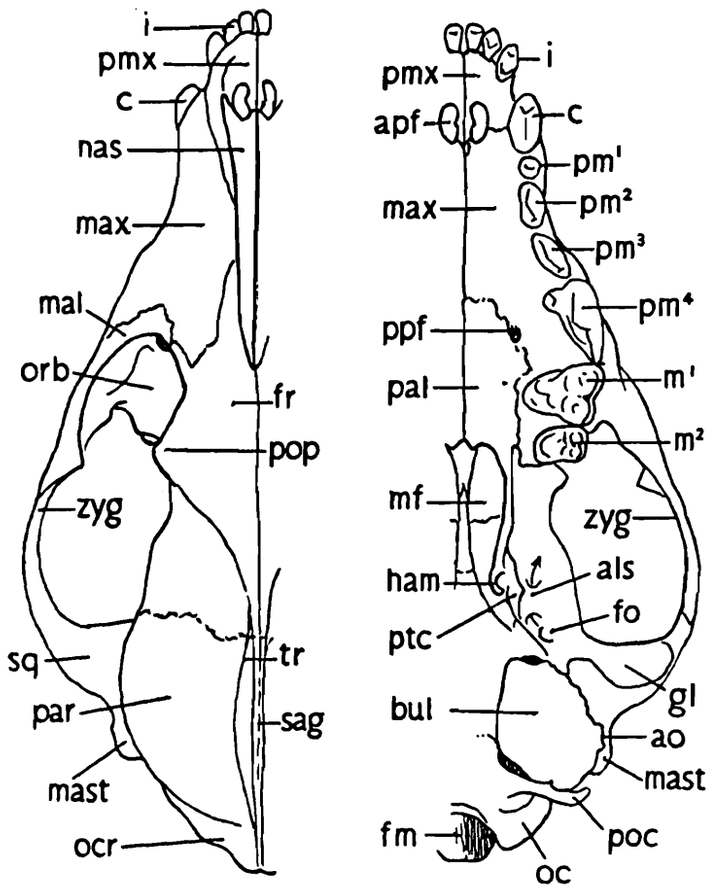


Fig. 3.—Upper and lower sides of left half of skull of Indian Jackal, with names of bones, teeth, and other features referred to in text. Upper side : *pmx*, premaxilla ; *nas*, nasal ; *max*, maxilla ; *mal*, malar bone of zygomatic arch (*zyg.*); *fr*, frontal ; *pop*, frontal postorbital process ; *orb*, orbit ; *sq*, squamosal branch of zygomatic arch ; *par*, parietal ; *mast*, mastoid ; *ocr*, occipital crest ; *sag*, sagittal crest ; *tr*, temporal ridge. Lower side : lettering as above, with *apf* and *ppf*, anterior and posterior palatine foramina ; *pal*, palatine ; *mf*, mesopterygoid fossa ; *ham*, hamular process of pterygoid ; *ptc*, external pterygoid crest ; *bul*, auditory bulla ; *fm*, foramen magnum ; *oc*, occipital condyle ; *poc*, paroccipital process ; *ao*, auditory orifice ; *gl*, glenoid ; *fo*, foramen ovale ; *als*, alisphenoid canal, marked by arrow; teeth: *i*, incisors; *c*, canine; pm^1 to pm^4, premolars ; m^1, m^2, molars.

the great masticatory muscle, the temporal, is attached. These are parts of the postdental portion of the mandible, the rest being the dental or tooth-bearing portion in front. The upper jaw contains a spacious cavity, opening in front by the *anterior nares* and behind, in the back of the mouth, by the *posterior nares*. The cavity is roofed above by the *nasals*, enclosed at the sides by the *maxillæ*, the anterior nares being bordered laterally and below by the *premaxillæ*. The floor of the cavity, which also forms the roof of the mouth, is composed of the premaxillæ in front, the maxillæ in the middle, and the *palatines* behind. The palate is typically pierced by two pairs of orifices, one, larger, in front; the other, smaller, behind, known respectively as the *anterior* and *posterior palatine foramina*. The cavity of the nasal chamber is largely occupied by two pairs of delicate, sponge-like bones, the *maxillo-turbinals* in front and the *ethmoturbinals* behind.

On the facial part of the maxilla below and in front of the orbit there is usually a well-defined orifice, the *infraorbital foramen*, through which nerves and blood-vessels pass to the upper lip. Usually within the front rim of the orbit is the *lacrymal foramen*. From the cheek below the eye to the ear runs a stout bar of bone, the *zygomatic arch*, the anterior part of which, consisting of the *malar* bone, forms the lower rim of the orbit, and its posterior part, composed of a forwardly directed process from the squamosal, a bone forming the wall of the lower part of the cranium above the ear, forms the outer edge of a space, the temporal fossa, which usually communicates with the orbit in front.

The cranial cavity is roofed in front by a pair of *frontal bones*, each of which is usually produced at the side into a *post-orbital process*, which sometimes meets a corresponding process rising from the malar part of the zygomatic arch to complete the ring round the orbit. Two roofing bones behind the frontals are the *parietals*. These, with the frontals to a lesser extent, give attachment to the masticatory temporal muscle on each side, and the edge of the muscle is typically marked by the temporal ridge, which extends from the postorbital process to the back of the skull. Not infrequently the ridges creep up to the summit of the skull with age and, coalescing, may rise into a high *sagittal crest* to support the muscle. The back of the skull is mainly formed by the occipital bone, which encircles the orifice, *foramen magnum*, through which the spinal cord passes, and on each side of this is the *occipital condyle*, by which the skull is jointed to the neck. The upper part of this bone is usually provided with a transverse curved *occipital crest* for supporting the muscles of the neck. The floor of the skull just in front of the foramen magnum is formed by the *basioccipital*, and the space between this and the squamosal,

to which the mandible is jointed, is occupied by bones connected with the ear, usually a swelling, the *auditory bulla*, connected with the auditory orifice, and behind this frequently a projection, the *mastoid*, and behind the bulla, or pressed against it, is a process from the occipital, the *paroccipital*.

The base of the skull in front of the areas just described and behind the palate is occupied by a pit, the *mesopterygoid fossa*, into which the posterior nares open. The side walls of this are formed by the palatine bones in front and the *pterygoids* behind, the latter sometimes running into a distinct process, the *hamular*. In the base of the skull, adjoining, there are typically four orifices for the exit of nerves from the

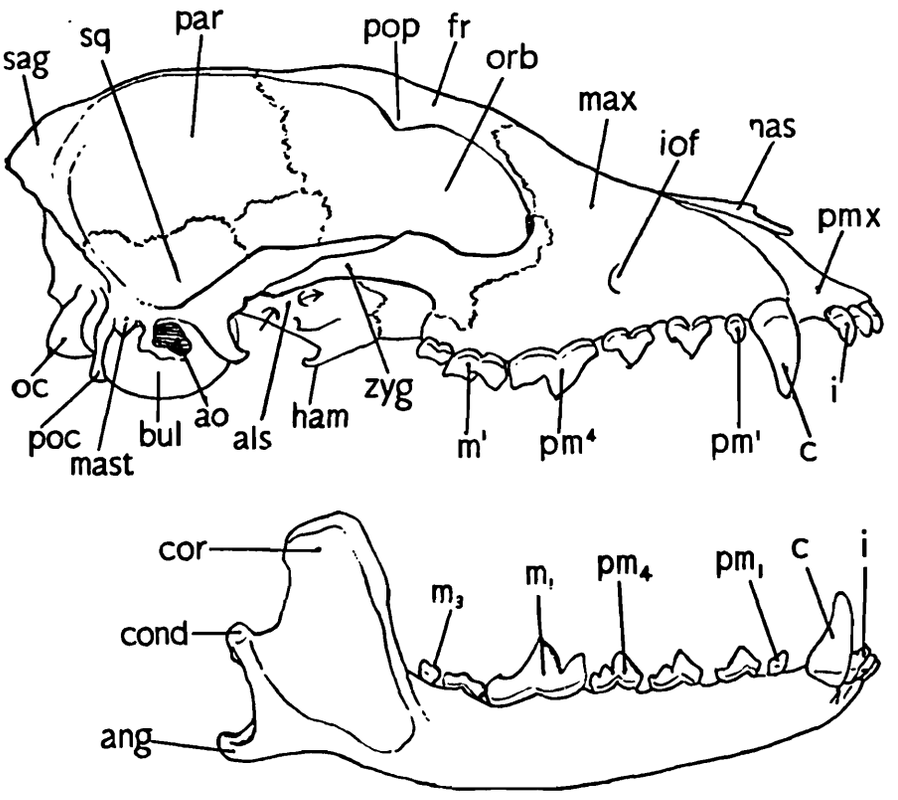


Fig. 4.—Side view of skull, with mandible, of Indian Jackal. Upper figure : lettering as in fig. 3, with *iof*, infraorbital foramen. Lower figure (mandible) : *cor*, coronoid process ; *cond*, condyle ; *ang*, angular process of postdental portion ; *i*, incisors ; *c*, canine ; pm_1 to pm_4, premolars ; m_1 to m_3, molars.

brain, forming a series from the middle of the temporal fossa backwards, and named the *optic foramen*, the *sphenoidal fissure*, the *foramen rotundum*, and the last, the *foramen ovale*, a little in front of the auditory bulla.

The *teeth* supply important characters for distinguishing mammals of all ranks, at least from genera to orders. The full complement of teeth in normal adult mammals is generally considered to be 11 on each side above and below, differentiated into four categories—3 incisors, 1 canine, 4 premolars, and 3 molars, represented by the formula above and below for

one side: i. $\frac{3}{3}$, c. $\frac{1}{1}$, pm. $\frac{4}{4}$, m. $\frac{3}{3}$ In only a few genera of Oriental mammals is this number retained above and below, the reduction affecting alike the teeth of all four categories. In the upper jaw the incisors are the teeth present in the premaxillæ. The rest, from the canines backwards, are lodged in the maxillæ, and are sometimes collectively called the "cheek-teeth." The premolars and molars cannot always be distinguished by their form and structure. The difference lies in the premolars, like the canines and incisors, having predecessors in the milk dentition, the molars being unrepresented in the first set. In the lower jaw the teeth are developed in a single bone, and the incisors are identified by their correspondence with those of the upper jaw. The lower canine always passes or lies in front of the upper when the jaw is closed. This position enables it to be distinguished from the first premolar in some mammals, where the lower canine resembles the incisors and the first premolar is canine-like. Similarly tusk-like teeth in the front of the upper jaw are determined as incisors or canines in accordance with their emergence in the premaxilla or maxilla.

A normal individual tooth consists of the root or roots imbedded in the bone of the jaw and of the crown projecting beyond it. It is developed from a pulp buried in the bone, and during its growth the root remains open at its lower end. In most cases the root closes and growth of the tooth ceases by the time it is brought into use. Such teeth are commonly short, and the condition is called *brachyodont*. But sometimes the roots remain open and the tooth continues to grow after it is in use, so that the effects of wear are made good, at all events until old age is reached. Such teeth, generally deeply imbedded and long, are called *hypsodont*. The crowns are still more variable in structure. Like the roots, they are composed mainly of "dentine," but they are typically coated with a layer of hard enamel, and outside the enamel there is in some cases a third substance, the cement. These three successive layers are manifest in the worn molar teeth of such animals as Elephants. The crowns of the teeth, especially of the posterior cheek-teeth, are typically provided with definite cusps or tubercles varying in size and number, and there is a theory, called the "tritubercular theory," by no means always accepted, that in early mammals the upper and lower teeth carried three cusps arranged, not in line, but in a triangle, the upper having two outer and one inner cusp and the lower two inner and one outer, so that they interlocked when the mouth was closed. In the upper tooth the inner cusp is called the *protocone*, the anterior of the two outers the *paracone*, and the posterior the *metacone*. In the lower tooth the outer cusp is the *protoconid*, the anterior inner the *paraconid*,

and the posterior inner the *metaconid*. These cusps can be homologized in the teeth of many existing mammals; but the crown is generally complicated by accessory cusps which may be developed, apparently, even on the *cingulum*, a thickened ridge of enamel, often traceable, encircling the base of the crown. Teeth indeed are extremely plastic organs, apparently very responsive to diet, and may be totally dissimilar in mammals otherwise tolerably closely resembling one another in structure*.

The rest of the skeleton may be briefly dismissed. The vertebral column, or "backbone," extending from the front of the neck to the tail-tip, and consisting of a series of bones mostly freely jointed together, is divided into several regions. The neck or cervical vertebræ, seven in number in all Indian mammals, have no ribs. A dozen or more of those that follow, the dorsal vertebræ, carry ribs most of which are attached below to a series of bones, the *sternum*. This region of the body is the *thorax*. Behind the last rib-bearing vertebra is a ribless series called the lumbar vertebræ, which are the only ones in the abdominal region. Then come a few vertebræ welded together to form the *sacrum*, to which the *pelvis* is attached; the caudal vertebræ of the tail, varying in number in accordance with the length of that organ, complete the series.

To the *scapula* or shoulder-blade on each side of the fore part of the thorax the fore limb is jointed, and in mammals in which this limb is capable of movement in various directions there is a collar-bone or *clavicle*, usually running from the lower end of the scapula to the front of the sternum. The fore limb consists of a single upper bone or *humerus*, jointed at its lower end to two bones, an inner, the *radius*, and an outer, the *ulna*, the upper end of the latter forming the elbow prominence. These bones at their lower ends are jointed to the wrist or *carpus*, composed of two rows of small bones which give great mobility to the fore foot. This primitively consisted of five *metacarpals* jointed to the wrist and more or less welded together, and five toes or digits, all of which, except the first, the *pollex*, which has only two, are formed of three bones, the *phalanges*.

The bony structure, or *pelvis*, supporting the hind limb is more complicated than that of the fore limb because it has other functions. It consists of three bones, indistinguishably welded in the adult, the upper, *ilium*, which is nearly immovably attached to the sacrum, and two lower, the *pubis* in front and the *ischium* behind. These two bones encircle

* The best instance of this, perhaps, is supplied by the Striped Hyæna and the Aard Wolf of Africa, which are beyond doubt nearly related, yet have widely different premolar and molar teeth. The Aard Wolf feeds mainly on white ants, whereas the Hyæna feeds mainly on dead mammals.

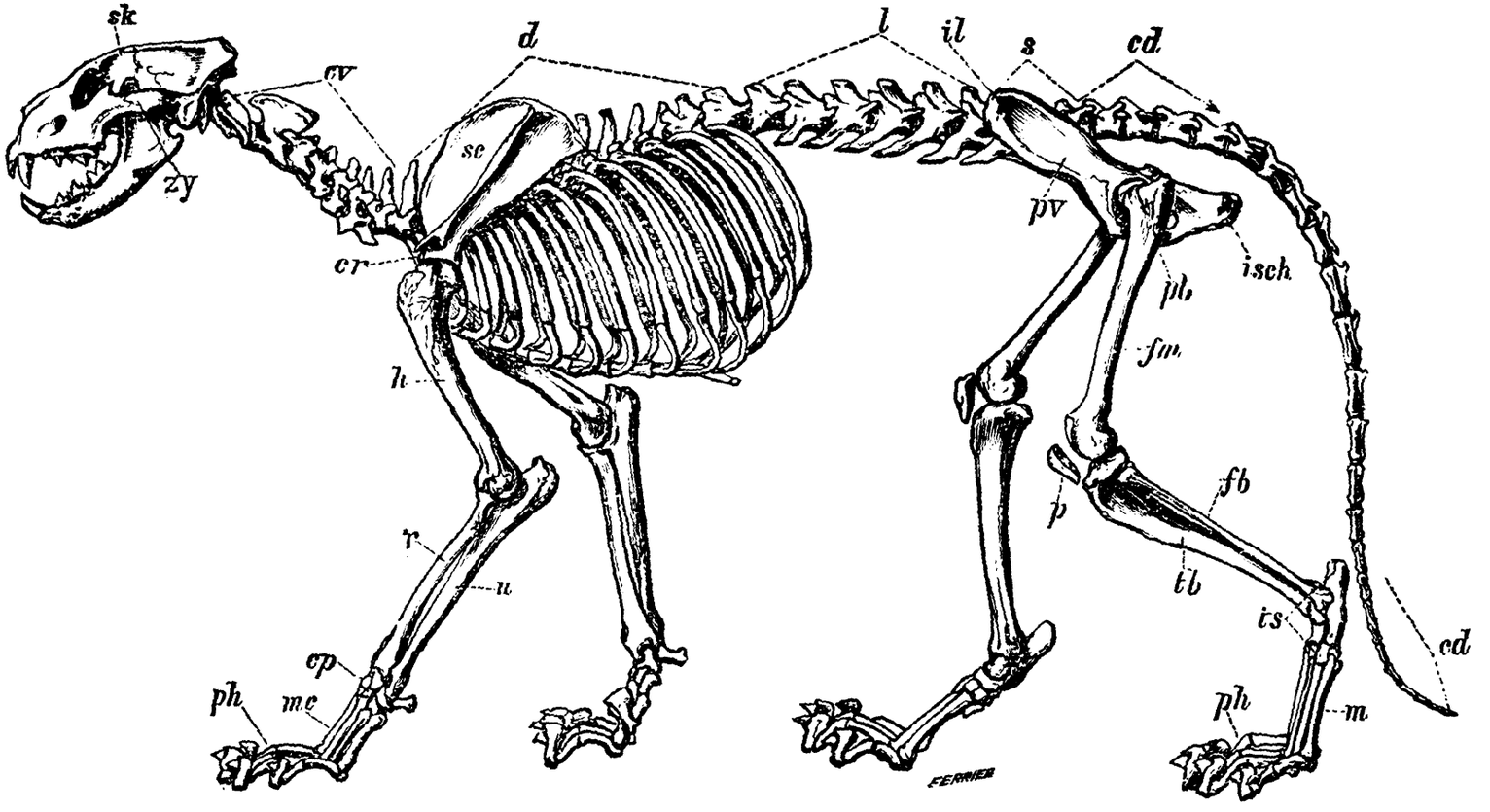


Fig. 5.—Skeleton of a Lioness. (From Guide to the Galleries of Mammalia, British Museum.)

cd, caudal vertebræ ; *cp*, carpus ; *cr*, coracoid ; *cv*, cervical vertebræ ; *d*, dorsal vertebræ ; *fb*, fibula ; *fm*, femur ; *h*, humerus ; *il*, ilium ; *isch*, ischium ; *l*, lumbar vertebræ ; *m*, metararsus ; *mc*, metacarpus ; *p*, patella ; *pb*, pubis ; *ph*, phalanges ; *pv*, pelvis ; *r*, radius ; *s*, sacral vertebræ ; *sc*, scapula ; *sk*, skull ; *tb*, tibia ; *ts*, tarsus ; *u*, ulna ; *zy*, zygomatic arch.

a large orifice, the *obturator foramen*, and are not only joined below it, but are almost always united to their fellows of the opposite side, forming the *symphysis pubis*. At the point where the three bones meet is the socket, or *acetabulum*, for the hind limb, the individual bones of which correspond to those of the fore limb ; the upper, or thigh bone, is the *femur*, the two below it the *tibia* and *fibula*, representing respectively the *radius* and *ulna* of the fore arm ; the ankle is the *tarsus*, of which one of the bones, the *calcaneum*, forms the heel or hock prominence, and the main body of the foot is composed primitively of five *metatarsals*, followed by five toes or digits, of which the first is called the *hallux*, with the same number of phalanges as in the fore foot. In mammals with very specialized limbs, like the Horses, Deer, and Antelopes, the bones above mentioned, both above and below the carpus and tarsus, may be profoundly modified.

From the primitive type, which may be pictured as a smallish, normally hairy, long-tailed, short-limbed mammal, with pentadactyle, clawed, padded feet, a rhinarium, facial vibrissæ, and pinna, which had inherited from its reptilian ancestor the capacity for running, climbing, and swimming, the mammals in the course of their evolution have become adapted to living under all the physical conditions the world supplies where food was obtainable, apart from certain places, like New Zealand, which the sea prevented the terrestrial species from reaching. On land some have become specialized for rapid movement on the surface, others for burrowing beneath it ; others, availing themselves of their climbing powers, took to living in trees, and from arboreal species of different kinds were evolved those with the capacity for flight, which in the case of Bats is equal to that of birds. From the land, too, taking advantage of the innate faculty for swimming, some invaded streams, rivers, and lakes, and from aquatic species were derived marine forms which, in the case of the Dugongs and Whales, are as nearly completely fitted for life in the sea as the fishes. But varied modes of life are not necessarily mutually exclusive. In several of the more generalized mammals partly terrestrial, partly aquatic, and partly arboreal habits are combined.

Adaptation to the different environments above sketched has been accompanied in mammals by a range of variation in structure surpassing that of the existing members of the other classes of Vertebrates. By their modifications they have been classified into a number of different orders. Some of these, like the Bats, Whales, Dugongs, and Elephants, for instance, stand apart from the rest, isolated as living animals by the extinction of ancestral linking forms. These

orders are easy to define. But in other cases, owing to the survival of comparatively primitive species, the ordinal differences are not equally definite, and some of the differentiating characters used in the following Key may seem comparatively trivial. They are, however, accompanied by others mentioned in the main text, where necessary.

It need only be added that, apart from the Monotremes of Australia, the Marsupials of Australia and America, the Edentates of America, the HYRACOIDEA and the TUBULIDENTATA (Aard Varks) of Africa, all the usually admitted orders of Mammalia are found in British India.

Key to the Orders of Mammalia, based on those, excluding Man, inhabiting British India.

a. Hind limbs present; fore limbs not paddle-like; tail without terminal fin and usually much narrower than body at its base.
b. Digits provided with claws or nails (absent on some fingers in Bats).
c. Coat consisting of hairs or spines; teeth present.
d. Digits of fore limb not exceptionally lengthened, and metacarpals not widely separated to support a flight-membrane.
e. First digit of hind foot the largest, opposable and prehensile, of the fore foot (hand) sometimes the same, but usually smaller . . . . . PRIMATES.
e'. First digit of fore and hind foot, when present, not modified for grasping.
f. Mouth not adapted for gnawing, without a pair of specially modified incisors above and below, and with no infolded flap of hairy skin.
g. Body and limbs not provided with a flight-membrane; lower incisors not comb-like.
h. Front teeth consisting of a pair of tusk-like canines with a row of typically 6 incisors between them, of which the outer are larger than the inner; brain more highly developed . . . . CARNIVORA.
h'. Front teeth very variable in arrangement and size, sometimes approaching those of the Carnivora, but the median incisors larger than the laterals, often very large; brain of a lower type . INSECTIVORA.
g'. Body, limbs, and tail supporting a flight-membrane; lower incisors comb-like . . . DERMOPTERA.
f'. Mouth adapted for gnawing, with a pair of large, median incisors above and below and an infolded flap of hairy skin RODENTIA.

d. Digits of fore limb exceptionally long, and metacarpals widely separated to wrist to support flight-membrane. . . . CHIROPTERA.

c'. Hairs consolidated to form erectile plates or scales; no teeth . PHOLIDOTA.

b'. Digits provided with hoofs.

i. Ears erect, a normal neck, at most a short proboscis; normal incisors present at least in lower jaw.

k. Median axis of feet passing between 2nd and 3rd digits, their hoofs equal and symmetrically paired . . . . . [DACTYLA. ARTIO-

k'. Median axis of feet passing through 3rd digit, which is the largest . . . . [DACTYLA. PERISSO-

i'. Ears lying against side of neck, which is very short; nose and upper lip forming a long prehensile proboscis; front teeth represented at most by a pair of upper tusk-like incisors . . . . PROBOSCIDEA.

a'. Hind limbs absent, fore limbs converted into paddle-shaped flippers; tail expanded at end into a horizontal swimming-fin or "fluke," and as thick as the adjoining part of the body at its base.

l. Lips tumid, mobile, and prehensile, the upper cleft; nostrils on summit of muzzle; back teeth with flat crowns; mammæ pectoral SIRENIA.

l'. Lips not noticeably tumid, mobile or prehensile, the upper not cleft; nostrils, except in the Cachalots, on summit of head; back teeth, when present, with conical crowns; mammæ inguinal CETACEA.

The increase in the number of orders over those admitted by Blanford and the change in some of the names are due to the dismemberment of the Colugos as DERMOPTERA from the INSECTIVORA and to the substitution for his UNGULATA of the three orders ARTIODACTYLA for the "even-toed" or "cloven-footed" mammals, of PERISSODACTYLA for the "odd-toed" hoofed mammals, and of PROBOSCIDEA for the Elephants. This is in accordance with recent opinion. Also it is now admitted that the Scaly Anteaters or Pangolins of Africa and Asia are not related to the Anteaters of S. America, which, with the Sloths and Armadillos, compose the true Edentata. The resemblance is merely a matter of diet-adaptation. The Pangolins are now called the PHOLIDOTA. Another order, MENOTYPHLA, might have been introduced by separating the Tree-Shrews from the INSECTIVORA.

Order PRIMATES.

As stated in the analytical Key, this order is mainly distinguished from the others constituting the mammalian fauna of British India by the large size, freedom of movement, and opposability of the first digit of the foot, the hallux or "great toe," so that this extremity forms a powerful grasping organ subservient to climbing*. In the hand the first digit, the pollex or "thumb," may be equally large and similarly functional, as in the Lorises, but in the Apes and Monkeys it is not so large as the other digits, and its opposability is useful rather for picking up food than for climbing. Associated with the freedom of movement of the arms and legs for climbing or other purposes are certain skeletal characters, namely, the presence of complete collar-bones, or clavicles, and the distinctness of the two bones of the forearm, radius, and ulna, and of the shin, the tibia, and fibula. The teeth do not exceed 36 in number, the formula of the complete set being: i. $\frac{2}{2}$, c. $\frac{1}{1}$, pm. $\frac{3}{3}$, m. $\frac{3}{3}$ There are always two pairs of incisors above and below, and the medians are larger than the laterals. The upper canines are always well developed and tusk-like, at least in the male, and the lower also in the Apes and Monkeys, but not in the Lemuroids. The first lower premolar is larger than the rest and acts as a sharpener to the hind edge of the upper canine, and in the Lemuroids is itself sharp and canine-like. The back cheek-teeth have broad crushing crowns, with four cusps, and are more complex than those in front behind the canines.

In his classification of the Mammalia, Man very naturally gives pride of place to this order containing himself and his next of kin, as indicated by its name. This position is only justified by the brain development and the intelligence that goes with it of some of the most specialized of its members. But this does not apply to the more "bestial" forms like the Lemuroids, and the organization of the order as a whole is much less specialized than in several others.

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* Only one other order has a similar type of foot, namely, the MARSUPIALIA of Australia and America. I long ago suggested the possibility of this resemblance being of genetic importance. As adaptive modifications to special methods of climbing the hallux in the PRIMATES is sometimes reduced in size. It is comparatively small, for instance, in the Orang-utan; and in the diminutive S. American Marmosets, which leap about trees like Squirrels, it is so small as to be nearly functionless, although still opposable.

Key to the principal Subdivisions of British Indian Primates.

a. Muzzle without rhinarium and with lips free from the gum and protrusible; skull with orbit closed behind, and the front teeth normal in position and function	[p. 14. *PITHECOIDEA,*
b. Skull with bony tubular auditory meatus; 2 premolars above and below on each side.	*Catarhini,* p. 15.
c. Arms much longer than the legs; no external trace of a tail	[p. 15. *Anthropomorpha.*
c′. Arms and legs subequal in length; tail usually long, sometimes reduced to a stump . . .	[p. 31. *Cynomorpha,*
b′. Skull without tubular auditory meatus; 3 premolars above and below on each side.	*Platyrhini.*
a′. Muzzle with distinct rhinarium and with lips adherent to the gum, not protrusible; skull with orbit open behind and front teeth abnormal .	[p. 163. *LEMUROIDEA,*

The characters of the family Hominidæ (Man), belonging to the Anthropomorpha, are not included in this Key. The characters of the Platyrhini, containing the American Monkeys, are entered by way of contrast with the Catarhini, but the group is not included in the Indian fauna.

Suborder *PITHECOIDEA* *.

No *rhinarium* or area of moist skin round the nostrils, with its extension below, as the *philtrum*, to the edge of the upper lip; the lip not closely adherent to the gum, but protrusible.

Hands and feet with the 4th digit not longer than the 3rd, which, more noticeably on the hand, is typically longer than the 2nd and 4th. Foot with its 2nd digit never differentiated from the rest by its claw-like nail. The tongue without a sublingua or serrated lamina beneath it.

Skull with the orbit shut off from the temporal fossa by a bony plate, leaving merely a narrow communicating cleft below it. Lower canine not projecting forwards and incisiform, the lower incisors not forming a comb-like structure and the median upper incisors not widely separated in the middle line.

This suborder, with the Tarsioidea, constitutes the section of Haplorhine Primates, characterized by the structure of the

* In 1918 I proposed this subordinal name as a substitute for the older name Anthropoidea because "Anthropoid," reasonably according to its meaning, has been consistently applied to the man-like Apes, and because "Anthropoid" cannot with any approach to its real significance be applied to, *e. g.*, a Marmoset. But a Marmoset and a man are alike Pithecoid or monkey-like.

nose, and upper lip, by the closed orbit, and other specialized features distinguishing them from the more primitive Strepsirhine Lemurs (p. 164). *Tarsius*, however, which does not occur west of Java, shows several superficial resemblances to the African Galagos, related to the Lorises (p. 164), and was formerly always regarded as a Lemuroid. Its survival as a representative of the primitive stock of Pithecoids, linking them in a measure with the Lemuroids, justifies the retention of the LEMUROIDEA in the Primates instead of their relegation to a special order, the PROSIMIÆ.

The Pithecoid Primates are divisible into two groups, the PLATYRHINI or American Monkeys and Marmosets, and the CATARHINI or Monkeys and Apes of Africa and Asia and Man.

CATARHINI.

Distinguished from the PLATYRHINI by the presence of a bony tube to the ear and by having only two premolar teeth above and below on each side, the dental formula being: i. $\frac{2}{2}$, c. $\frac{1}{1}$, pm. $\frac{2}{2}$, m. $\frac{3}{3} = 32$, instead of i. $\frac{2}{2}$, c. $\frac{1}{1}$, pm. $\frac{3}{3}$, m. $\frac{3}{3}$ or $\frac{2}{2} = 36$ or 32, the numerical equality in the latter case being reached by the loss of the 3rd molar in the Marmosets. In the CATARHINI also the periotic bone is always perforated by the carotid canal, marked by a conspicuous foramen, whereas in the PLATYRHINI the artery usually enters the brain behind the periotic. The external differences are not so important, but the thumb in the Catarhines is more opposable and prehensile and the nostrils are typically narrower and more convergent at their lower ends than in the Platyrhines, which take that name from the normally wider space between the nostrils.

Section *ANTHROPOMORPHA*.

THE MAN-LIKE APES.

This section of the Catarhine Primates, comprising the species to which the term "Apes" is now conventionally restricted, is distinguished by the absence of all external trace of the tail, by the great development of the arms, which are much longer than the legs, by the thumb being more freely jointed to the hand and emerging close to the wrist, with its basal thickening, the "ball of the thumb," approximately on a level with the external metacarpal pad; the foot has its heel broader in proportion to its length, the hands and feet are never markedly unequal in length, and the pads on the palms and soles are poorly developed.

These characters are associated with marked peculiarities both in arboreal and terrestrial activity. In walking in the quadrupedal attitude the palms of the hands are never applied to the ground, the bent knuckles of the fingers being used instead, and the entire sole of the foot, or its outer edge, supports the hind quarters, which, as compared with the

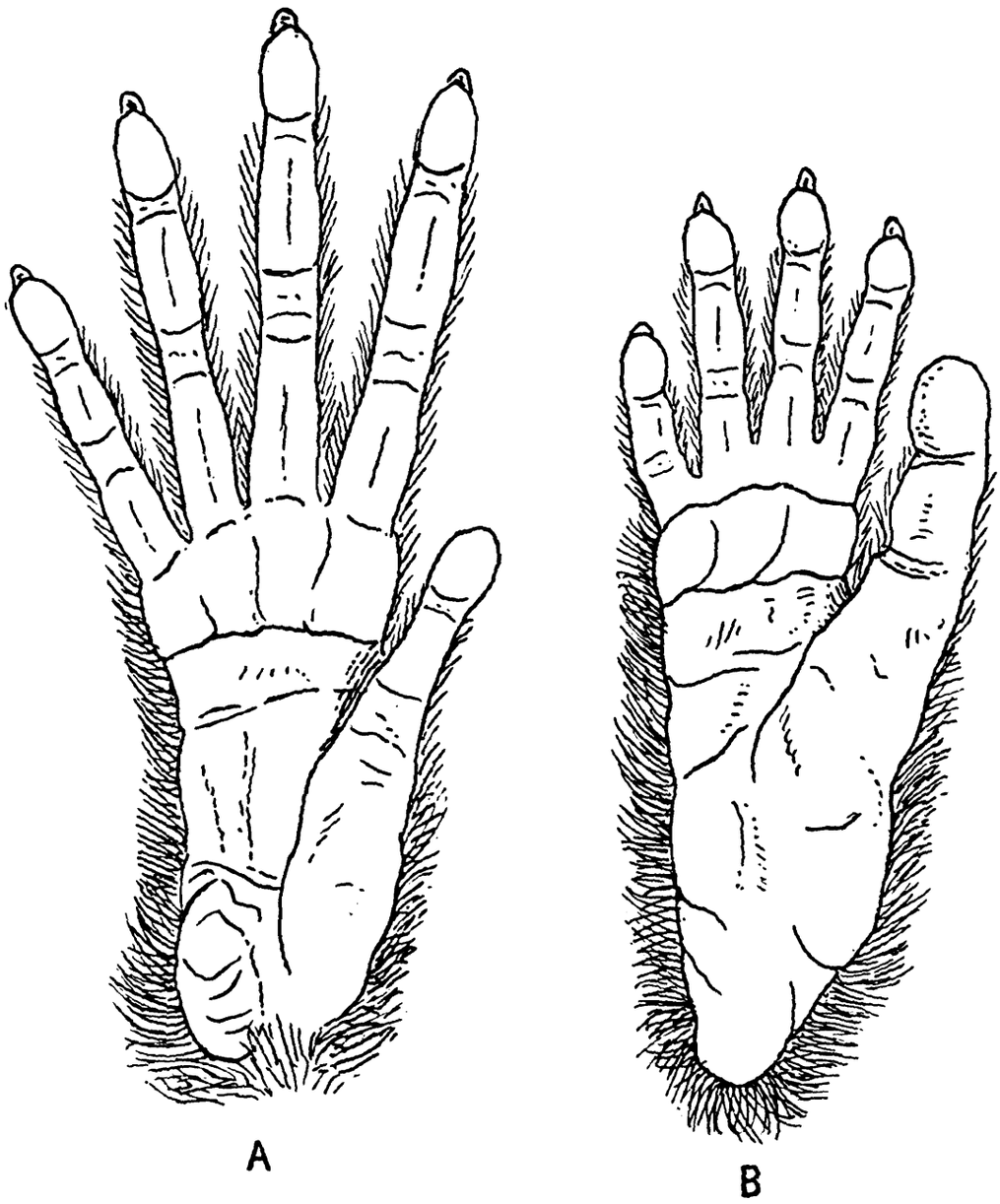


Fig. 6.—A. Right hand of Lar Gibbon (*Hylobates lar*).
B. Right foot of the same.

shoulders, are weak and light. In the young at least the erect bipedal attitude is readily assumed for standing, walking, or even running. In tree-climbing, when speed is required, the powerful arms are principally employed for swinging from branch to branch, the legs being too weak for long leaps. This method of climbing has been called *brachiation*.



Photo W. S. Berridge.

Hoolock Gibbon (*Hylobates hoolock*)



Photo W. S. Berridge.

To the ANTHROPOMORPHA belong the Gorilla and Chimpanzee of Africa and the Orang-utan and Gibbons of the Oriental Region. They are essentially forest animals. The Gibbons alone, constituting the family Hylobatidæ, occur in the British Indian fauna *.

Family HYLOBATIDÆ.

THE GIBBONS.

Apes with ischial callosities invariably present and well developed, the arms and legs, especially the arms, relatively long, with long and narrow hands and feet and long, slender digits, the pollex, or thumb, very long and, when closed, fitting into a depression on the adjoining surface of the hand, the hallux, or "great toe," also long and, when closed, overlapping the distal margin of the sole of the foot. No striking secondary sexual characters, the two sexes being to all intents and purposes alike in size and skull characters, the ♀ having enlarged canines, which at most are only a little smaller than those of the ♂. The skull has a larger cranial and smaller facial portion, with weaker jaws, than in Asiatic Catarhine monkeys.

In the almost complete absence of secondary sexual characters the Gibbons differ from all the other families of Catarhine Primates.

Although less man-like than the other Anthropoid Apes in mental capacity, and in some, but by no means all, structural characters, thus coming nearer the ordinary Monkeys, the Gibbons surpass the other Apes in physical activities, manifested by their ability to walk and run with facility in an erect attitude on the ground and by the extent to which they have perfected the arm-swinging method of traversing the forest. In these and other habits all the species of Gibbons seem to be alike or to differ only in minor particulars.

On the ground they are essentially bipeds, standing and walking on the flat sole of the foot, with the great toe projecting sideways as a support, and, when hurried, either running with considerable speed, although with a somewhat awkward gait and not so fast as man, or progressing with a series of leaps, the two legs acting in unison. When thus

* Man also, forming the family Hominidæ, belongs to this section. He is chiefly distinguished from the Apes by the perfection of the bipedal attitude, which has brought with it some modifications of structure, of which the most important is the tying up of the great toe to the side of the foot so that it has lost its opposability to the others and is no longer, strictly speaking, prehensile.

on the move they may lightly touch the ground with the fingers to steady themselves; but almost always they hold the arms up, outstretched, but bent at the elbows and wrist, and employ them as balancers. So accurate is the balance that Gibbons can walk along the branch of a tree or, as observed in captive specimens, even along a swaying, horizontal rope, grasping it with their prehensile feet.

Equally remarkable are the means they employ and the speed they attain when traversing forest trees. With a jump off the upper side of a branch they launch themselves towards another, grasp it with upstretched hand, swing beneath it and, letting go, are carried on to another, which is similarly grasped by the other hand, the action being continued from branch to branch at great speed. When arresting their course they retain the hold of the branch and, swinging up on its further side, alight on their feet on its upper surface. Naturally they also climb slowly about trees after the manner of other Anthropoid Apes, but the method above described is the method adopted when speed is required. No other Pithecoid Primate is capable of such arboreal acrobatic feats, and none but man can exhibit such terrestrial bipedal activity.

Another habit they have in common is howling vociferously from the tree-tops for two or three hours after sunrise, then quietly resting or feeding till towards sundown, when a briefer concert is indulged in before retiring to rest on the branches. Their diet consists mainly of leaves, flowers, and fruits, varied with some spiders and insects; and their usual method of drinking from a pool is to dip the back of the hand in the water and lick it off with the tongue, but occasionally they suck up the liquid direct with their lips.

The period of gestation is seven months (see p. 31).

Final agreement as to the value of the characters by which the various kinds of Gibbons that have been named differ from each other has not yet been reached by systematists. But the latest classification of the family by Miller (Journ. Mamm. xiv, p. 159, 1933) establishes the existence of at all events five well-marked species which, so far as is known, do not intergrade, and are given subgeneric rank. These are: *H. lar* and *H. hoolock*, representing *Hylobates* (sensu stricto); *H. leucogenys*, subgenus *Nomascus*, from Siam and Indo-China; *H klossii*, subgenus *Brachitanytes*, the dwarf Gibbon of S. Pagi Island, west coast of Sumatra; and *H. syndactylus*, subgenus *Symphalangus*, the Siamang of Sumatra and the Malay Peninsula.

The two British Indian species belong to *Hylobates* (s. s.).

Genus **HYLOBATES** Illiger.

Hylobates, Illiger, Prodr. Syst. Mamm. p. 67, 1811 ; Miller, Journ. Mamm. xiv, p. 159, 1933 (*sensu stricto* as subgenus).

Type of the genus, *Homo lar* Linn.

Distribution.—From ASSAM and BURMA to Siam and Indo-China, and through the Malay States and Sunda Islands to Borneo.

Distinguished from the species constituting the subgenera *Nomascus*, *Brachitanytes*, and *Symphalangus*, as defined by Miller, by one or more of the following characters :—Hair on the crown directed backwards, longer laterally than mesially ; laryngeal sac absent in both sexes and the throat not noticeably thinly haired ; the scrotum absent, the testicles in the adult only descending to the base of the penis, but not below it. Skull with its facial profile tolerably strongly concave between the top of the nasal and the summit of the prominent brow-ridge *.

This diagnosis applies to the two British Indian species and to the three forms *agilis*, *leuciscus*, and *mulleri* from the Malay Peninsula, Sumatra, Java, and Borneo, which, with skulls like those of *lar* but differing in coloration, I regarded as subspecies of it (Proc. Zool. Soc. x. 1927, p. 722). Later, however, Kloss (Proc. Zool. Soc. 1929, p. 117) gave reasons for considering them specifically distinct, an opinion apparently endorsed by Miller.

The two species occurring in British India may be briefly distinguished as follows :—

a. Hands and feet the same colour as the arms and legs ; black phase with a pale brow-band, but the face not encircled with white ; pale phase with the ventral surface darker than the dorsal. [p. 19. *hoolock* (Harl.),

b. Hands and feet wholly or mostly white above, very conspicuously contrasted with the arms and legs in the dark phase and always a little lighter in the pale phase ; face encircled with a white ring in the black phase ; the ventral surface about the same tint as the dorsal in the pale phase [p. 26. *lar* (Linn.),

1. **Hylobates hoolock** (Harlan). The Hoolock Gibbon.

Simia hoolock, Harlan, Tr. Amer. Phil. Soc. iv, p. 52, pl. ii, 1834, and of all recent authors under *Hylobates*.

Hylobates fuscus, Winslow Lewis, Journ. Nat. Hist. Soc. Bost. i, pt. 1, p. 32, pls. i & ii, 1834.

Hylobates choromandus, Ogilby, Proc. Zool. Soc. 1837, p. 689.

Hylobates scyritus, Ogilby, Royle's Illustr. Himal. Bot. p. ix, 1839.

Vernacular.—Uluk (Hindi) ; *Myouk-lwai-gyau* and *Too-boung* (Arakan) ; *Wu-wa* (Shan).

* Miller mentioned as an additional diagnostic character the direction of the hairs on the radial side of the forearm towards the thumb. The two British Indian species differ in this respect.

Locality of the *type* of *hoolock*, Garo Hills, Assam; of *fuscus*, "the vicinity of the Himalaya Mountains"; of *choromandus*, unknown; of *scyritus*, Assam*.

Distribution.—From ASSAM, CACHAR, and CHITTAGONG through UPPER BURMA to WESTERN YUNNAN and the NORTH SHAN STATES.

Coat long and thick, smooth, not raised into a tuft on the crown of the head, and abundant round the callosities and the genital area. Hairs on the forearm growing upwards from the wrist to the elbow. Colour varying, sexually dimorphic in the adult; the male is black, with a contrasted silvery-white brow-band and a brown or grey beard-like tuft on the genital area; the female is more variable and much paler, the entire upper side and the outside of the limbs may be tolerably uniformly golden or ruddy-buff, or brownish-buff clouded with brown on the back or buffy-white on the head, nape, fore part of the back, shoulders, and arms, becoming clouded with brown on the flanks, loins, and legs; the hands and feet may be the same tint as the arms and legs, but usually the digits, or at least their distal ends, are black; the face is encircled by white hairs, with a narrow line of white between and below the eyes; the ventral surface, the middle line of the throat, and the cheeks up to the ears are darker or lighter brown, always darker than the dorsal surface, and the brown hue of the cheeks, often very dark, emphasises the pale band round the face; the hairs of the genital region just below the vulva are brown or black, always darker than the surrounding hairs.

There has been great difference of opinion about the incidence of the black and pale phases in the two sexes. G. M. Allen (Amer. Mus. Novit. no. 429, p. 5, 1930) suggested that the species goes through colour-changes similar to those known to occur in the Indo-Chinese species *H. (Nomascus) concolor*, which I described many years ago (Proc. Zool. Soc. 1905, p. 169). This suggestion was proved correct by McCann (Journ. Bomb. Nat. Hist. Soc. xxxvi. p. 395, 1933), who, from his observations in the Naga Hills, found that the young at birth is pale greyish-white, with a yellowish tinge, gradually darkens with age, and finally turns black before reaching maturity. This black hue is retained throughout life by the ♂; but in the ♀ at puberty the coat fades to the pale yellowish-brown hue. McCann's observations on the colour-change in the ♀ Hoolock were subsequently confirmed by Major W B. Shakespear (Journ. Bomb. Nat. Hist. Soc. xxxvii. p. 214, 1934). A specimen which was at first grey gradually changed to jet-black, and stayed that colour until about 5½ years old,

* The types of *choromandus* and *scyritus* in the British Museum are females in the pale phase.

when she began to turn grey and became greyish all over. The largest black ♀ I have seen had the head and body 20 in. long, the foot 5½ in., and weighed 8 lb.; but in the skull the milk-canines were still in place and the last molar not erupted.

Some individual differences in colour may be mentioned. In three adult ♂♂ from H'Kamti, Upper Burma, the chin may be pale buffy, matching the brow-band, and strongly contrasted with the surrounding black or dark brown or uncontrasted. The hairs of the genital tuft, from 50 to 55 mm. long, similarly vary from being black throughout, black at the base, and brown distally or uniformly pale greyish-brown and conspicuous from its generally pale hue. In a ♂ from Hatikhali, in the Cachar Hills, there is no white on the chin and the hairs of the genital tuft, 58 mm. long, are brown distally; in one from the Kabaw Valley, Upper Chindwin, to the west of the river, the chin is also dark, but the genital hairs are very deep blackish-brown and about 45 mm. long. But in a ♂ from Homalin, Upper Chindwin, on the east bank of the river, there is some white on the chin and the genital hairs, measuring 75 mm., are blackish at the base and largely grey distally, and in one from Gokteik, in the N. Shan States, the chin is brown, the genital hairs, 85 mm. long, are black at the base, brown in the middle, and grey at the tip. The difference in the colour of the genital hairs is probably a question of bleaching from blackish-brown to reddish, and finally to grey. In the ♀ the prevalent colour, as shown by skins from H'Kamti, the Kabaw Valley, and the Chin Hills, is mainly shining buff above, brown below and on the cheeks. One from Margharita, in the Naga Hills, stands out for the very rich orange-ochreous hue of the upper side and the outside of the limbs. Very different is a ♀ from Barahapjan, Lakhimpur, which is not so richly coloured as the skin from H'Kamti, being browner on the back and greyer on the shoulders, head, and outside of the limbs.

The flesh-measurements (in English inches) and the weights (in lb.) of some specimens are as follows :—

Locality and sex.	Head and body.	Foot.	Weight.
Hatikholi, Cachar Hills; ad. ♂	24⅘	6⅕	17½
Homalin, Chindwin; ad. ♂	24⅕	6+	16
H'Kamti, Chindwin; ad. ♂ .	23½	6	13½
Gokteik, N. Shan States; ad. ♂	23	6⅕	14½
H'Kamti, Chindwin; ad. ♀ .	24½	6	14½
Gokteik, N. Shan States; ad. ♀	23	6—	—
Margharita, Naga Hills; ad. ♀	20	5½	14
Kulbi, Kamrup; ad. ♀	18	6	—

Although the sexes overlap in size, the ♂♂ from these data are a little larger on the average than the ♀♀.

The skull varies individually in the height and length of the cranial portion, the development of the brow-ridges, which thicken with age, in the size and shape of the orbits and of the anterior narial aperture, and in other particulars.

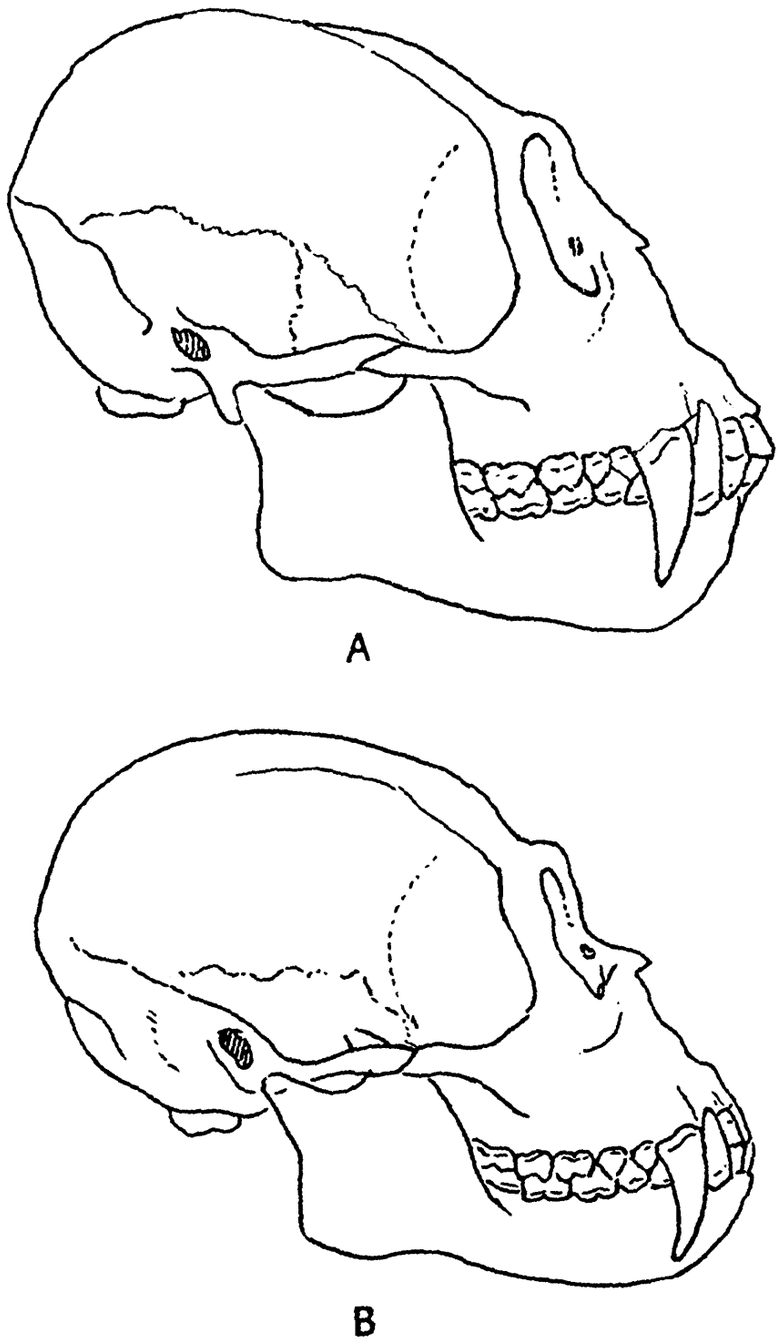


Fig. 7.—A. Skull of adult ♂ Hoolock Gibbon (*Hylobates hoolock*) from the Upper Chindwin. B. Skull of adult ♂ Lar Gibbon (*Hylobates lar*) from Bankachon, Tenasserim.

As the following table of measurements shows, ♂ skulls are on the average a little larger than ♀ skulls, and thus bear out the conclusion established by the flesh-measurements of the

Skull-measurements (in mm.)* of *Hylobates hoolock*.

Locality and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
H'Kamti, Upper Chindwin ; ad. ♂	114	100	69	65	31	38	78
H'Kamti, Upper Chindwin ; ad. ♂	113	96	76	66	34	37	78
Mokokchung, Naga Hills ; ad. ♂	112	97	75	64	32	36	79
Kabaw Valley, Upper Chindwin ; ad. ♂	111	91	72	63	31	37	79
Homalin, Upper Chindwin ; ad. ♂	110	92	77	67	32	38	77
H'Kamti, Upper Chindwin ; ad. ♀	113	96	76	67	33	38	77
Sadiya, Assam ; ad. ♀	111	94	71	65	32	38	78
Bara Hapjan, Lakhimpur ; ad. ♀	110	94	71	62	32½	36	75
Margharita, Naga Hills ; ad. ♀.	108	90	69	61	32	36	75
Kabaw Valley, Upper Chindwin ; ad. ♀	106	89	69	60	31	36	78

* The measurements are taken as follows :—*Total length* from the tip of the premaxilla to the end of the cranium ; *condylo-basal length* from the same point to the end of the occipital condyle ; *zygomatic width* across the zygomata at their widest point ; *orbital width* across the middle of the orbits ; *maxillary width* across the maxilla at the base of the canines ; *upper cheek-teeth* from front edge of canine to hinder edge of last molar ; *mandibular length* from the tip of the condyle to that of the symphysis.

slight average superiority of the ♂. The points in which the skull differs from that of *H. lar*, the other British Indian species, are mentioned under that heading.

Distribution.—Pemberton's record of this Gibbon in Bhutan, rejected by Blanford, and not subsequently confirmed, may perhaps be true, since the Survey secured it in Lakhimpur to the north of the Brahmaputra. In the Mishmi, Naga, Garo, and other hill-ranges on the other side of this river it seems to be plentiful, and west of the Chindwin, in the Kabaw Valley and Chin Hills, it certainly occurs. But how much farther south it goes is a little uncertain. Tickell, it is true, said it occurs in Arakan, but he thought the Gibbon he called the Hoolock from this district was different from the Hoolock of Assam. In the H'Kamti State, Upper Burma, it is equally plentiful on both banks of the Chindwin according to Shortridge, who states that it must have crossed to the eastern side by way of the Hukawng Valley, above the source of the river, but that the comparatively flat country on the east bank, S. of H'Kamti, was unfavourable to its extension farther south. East of the Irrawaddy it is found in the Kakhyen Hills, Western Yunnan, and in the Hsipaw and N. Shan States*.

Habits.—Anderson wrote of this Gibbon as occurring in "large troops" in the dense forests on each side of the Irawaddy below Bhamo, where in the early morning the surrounding hills echoed their howling. In the Kakhyen Hills he found that they slept at night in the sheltered warm valleys and at daybreak ascended the hills to a height of about 4,000 ft., traversing the forest with wonderful rapidity, uttering the while their characteristic cry "*Whoko*! *Whoko*!" Their diet consisted of the "essential elements of sylvian life": leaves, flowers, insects, spiders, eggs, and birds. From the eagerness and method with which captive specimens in Calcutta caught and devoured small living birds, Anderson inferred that the Hoolock "must be a scourge to the feathery tribe." Candler, however (Proc. Zool. Soc. 1906, p. 187), who observed this Ape in Cachar, differs from Anderson with respect to its diet. He thinks they feed mainly on fruits and the succulent shoots of young bamboos and other trees, and they will certainly eat some spiders. But his captive specimens refused eggs and showed no partiality for insects or small birds, merely pulling them to pieces and possibly tasting them †

† Anderson's record of it from Pegu was, I suspect, due to his inability to distinguish it in the pale phase from *H. lar*.

* My own experience with Hoolocks in the London Zoological Gardens bears out Candler's opinion. No doubt, however, they differ individually in tastes.

Nor is Anderson's statement that they occur in large troops borne out by subsequent observers. Mackenzie, who came across them in the heavier jungles of the Chin Hills up to 5,000 ft. and in the Kabaw Valley, states that they usually go about in parties of three or four, but sometimes singly; once only did he notice a party of as many as six, and in the Hsipaw State Shortridge observed them in pairs or singly, although he was told that where plentiful they are gregarious. It is quite possible that their habits in this respect vary locally and that the usual family parties may at times join forces.

McCann (Journ. Bomb. Nat. Hist. Soc. xxxvi. p. 395, 1933) has given a tolerably full account of the habits of this Gibbon in the Naga Hills. He confirms the statements of Shortridge and Mackenzie that it goes about in small family parties consisting of the two parents and one or more young, the largest party seen being composed of seven, of which the youngest was a baby. He thinks there is a definite breeding season; and since every mature ♀ shot in January and early March had a young one, he infers that the young are born in the cold weather between November and February. He also believes that maturity is reached in four or five, possibly six, years, and that the young adults then leave the party or are driven from it by the parents.

They spend most of the day in high trees, and in the early mornings may often be seen sunning themselves on exposed boughs, but during the hottest part of the day they frequently descend to lower levels of the jungle. When alarmed they hide in the foliage, in the forks of branches or in bamboo clumps, and their usual alarm-call is a sharp, rather harsh bark, often repeated; but alarm is also sometimes expressed by a sound like a loud belch repeated from time to time. When sleeping they typically assume a sitting posture on a branch, with the head buried between the knees.

Their diet consists of leaves, flowers, and fruits, varied with spiders and certain edible insects. Water for drinking is usually taken off the foliage either direct with the tongue or by wetting and licking the hands. In dense forests they seldom come to the ground; but now and again they leave the trees and enter villages to plunder cultivated gardens, being particularly fond of the flowers of *Bombax*.

Over the ground they move with exceeding rapidity for a short distance in the typical Gibbon fashion described above, but stop from time to time to rest.

2. **Hylobates lar** (Linnæus). The Lar or White-handed Gibbon.

Homo lar, Linn., Mant. Plant., App. p. 521, 1771.
Hylobates lar, Illiger, Abhand. Akad. Wiss. Berl. 1815, p. 88, and of all recent authors.

Locality of the *type*, the southern portion of the Malay Peninsula (restricted by Kloss in 1929).

Distribution.—The Malay Peninsula northwards through TENASSERIM and the adjoining district of Siam into LOWER BURMA.

Distinguished from *H hoolock* by its slightly smaller size, by the hairs on the radial (inner) side of the forearm growing downwards from the elbow to the thumb, upwards from the wrist to the elbow externally, by having the entire hands and feet, or at least the fingers and toes, white and contrasted with the arms and legs, and by the absence of sexual dimorphism in colour between the adult ♂ and ♀, which may be either blackish or varying shades of brown, tawny buff or even cream; but the black phase is distinguished from that of *H hoolock* not only by the whiteness of the extremities, but also by a conspicuous white band encircling the face. In the pale phases these white areas are not so conspicuous, although always visible, and the facial band is seldom thrown into relief by the brown cheeks; nor is the lower side noticeably darker and browner than the upper, as in the adult ♀ of *H hoolock*. The rump, with its callosities, is not so concealed by hair, and the genital tuft of the adult ♂ is much smaller than in *H. hoolock**. The skull is a little smaller, but has relatively wider orbits, with the brow-ridges better developed at their inner ends, the upper jaw is weaker and the teeth a little smaller (fig. 7, p. 22).

2 *a*. **Hylobates lar entelloides** Geoffroy.

Hylobates entelloides, I. Geoffroy, C. R. Acad. Sci. Paris, xv, p. 717, 1842; Arch. Mus. ii, p. 532, pl. xxix, 1843.
Hylobates lar entelloides, Kloss, Proc. Zool. Soc. 1929, p. 117.

Vernacular.—*Myowk Hlwé giaw* (Burmese); *Khayoopathán*, black phase, *Khayoo pawá*, pale phase (Karen); *Ungta puttee*, pale phase, *Ungta etam*, black phase, *Wow wow* (Malay), *Mawa* (Malay at Bankachon).

Locality of the *type*, Malay Peninsula about lat. 12° N.

Distribution.—Northern part of the Malay Peninsula, TENASSERIM, S.W Siam.

* This description of the external features applies to the typical *H. lar lar* from Southern Malaya and to its northern representative in Lower Burma, but not to *H. lar pileatus* of Siam and Cambodia, which intergrades with the Burmese form.

Distinguished, at least on the average, from typical *lar* from the southern part of the Malay Peninsula by having the hands and feet less extensively white by encroachment of the black of the arms and legs below the wrist and ankle and by being blacker and less brown on the body in the dark phase. In the pale phase the tops of the hands and feet look soiled.

Geoffroy's type was an adult ♀ in the pale phase. His coloured plate, if accurate in this respect, shows that the feet at least were wholly white above up to the ankle-joint. The locality of this Gibbon is about the same latitude as Tenasserim Town, considerably to the north of Bankachon; and in 1927 in my paper dealing with this species of Gibbon special attention was drawn to two ♂ specimens from the last-named locality, close to Victoria Point, Tenasserim, on account of the blackness of the wrists and ankles and the infuscation of the upper sides of the hands and feet, serving to link in this respect typical *lar* with the race *H. lar pileatus* which inhabits Siam and Cambodia. On revising his abundant material of the species two years later Kloss found that this coloration of the hands and feet, accompanied by the general blacker hue of the back, served to distinguish racially Tenasserim specimens from those found farther south, and he adopted *entelloides* to designate them.

In a series of skins from Bankachon, Victoria Point, Tenasserim (Hume and Shortridge), the darkening of the hands and feet is very variable. In a rufous-brown ♂ the hairs on the fingers and toes and some on the top of the hands and feet are brown. In others the hands and feet may be dusky, greyish-brown above to the base of the fingers and toes. Even in those with the whitest hands and feet the dark hue of the arms and legs extends practically down to the naked skin of the palm and sole behind and to a corresponding distance in front. But in a ♀ skin from Tavoy (Smith) the hands and feet are as white as in typical *lar*, the black of the limbs stopping short about an inch above the naked skin of the palm and sole behind and to a corresponding distance in front. In its general hue, however, this specimen is not so brown as in typical *lar*, the back being black and extensively grey on the shoulders.

From available material it appears the percentage of skins in the black phase is less in Southern than in Northern Tenasserim. Thus in 22 skins from Bankachon, 4 ♂♂ are black, 11 ♂♂ and 7 ♀♀ are pale. On the other hand, 1 ♀ from Tavoy is black; in 4 from the Taok Plateau (Vernay), 1 ♂ and 2 ♀♀ are black, 1 ♀ pale; in 2 ♂♂ from 17 miles east of Lakya (Vernay) one is black, the other pale, and 1 ♂ from the Haungtharaw River, Kawkareik (Davison), is pale. Of the

8 skins from these localities, 5 are black and 3 pale, 2 ♂♂ being black, 2 pale, and 3 ♀♀ black and 1 pale. In Amherst, however, Tickell says pale specimens were more numerous than black.

The only newly-born young I have seen was collected by Shortridge at Bankachon. It is darkish brown in colour, paler than the normal dark phase, and darker than the pale phase of the adults. A rather older black young one from Amherst was figured by Tickell; and two half-grown specimens from Bankachon are in the normal pale phase.

The extremes in size and weight are supplied by the long series of skins from Bankachon. The largest and smallest ♂ and ♀ are entered below, with the average length of the head and body. The average of the ♀ includes three from the Taok Plateau, which fit in with the Bankachon females. Intermediates between the extreme weights quoted have been recorded.

Locality and sex.	Head and body.	Foot.	Weight.
Bankachon; ad. ♂	23	5½	16¾
Bankachon; ad. ♂	21⅛	6	13½
Average of 10; ad. ♂	22+	—	—
Bankachon; ad. ♀	22⅝	6	15
Bankachon; ad. ♀	20	5⅜	10
Average of 7; ad. ♀	21⅛	—	—

The subjoined table of skull-measurements shows that although the total and mandibular lengths of the largest may equal those of the smallest skulls of *H hoolock*, the averages are decidedly less. On the other hand the lengths of the condylobase and of the upper cheek-teeth are in all cases less. Also it seems evident that the skulls of *H. lar*, both ♂ and ♀, are individually much more variable than of *H. hoolock* despite the comparatively restricted geographical range of *H. lar entelloides*.

The young are born in the early part of the cold weather, as in the case of the Hoolock, and are dependent on the mother for seven months.

Habits.—This Gibbon, Tickell tells us, is found in great abundance in all the forests skirting the hills of Tenasserim, but not above 3,500 ft. It habitually lives in troops of from eight or ten to twenty individuals of all ages and both sexes. Only occasionally is an old male seen by itself. In indulging in early morning concerts in the tree-tops, one troop calling to another in a distant part of the forest, and in remaining silent, feeding and resting, during the greater part of the day afterwards, also in its instinct to hide in the foliage or behind a thick branch when danger threatens, it resembles the Hoolock; but according to Tickell it is much less active on

Skull-measurements (in mm.) of *Hylobates lar entelloides*.

Locality and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
Bankachon, Tenasserim ; ad. ♂	110	89	73	66	30	34	72
Taok Plateau, Tenasserim ; old ♂.	102	84	70	67	31	34	73
Bankachon, Tenasserim ; old ♂	98	79	69	65	28	30	66
Bankachon, Tenasserim ; ad. ♀	109	88	70	66	32	32	72
Taok Plateau, Tenasserim ; ad. ♀	108	87	73	61	30	34	75
Tavoy, Tenasserim ; ad. ♀	98	—	66	60	28	33	69

the ground than that species and can only shuffle along on its legs in a half-erect posture, using its arms for support*.

According to Shortridge this Gibbon is plentiful near Victoria Point, where, although not avoiding the neighbourhood of human habitations, it seldom leaves the forests and is probably rarely destructive to ground crops. It is particularly noisy in the early morning and evening, the call consisting

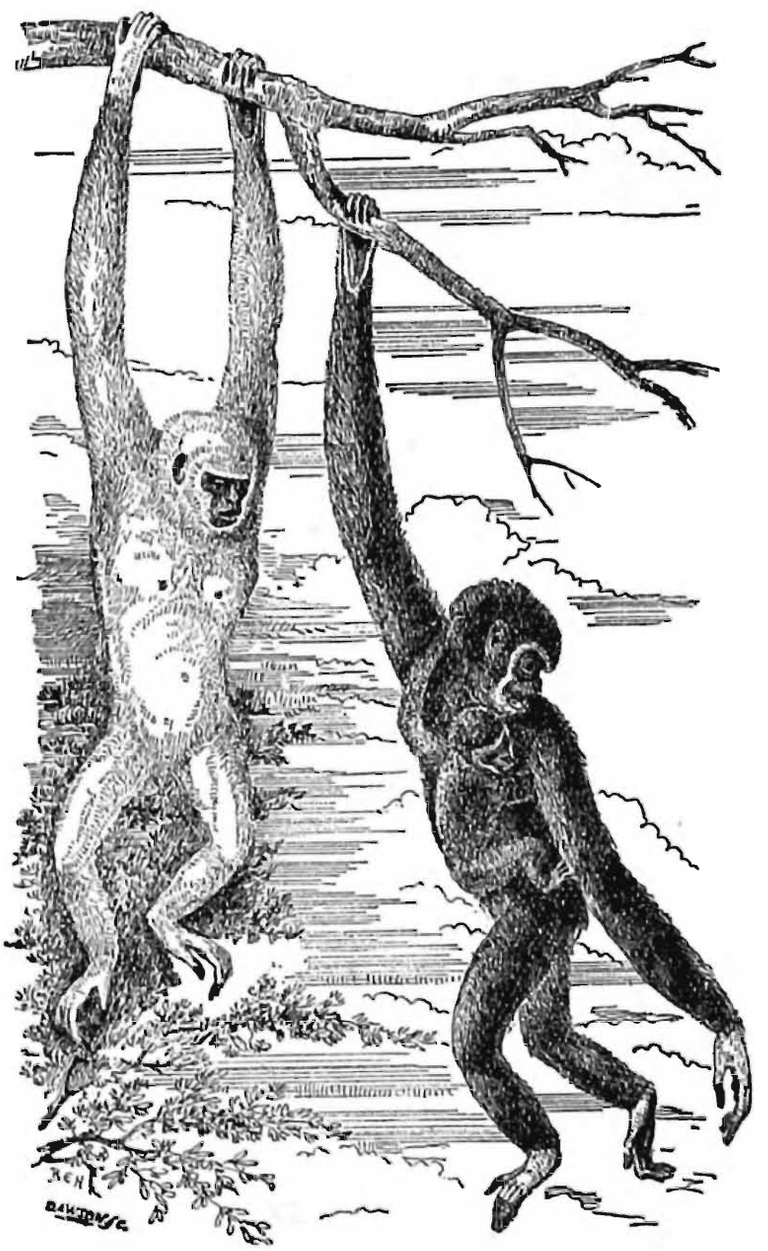


Fig. 8.—Lar Gibbon (*Hylobates lar entelloides*), black and pale phase, showing method of climbing by brachiation.

of a series of rapid whoops ascending and descending through several octaves, the sound, although somewhat resembling that of a siren, being one of the most musical and striking

* This statement must be taken with reservation. I have seen Lar Gibbons in the Zoological Gardens that ran and walked erect with uplifted arms, and differed not at all from Hoolocks in those respects.

to be heard in tropical jungles. He confirms Tickell's statement that the ape is nearly always found in parties of about a dozen, although several parties may sometimes mingle temporarily.

From observations on captive specimens of this Gibbon in Rangoon Sir S. M. Robinson discovered that the period of gestation is seven months as in ordinary Monkeys, not nine months as in the Chimpanzee. At birth the young one had very little hair on the head and a wizened, old-looking face; but in a short time the hair grew and the skin of the face filled out. It clung to the hair of the mother, who held it in place with her arm, thigh or foot. In another case, recorded by Mr. Ogilvie, the ♂ stayed with the ♀ after the birth of the young one, which was carried by the ♀ until it was over two years old. During that time it was never seen to take any food but its mother's milk.

Section *CYNOMORPHA*.

To this group of Catarhine Primates belong the Monkeys of Africa and Asia. The tail, in British Indian species, is generally long or longish, but may be reduced to a stump 1 in. or less in length. The arms and legs are subequal in length, the hands are much shorter than the feet and have the thumb weak, tied closely to the palm and emerging from the middle of its inner edge; the heel of the foot is narrower in proportion to its length, and the pads of the palms and soles are comparatively well defined.

As in the Apes, or ANTHROPOMORPHA, these structural features are correlated with the habitual method of progression both in trees and on the ground. In running or walking the attitude is essentially quadrupedal. The fore and hind quarters are nearly on a level, and part or the whole of the palm of the hand is applied to the ground, but the heel of the foot is raised. The erect bipedal attitude can be assumed for the purpose of looking around, but walking on the legs is difficult and only occasionally resorted to. In climbing, rapid progression through the trees is effected by a series of leaps, the propelling power lying in the strong, springy hind quarters and legs.

It is on account of their resemblance to typical quadrupedal mammals in their attitude and way of moving on the ground that these monkeys are called CYNOMORPHA or Dog-like; and in their method of climbing they do not differ essentially from ordinary arboreal mammals. They are clearly less highly organized than the Apes; but are much more varied in their habits, some being essentially forest dwellers, whereas others live mainly on the ground, often on rocky hill-sides.

The CYNOMORPHA are divisible into the following two families, both of which are represented in the British Indian fauna :—

a. Check-pouches present, the stomach simple and undivided	[p. 32. **Cercopithecidæ,**
a'. Cheek-pouches absent, the stomach complex and sacculated	**Colobidæ**, p. 83.

Family CERCOPITHECIDÆ.

To this family belong the Baboons (*Papio*) the Mangabeys (*Cercocebus*), the Cercopitheques or Guenons (*Cercopithecus*) and other genera restricted to Africa, and the Macaques (*Macaca*), which are mainly found only in southern and eastern Asia, with one isolated species in Morocco, whence it has been introduced to Gibraltar. The British Indian species in this volume are, for the sake of convenience, all assigned to *Macaca* ; but they fall into several natural groups for which generic or subgeneric names have been proposed and are sometimes adopted The characters on which these are based are mainly the structure of the genital organs in the male, the length of the tail, the direction of hair-growth on the head, and a few other features of less importance.

As in most Monkeys, the external characters supply a much better basis for the determination of the species than the skulls, which are individually very variable, and intergrade in some cases in a remarkable way.

Genus **MACACA** Lacépède.

Macaca, Lacépède, Tabl. Mamm. p. 4, 1799 (reprinted Mém. Inst. Nat. Sci. iii, p. 490).
Macacus, of most subsequent authors.

Type of the genus, *Simia inuus* Linn.

Distribution.—Apart from the typical species, isolated and indigenous in Morocco and Algeria, restricted to south-eastern Asia roughly from Kafiristan to Pekin, omitting the Tibetan Plateau, and thence to Borneo and the Philippines.

In all its external features this genus is very variable. Its nearest ally appears to be the African genus *Cercocebus*, the Mangabey. From this it may be distinguished by the absence in the skull of the deep pit on the side of the muzzle just below the orbit.

In many species of Macaques the hair on the crown radiates from a central whorl and is differentiated by its direction, sometimes by its length, from the hairs on the sides of the crown and behind the brows to form a definite " cap." In British Indian species this arrangement occurs in *M silenus*,

M. nemestrina, *M speciosa*, *M radiata*, and *M. sinica*, the "cap" reaching its maximum of development in the last two, which take their trivial names, "Bonnet" and "Toque" Macaques, from that feature. The arrangement is also found in, perhaps, about 25 per cent. of skins of *M. assamensis*. But in *M. mulatta* and *M. irus* the hair slopes backwards from the brow without a parting or whorl, and the "cap" is similarly absent in the S. Chinese *M. cyclopis*, the Japanese *M fuscata*, and the "Gibraltar Ape," *M. sylvana*. Probably the "cap" is a later development in evolution than the straight-haired arrangement.

Key to the Identification of the Species of Macaca.

a. Colour black, relieved by a ruff of long greyish hair extending on each side of the face from the temples to the throat . . *silenus* (Linn.), p. 66.
a'. Colour paler, no such ruff on sides of head.
b. Tail inconspicuous, reduced to a stump seldom over 1 in. long .. .. *speciosa* Cuv., p. 69.
b' Tail always conspicuous, shortish or long.
c. Tail shortish, up to about half the length of the head and body and to about twice the length of the foot .
d. Tail thin and short-haired, carried in an arch; hair on crown short, radiating to form a definite cap . *nemestrina* (Linn.), [p. 58.
d'. Tail normally hairy, not carried in an arch; no definite cap on crown.
e. Hind quarters orange-red, brighter than fore quarters . . *mulatta* (Zimm.), [p. 44.
e'. Hind quarters never red, and typically duller than fore quarters . .. . *assamensis* McCl., [p. 52.
c'. Tail almost as long as the head and body or longer, about four times the length of the foot.
f. Hair on crown short, sweeping backwards from brow . .. *irus* Cuv., p. 78.
f'. Hair on crown long, with median whorl or parting, forming a "bonnet."
g. Hair on cheek growing upwards from throat to crown without whorl; forehead more exposed. *radiata* (Geoffr.), [p. 38.
g'. Hair on cheek forming a definite whorl; forehead more covered. *sinica* (Linn.), p. 34.

In this key the species are not arranged altogether in accordance with their affinities. The natural groups into which they fall and the names that have been given to them are as follows :—

Silenus, Goldfuss, 1820; type, *silenus*. Here also, apparently, belongs *nemestrinus*, which has several characters in common with *silenus*, despite the differences set forth in the key.

Lyssodes, Gistel, 1848 ; type, *speciosus*. This is an isolated species, distinguished mainly by the abnormal external genital organs of the ♂.

Rhesus, Lesson, 1840 ; type, *mulatta*. *M assamensis* may also be provisionally referred here.

Cynamolgus, Reichenbach, 1862 ; type, *irus*. This species also stands alone, the length of the tail, in which it resembles the others entered under *e'*, being merely a primitive character.

Zati, Reichenbach, 1862 ; type, *radiata* ; also contains *sinica*. These two are nearly alike in the mode of hair-growth on the head, and differ from the rest in the peculiar structure of the ♂ genitalia.

The type-species of *Macaca*, an earlier name than any of the others, is apparently most nearly related to *Rhesus*, but differs in its tail, which is generally wholly suppressed and is at most just detectable.

3. **Macaca sinica** (Linnæus). The Toque Macaque.

Simia sinica, Linn., Mant. Plant., p. 521, 1771 ; Schreber, Säug. i, p. 108, 1775.

Macacus sinicus, Kelaart, Prodr. Faun. Zeylan. p. 8, 1852.

Cynamolgus (*Zati*) *sinicus* and *audeberti*, Reichenbach, Vollst. Nat. Affen, pp. 130 and 132, 1862.

Macacus pileatus, Blyth, Cat. Mamm. As. Soc. p. 9, 1863 ; Anderson, Zool. Res. Yunnan, p. 91, 1878 ; Blanford, Mamm. Brit. Ind. p. 24, 1888 (not *pileatus* Kerr, 1792, or of Shaw, 1800, or Reichenbach, 1862).

Macaca sinica, Hinton & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 813, 1921 ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 281, 1931 ; Hill, Ceyl. Journ. Sci. xvi, p. 316, 1932 ; Phillips, Man. Mamm. Ceyl. p. 5, 1936 *.

Vernacular.—Red Monkey ; *Rilawa* (Sinhalese) ; *Kurangu* (Tamil) ; *Sirra Kurangu* (Jaffna Tamil).

Locality of the *type* unknown.

Distribution.—CEYLON.

The smallest of the British Indian species of *Macaca*, with the tail subcylindrical, smooth-haired, and long, longer than the head and body ; the hairs on the crown long, radiating

* The confused synonymy of this species and of its near ally *M. radiata* of Southern India was cleared up in 1921 by Hinton and Wroughton, who showed that the " Bonnet chinois " of Buffon, upon which *Simia sinica* Linn. was based, was the reddish Ceylonese Bonnet Macaque, and not the Indian form as described by Anderson and Blanford. Also that the description of *pileatus* given by Kerr (Anim. Kingd. p. 69, 1792), an author ignored by Blanford as not being " binomial," most emphatically does not apply to any Macaque, nor, indeed, to any monkey as yet identified. The same is true of *pileata* Shaw (Gen. Zool. i, p. 53, 1800), to whom Blanford assigned the name. In this monkey the hair on the crown forms an upstanding rounded tuft, the limbs are black, and the body brown. Hinton and Wroughton's conclusions were confirmed by Miller (Anat. of Rhesus, p. 4, 1933).

from a central whorl, those in front of the whorl forming a definite frontal fringe, with their tips nearly reaching the black eyebrows; the hairs on the cheek short, not forming bushy whiskers, those on the temples and close to the face directed backwards and meeting the upward and forward stream in front of the ear to form a distinct whorl on the cheek. The penis large, with a long, swollen glans which has a well-developed "corona." No periodic catamenial swelling affecting the tissues round the genital orifice in the ♀.

General colour above variable, sometimes brownish or olivaceous, with paler buffy speckling, but usually more or less ochreous or reddish, sometimes bright and ferruginous, the limbs externally typically paler than the back, but the upper thigh brighter, the tail above darker, with a blackish tinge; the underside, inner side of the limbs, sides of the neck, and cheek white or whitish, sometimes with a pale area

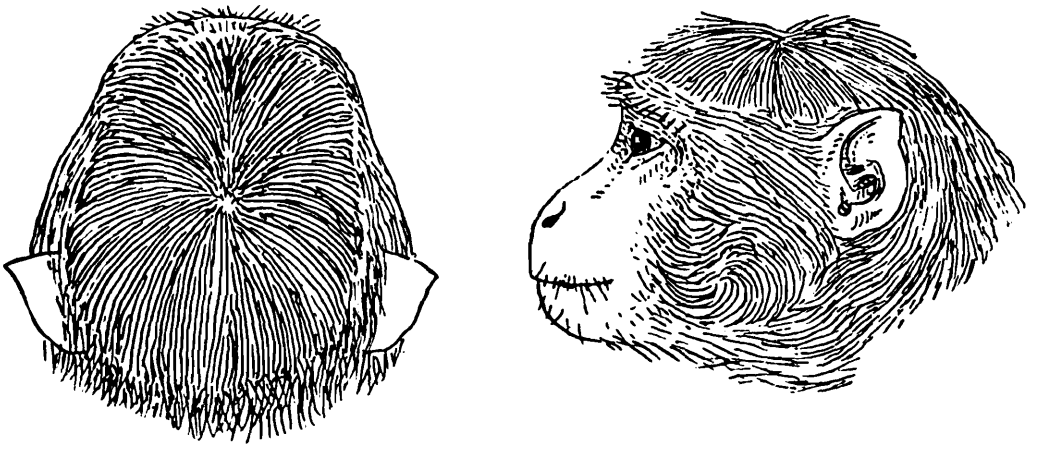


Fig. 9.—Upper and side views of head of Toque Macaque (*Macaca sinica*) to show typical hair-growth on the crown and cheeks. (Drawn from skin of the type of *inaurea* from Cheddikulam.)

passing over the ear from the temple. Hairs on the crown very variable, sometimes directed forwards as far as the brows, but sometimes there is a shortish area behind the brows, with the short hairs directed sideways or backwards.

The skull of *M. sinica* is small for the genus, and in the adult ♂ rather low for its length, due to the produced jaws; the brow is prominent owing to a pronounced depression behind it; the temporal ridges are moderately well developed, sometimes meeting in the middle line; the occipital crest is moderately salient, and there is a distinct constriction of the muzzle caused by a depression behind the canines and below the orbit*.

* Phillips published an excellent photogravure of the skull of an adult ♂ of this species, said to be ⅔ nat. size. It is, however, reduced by considerably more than ½. I have no material sufficing to show if there is any cranial difference between the two races of *M. sinica*. Probably there is not.

3 *a*. **Macaca sinica sinica** (Linnæus).

Macaca sinica sinica, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 285, 1931 (restricted); Phillips, Man. Mamm. Ceylon, p. 5, 1936.

Macaca sinica inaurea, Pocock, Journ. Bomb. Nat. Soc. Hist. xxxv, p. 286, 1931 *.

Locality of the *type* unknown; of *inaurea*, Cheddikulam, N.P.

Distribution.—"The low-country dry zone" from the extreme north to the extreme south of CEYLON (Phillips).

The "bonnet" uniformly coloured throughout, the hairs drabby-greyish, with paler buffy tips. The general colour is individually and seasonally very variable; usually in the fresh coat the hairs of the upper side are dark greyish or blackish for about two-thirds of their length, with the tips ochreous or reddish, the shoulders and outside of the thighs being brighter than the back, but the tips may be dull buffish, so that there is no bright tint in the pelage except a little on the outer side of the thigh. Sometimes the dorsal tint is more uniformly brown without bright speckling. This may be due to the breaking off of the pale tips of the hairs when dead before the moult. Skins, for instance, from Maha Oya, E.P. (Aug. 12 and 17), have the coat on the back short, coarse, and dark olive-brown in hue, quite unlike normal fresh-coated skins from the Eastern Province; but beneath the old brown hairs the newly erupting coat shows the characteristic rich ochreous speckling. The hairs of the frontal fringe vary from about 45 to nearly 70 mm., and of the shoulders from about 45 to 55 mm.

The following are some measurements (in English inches) and weights, several being Phillips's records :—

Locality and sex.	Head and body.	Tail.	Foot.
Phillips's largest, loc. ? ; ad ♂	21	22½	5
Mankeni, E.P. ; ad. ♂ .	19⅕	23⅖	5¼
Cheddikulam, N.P. ; ad. ♂	18⅖	22⅖	5⅕
Mankeni, E.P. ; ad. ♂ ..	17⅖	21⅗	5
Phillips's average of 6 ad. ♂♂	19	21½	5
Phillips's largest ad. ♀.. .	17	22⅖	—
Wellawaya, Uva ; ad. ♀ .	16⅘	22	4⅗
Phillips's average of 2 ad. ♀♀ .	16⅘	21	4⅖

* I here accept Phillip's decision to the effect that dull and bright tinted specimens in fresh coat occur indiscriminately throughout the dry zone, although the material at my disposal suggested that bright reddish specimens are dominant at Mankeni and Maha Oya in the E.P., and at Wellawaya and Tellulah in Uva, and duller, olivaceous specimens in the N.P., the two meeting at Kala Oya in N.W.P. This opinion was expressed by the racial name *inaurea* given to an adult ♂ in perfect coat (Nov.) collected at Cheddikulam, north of Adam's Bridge, N.P. On the label of this skin, which closely resembles some skins of the

The weight of the larger ♂ from Mankeni was 12 lb., of the smaller 10 lb., the one from Cheddikulam being 10½ lb., the same as Phillips's average of 4 ♂♂; Phillips's largest ♀ was 9½ lb. and his average of 2 ♀♀ 7½ lb.

This Toque Macaque is found in the jungles of the low-country dry zone about as far south, according to Phillips, as lat. 8° N. in the west and central portion of the island and on the eastern side to the extreme south. Major E. W Mayor, who collected many specimens both in the northern and eastern parts of its range, found them shy and very difficult to shoot. Phillips reports that troops composed solely of young individuals have been observed on several occasions. The rest of its habits are no doubt the same as in the next, better-known race.

3 *b*. **Macaca sinica aurifrons** Pocock.

Macaca sinica aurifrons, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 286, 1931 ; Phillips, Man. Mamm. Ceylon, p. 8, 1936.

Locality of the *type*, Rayigam Korale, Western Province.

Distribution.—" The low-country wet zone and the central hill-zone " of CEYLON (Phillips).

Distinguished from typical *sinica* by the colour of the " bonnet," of which the hairs of the anterior part or fringe are uniformly reddish or buffy throughout and those of the posterior half dusky greyish at the base, reddish at the tips. The general colour of the upper side is also rather brighter red on the average, and a darker appearance is imparted to the pelage by the partial exposure of the deeper black base of the hairs owing to the looseness of the rather longer coat.

The type of this race is an unusually richly red specimen with the hairs of the frontal fringe 75 mm. and of the shoulder 58 mm. In another the same measurements are 72 and 60 mm.

The following measurements (in English inches) and weights (lb.) are taken from Phillips's volume :—

	Head and body.	Tail.	Foot.
Largest ♂	19⅘	24½	5½
Average of 3 ♂♂	18½	23	5+
Largest ♀ ..	17⅘	18¼	4⅕
Average of 4 ♀♀	16½	20	4½

The average weight of 2 ♂♂ was 9¾ lb., of 2 ♀♀ 7½ lb. These particulars suggest that this race may be a trifle smaller on the average than typical *sinica* ; but the data are insufficient

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Indian species, *M. radiata*, except that there is a little red on the outside of the thigh, the collector, E. W. Mayor, who two months earlier had secured a fair number of skins in the E.P., wrote: " Fur seems darker here," *i. e.*, at Cheddikulam, where he saw living specimens.

and there are not enough adult skulls available to throw light on the point. (For skull-measurements of *M sinica* see p. 43.)

According to Phillips this race of the Toque Macaque is found from the highest mountain peaks to the seashore, and on the lower hill-slopes of the northern and eastern portions of its area it everywhere blends with the typical dry-zone lowland race. It occurs both in the forests and in the "sholas" or isolated patches of jungle in the grass-covered hills. Like other Macaques it is gregarious, its troops consisting of about twenty or more individuals of both sexes and of all ages. It is mostly active by day, moving about and feeding both in trees and on the ground, its diet consisting of fruits, berries, flowers, seeds, and shoots as well as of insects, grubs, and spiders. Often also it raids plantations of coco-nut and cardamom, committing considerable damage. In districts where it is persecuted on this account it is wary of man, but otherwise pays little heed to him. It has, however a great dread of leopards, pythons, and crocodiles, the latter especially when it approaches water to drink. Sometimes, however, it takes to the water to hide and is a good swimmer, both at the surface and below it. Like the Wanderoos (Leaf-Monkeys), with which it occasionally associates, it has the habit of hiding in the foliage when frightened.

4. **Macaca radiata** (Geoffroy). The Bonnet Macaque.

Cercocebus radiatus, Geoffroy, Ann. Mus. Nat. Hist. Paris, xix, p. 98, 1912; F. Cuvier, Hist. Nat. Mamm. folio 1, no. 33,

Macacus radiatus of Blyth, Jerdon, and other earlier writers on Indian Mammals.

Macaca radiata, Hinton & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 814, 1921; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 276, 1931; Hill, Ceyl. Journ. Sci. xvi, p. 314, 1932.

Macacus sinicus, Anderson, Zool. Res. Yunnan, p. 90, 1878; Blanford, Mamm. Brit. Ind. p. 23, 1888 (not of Linn.) *.

Vernacular.—*Bandar, Bandra* (Hindi and Dekhani); *Mákad Lal manga* (Marathi); *Makadu, Wánar, Kerda* (Mahr.); *Mang, Kodaga, Koti, Kápi, Maungya, Kemp Manga* (Kanarese); *Koranga, Vella Manthi* (Mal.); *Kurangu* or *Corongu* (Tamil); *Mucha* (Coorg); *Kodan* (Toda).

Locality of the *type* unknown; apparently a menagerie specimen, according to Miller.

Distribution.—Southern India, at least as far north on the west as Satara, and on the east not north of the Godaveri River.

Distinguished from *M. sinica* by its larger size, as shown by the flesh and cranial measurements, by the hair-growth of the top and sides of the head, and by the generally duller colour.

* For the synonymy of this species see above under *M. sinica*.

The arrangement of the hair on the crown is typically fundamentally the same as in *M. sinica*. It always radiates from a central whorl and is long posteriorly and laterally, but anteriorly it is always shorter, so that the fringe overlaps a smaller area of the forehead, and the bonnet, instead of being circular, is subelliptical. Usually the tips of the hairs of the fringe extend about half-way between the whorl and the eyebrows, and the short hairs behind the brows extend sideways from a median parting*, but the arrangement is very variable. Sometimes there is a whorl far back on the forehead, whence the short hairs radiate at the hinder end of the medium parting; sometimes the hairs of the centre of the fringe in front are only a few mm. long, and the lateral hairs extend like a tuft on each side; sometimes the hairs behind the brows are directed backwards, unparted and long, those in the centre overlapping the whorl on the crown and

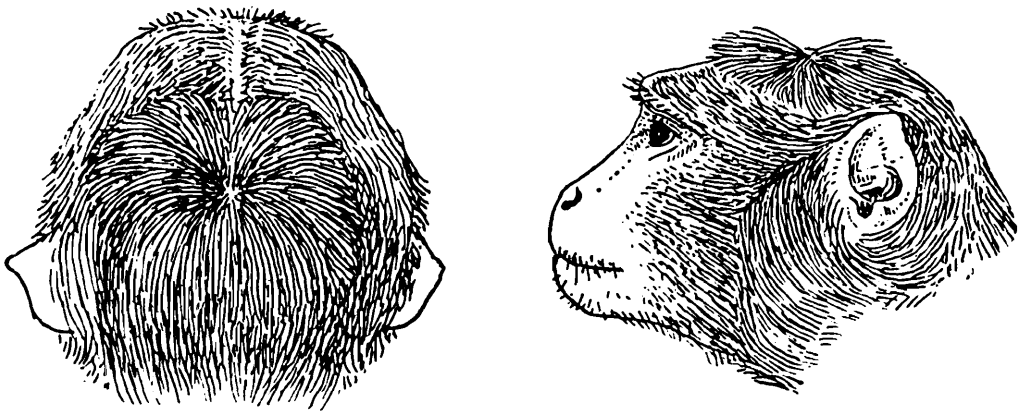


Fig. 10.—Upper and side views of head of Bonnet Macaque (*Macaca radiata*) to show typical hair-growth on the crown and cheeks. (Drawn from skin from South Coorg.)

the mesially abbreviated fringe in front of it. The short hairs on the cheek grow upwards from the throat and lower jaw to the level of the top of the ear or thereabouts without forming the whorl described in *M. sinica*.

The coat and colour are variable seasonally and individually independently of the season. Typically the winter coat is deep brown or olive-brown above, with little, if any, pale speckling, and the hairs of the bonnet are dark distally, paler at the base, the arms are greyer than the back, the legs greyer than the arms, the tail is blackish above in its basal half, brown distally, and the underside is whitish-grey; but in spring and early summer the long hairs of the upper side, up to about 70 mm. on the shoulders, fade to a buffy-grey tint, and become dull, lustreless, shaggy, and harsh to the touch. Occasionally, however, there is a distinct yellowish speckling

* Described by Hinton and Wroughton and illustrated by Hill. The hairs of the middle of the fringe vary, however, from about 25 to 60 mm.

in the dorsal pelage recalling that of *M. sinica*, and in one skin there is a reddish tinge in the hairs of the flanks, shoulders, and sides of the neck. Some skins are very like the skin of *M. sinica* from Cheddikulam, except that they never have the brighter hue on the outside of the thigh *.

The skull of *N radiata* is larger than that of *M. sinica*, and has the brows less prominent owing to a shallower depression behind them ; and this is associated with relatively narrower width across the orbits, with on the average at least weaker temporal ridges and a shallower depression on the muzzle behind the canines and below the orbits. These features indicate less muscular development.

4 *a*. **Macaca radiata radiata** (Geoffroy).

Macaca radiata radiata, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, pp. 276–8, 1931 (*sensu stricto*) ; Osman Hill, Proc. Zool. Soc., Syst. 1937, p. 212.

Locality of *type* unknown.

Distribution.—As above, but replaced in Travancore by the next race.

General colour as described above under the species, typically olive or greyish-brown on the upper side, sometimes speckled; bonnet rather darker, greyish-white on the underside, with areas of dark pigment in the skin emphasizing the pale hue of the hairs.

The following are the flesh-measurements (in English inches), indicating the range in size :—

Locality and sex.	Head and body.	Tail.	Foot.
Bellary ; ad. ♂ ..	23⅜	27	6⅛
Shevaroy Hills ; ad. ♂	21⅜	24⅜	5⅜
S.W. Dharwar ; ad. ♂	21⅛	22½	5
N. Coorg ; ad. ♂ .	21⅛	20	5
Satara ; ad. ♂	20⅛	25⅜	6
Dharwar ; ad. ♀	20⅜	22⅜	—
Dharwar ; ad. ♀	19⅛	22⅛	5
Dharwar ; ad. ♀	18⅛	20⅛	4⅝

* Osman Hill, who compared living and injected examples of *M. sinica* and *M. radiata*, says that *M. radiata* differs in having the face muddy-flesh tinted, with soft hairs, the edges of the lips and the entire ears unpigmented, and the ears more prominent, whereas in *M. sinica* the face is pale flesh, with bristly hairs, the edges of the lips and the ears pigmented, and the ears less prominent. His figures, however, contradict the statement regarding the prominence of the ears, and in dried skins of *radiata* the ears may be pallid or dark greyish-black. As a further difference he says that *M. sinica* has a well-marked tract of white hairs passing over the ears from the upper cheek to the side of the neck, the same tract in *M. radiata* being dark. This tract is very variable in distinctness in made-up skins of *M. sinica*, and in a skin of *M. radiata* from Mysore there is a distinct pale tract of light hairs on the area in question. In the texture of the hairs of the face I can find no constant difference.

The tail is very variable. It may be as much as about 5 in. longer than the head and body or 1 in. shorter. The weights of the adult ♂ range from 13 lb. (N. Coorg) to 19½ lb. (Bellary); of adult ♀ from 7 to 8 lb.

A few isolated specimens, *e. g.*, one from sea-level below the Gersoppa Falls in Kanara and another from Cumbum in Madura, which are aberrant in colour, suggest the possibility of the inclusion of more than one race in typical *radiata* as above defined. Setting these aside, this Macaque occurs in Western India in Satara, Dharwar, 2,300 ft.; Kanara, 2000, ft.; Mysore, Coorg, 2,000 to 3,555 ft.; the Nilgiri Hills, 5,120 ft.; Cochin, 1,500 ft.; the Palni Hills, 3,000 to 5,500 ft., and in the Eastern Ghats at Salem, the Shevaroy Hills, 4,500 ft., and Kurnool. It is even found "in populous towns, where it pillages the shops of fruit and grain." In Cochin, at least, it is commoner, according to R. O'Brien, in the plains than in the

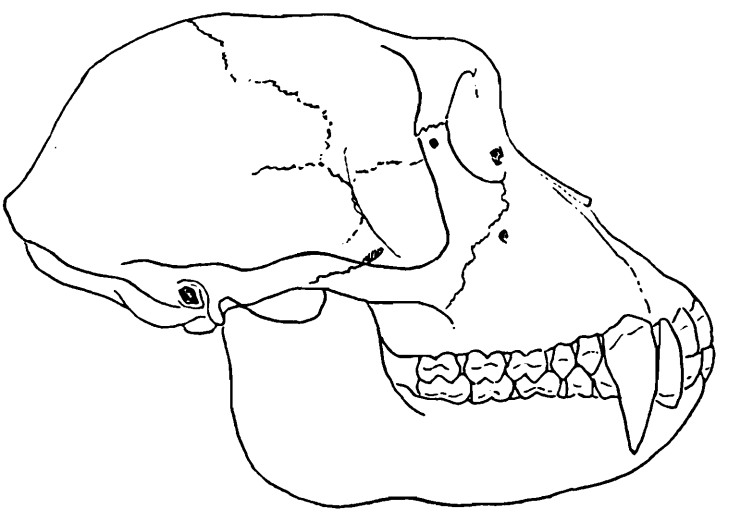


Fig. 11.—Skull of adult ♂ Bonnet Macaque (*Macaca radiata*) from Dharwar. × ½.

hills. Shortridge reports that in Dharwar it is very plentiful, going about in large parties of from 20 to 30 individuals. On the banks of a stream he saw troops of them mixing apparently on perfectly friendly terms with Langurs, but when alarmed the two species separated. Near the Hindu temples at Gaday, where it is protected, large numbers are said to have died of bubonic plague. At Vijayanagar in Bellary it is plentiful in the vicinity of Hampi Temple, and it is sufficiently plentiful throughout Coorg to be a great nuisance to the owners of coffee estates by destroying large quantities of ripe berries. Its habits no doubt are the same everywhere, and similar to those of *M. sinica*. In the Nelliampathy Hills, according to Kinloch, it occurs in moderate troops on the northern cliffs and in the bamboo jungles on the south slopes, but not in the evergreen forest of the plateau.

4 *b*. **Macaca radiata diluta** Pocock.

Macaca radiata diluta, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 278, 1931 ; Hill, Proc. Zool. Soc., Syst. 1937, p. 212.

Locality of the *type*, Boothapaundy, on the Ghats north of Aramboly in Travancore.

Distribution.—TRAVANCORE.

Distinguished from typical *radiata* by its colour, which, although very variable, is paler, the fore part of the bonnet tending to ochraceous, and the same colour often present on the shoulders, lower back, buttocks, and thighs, the underside varying from dirty white to buff.

This description is taken from the account given by Hill, who saw many living specimens. I described the race on the evidence of two skins, and distinguished it by its much paler winter coat, buffy throughout above, the underside being cream, with the skin pallid, not blackish. The flesh-measurements of the larger of the two specimens collected by R. S. Pillay are :—

Locality and sex.	Head and body.	Tail.	Foot.
Boothapaundy ; ad. ♀	16⅘	20⅕	—
Boothapaundy ; ad. ♀	13⅗	21	—

These dimensions suggest a smaller race than typical *radiata* ; but the skull of the smaller specimen, the type, is as large as ♀ skulls of *radiata*.

Blanford referred to a specimen from Travancore with " unusually long top-knot." In the type of *diluta* the hairs of the forehead are long, and sweep backwards from the brow to form with the front hairs of the bonnet a kind of upstanding crest just in front of the whorl on the crown. Presumably this feature is inconstant, since Hill does not refer to it.

According to Hill this Macaque is quite common in Travancore and is distributed throughout the district. He came across two troops associated with Hindu temples, one a few miles south of Alleppey, on the road to Quilon, the other five miles south of Aramboly.

Although the ♂ skulls of *radiata* intergrade in size with those of *sinica*, the general superiority of the skulls of both sexes of *radiata* is shown by the following averages :—

Average total length of	8 ad. ♂	skulls of	*radiata*	=	121	mm.
,, ,,	6 ad. ♀	,,	,,	=	104	,,
,, ,,	4 ad. ♂	,,	*sinica*	=	115	,,
,, ,,	4 ad. ♀	,,	,,	=	98	,,

Skull-measurements (in mm.) of approximately the largest and smallest skulls of *Macaca radiata* and *M. sinica* in the British Museum.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
M. radiata.							
Dharwar ; ad. ♂ .	127	100	83	65	36	40	93
Nilgiri Hills, ad. ♂ ; .	116	94	80	65	32	38	84
Salem ; ad. ♀. .	108	82	64	54	26	34	71
Halery, N. Coorg ; ad. ♀ .	102	77	67	54	28	35	71
M. sinica.							
Cheddikulam, N.P. ; ad. ♂ .	119	95	81	65	32	37	86
Mankeni, E.P. ; ad. ♂ .	111	89	79	62	29	40	82
Kotiyagalla ; ad. ♂. .	117	94	79	67	33	40	82
Tellula ; ad. ♀ .	97	75	65	53	25	32	68
Wellawaya, Uva ; yg. ad. ♀ .	95	72	—	54±	23	32	—

5. **Macaca mulatta** (Zimmermann). The Rhesus Macaque.

(For synonymy and bibliographical references see under the subspecific headings.)

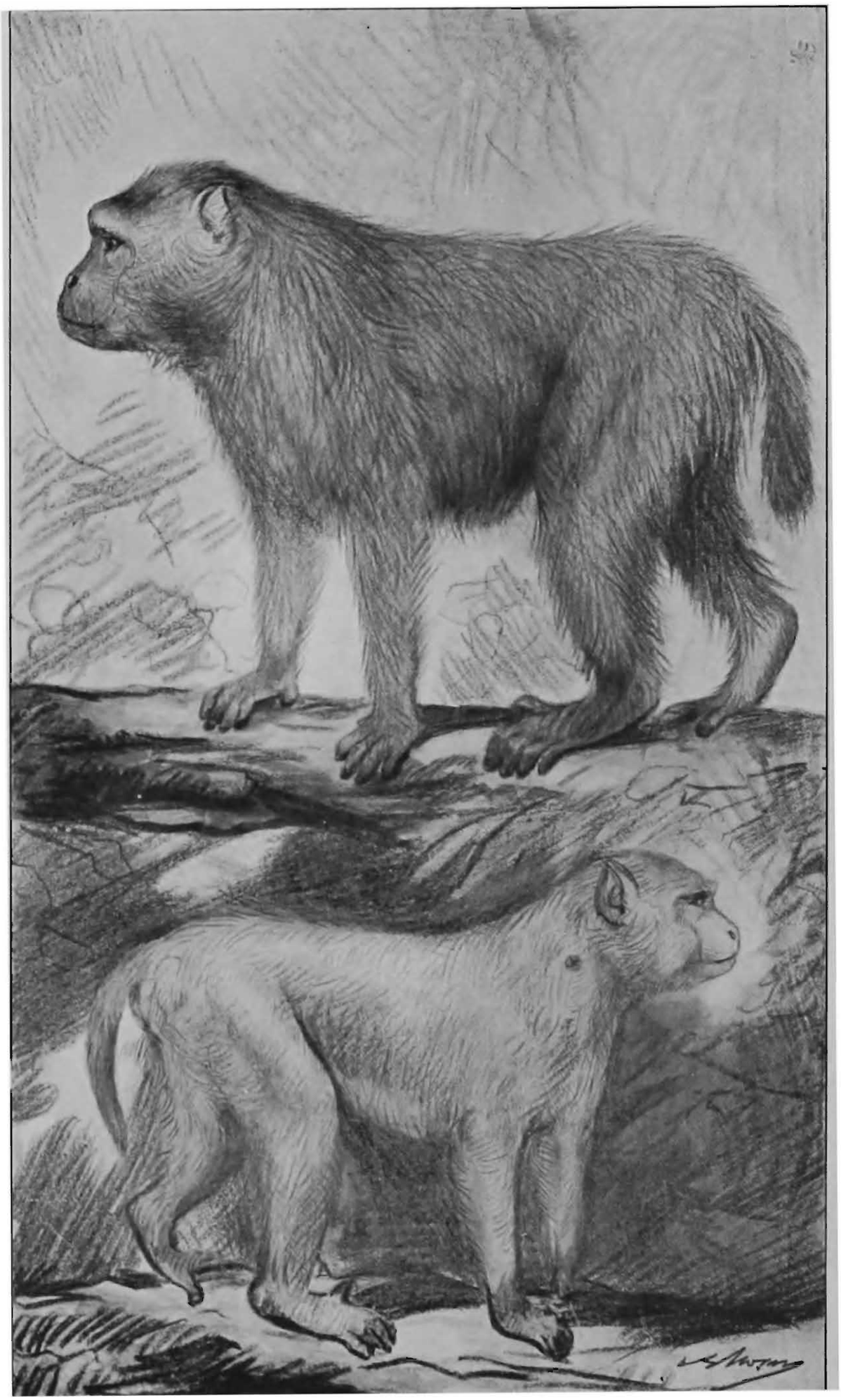
A medium-sized or tolerably large Macaque, with the tail uniformly hairy throughout, typically pendulous, not carried in an arch above the level of the buttocks, tolerably short, usually about half the length of the head and body, typically considerably longer than the hind foot, but in some Chinese races hardly exceeding it. Hair of the crown directed backwards from the brows, without a whorl or parting, and not forming a definite crest or "cap"; no definite crest on the cheeks or temples, but usually a whorl low down on the cheek. Colour very characteristic, the head, shoulders, arms, and fore back generally olivaceous in hue owing to the hairs being blackish or grey, but speckled with duller or brighter buff annulations; but the loins, rump, and the base of the tail are orange-red in varying intensities; the base of the hairs is grey or whitish, not annulated. The skin of the face, hands, and feet is pallid, although the face is sometimes suffused with red. The penis is tolerably large, with the glans elongated, about twice as long as its posterior width, expanded distally, with the left lip of the orifice much larger than the right and the orifice terminal. There is no noticeable catamenial swelling in the female, but the skin of the rump is often bright red.

The skull of *M mulatta** is much more variable in size and shape than the skull of *M. radiata*, and has the sagittal crest and the temporal ridges typically less well developed, and there is scarcely a trace of constriction behind the canines on the muzzle. But in skulls of about the same length in the two species the skull of *M. mulatta* has the zygomatic and transorbital widths a little greater, giving a more robust aspect to the skull. The facial profile may be about the same as in *M radiata*, the interorbital septum and the nasals forming a relatively shallow, evenly curved concavity; but in some skulls the septum is more steeply and the nasals less steeply sloped, so that the concavity is deeper, giving a "snub-nosed" aspect to the face. I have not observed this condition in any skull of *M radiata*.

Distribution.—From Kafiristan and Chitral through the HIMALAYAS and NORTHERN INDIA eastwards to BURMA, Siam, Indo-China, and Hainan, and northwards through China to the latitude of Pekin.

Three races are found in British Indian territory. In

* As pointed out by Hinton and Wroughton, the drawings published by Blanford, (p. 12) to illustrate the skull of *M. rhesus* (=*mulatta*) were taken from a skull of *M. assamensis*. Anderson put Blanford wrong.



Upper fig.—McMahon's Rhesus Macaque (*Macaca mulatta mcmahoni*).
Lower fig.—Common Rhesus Macaque (*Macaca mulatta mulatta*).

addition to these, *M. m. lasiotus* Gray inhabits Szechwan, *M. m. sancti-johannis* Swinhoe (=*littoralis* Elliot) occurs in the neighbourhood of Hong-kong, and *M. m. tcheliensis* M.-Edwards near Pekin.

Since the three British Indian races merely differ slightly in size, thickness of coat, and some cranial features from each other, it is needless to epitomize their distinctive characters in an analytical key.

5 *a*. **Macaca mulatta mulatta** (Zimmermann).

Cercopithecus mulatta, Zimmermann, Geogr. Gesch. Mensch. ii, p. 195, 1780 (based on the "Tawny Monkey," Pennant, Syn. Quadr. p. 120, 1771).
Simia (*Cercopithecus*) *fulvus*, Kerr, Anim. Kingd. p. 73, 1792.
Simia rhesus, Audebert, Hist. Nat. Singes, p. 5, 1798.
Simia erythræa, Shaw, Gen. Zool. i, p. 33, 1800.
Macacus (*Pithex*) *oinops* and *nipalensis*, Hodgson, Journ. As. Soc. Beng. ix, p. 1212, 1840.
Macaca mulatta, Hinton & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 668, 1921 (where the involved synonymy of this Macaque is unravelled).
Macaca mulatta mulatta, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, pp. 533–9, 1932.

Vernacular.—*Bandar* (Hind.); *Markat* (Beng.); *Myouk Sat* (Burmese); *Leng Leng* (N. Shan States).

Locality of *types* of *mulatta* and *fulvus*, both based on the "Tawny Monkey" of Pennant, "India"; of *rhesus* and *erythræa*, based on "Macaque à queue courte" of Buffon, Hist. Nat. Suppl. vii, p. 56, 1789, unknown; of *oinops* and *nipalensis* the Nepal Tarai. This locality, the first definite district of India assigned to the species, I selected in 1932 as the type-locality of *mulatta*.

Distribution.—The whole of Northern India from Nepal, Bhutan, N. Kamrup, and Assam as far south at least as the Tapti River in the west and not south of the Godavari in the east; also the whole of Burma from H'Kamti and Homalin in Upper Burma to the south of Prome. Evidence for the occurrence of this race in Siam is supplied by a specimen described as *M. siamica* by Kloss; in Indo-China by specimens collected by Delacour and Lowe in Annam and Tong-king and in Hainan by specimens which Elliot described as *Pithecus brevicaudus*.

The smallest of the three British Indian races of *M. mulatta*, both in size of the body and the skull, which has on the average a weaker muzzle and less pronounced brow-ridge and the temporal ridges farther apart. The winter coat is also less woolly and shorter, from 2 to 2½ in. on the shoulder.

The colour in the fresh, unfaded coat is very variable individually, irrespective of age, sex, locality, and season,

in accordance with the brightness and extent of the paler and darker annulations and the depth of hue of the bases of the hairs of the head and fore quarters, and the duller or more brilliant orange of the hind quarters. The variation is well illustrated by two adult ♂ examples collected on 21 November and 25 November at Rajapara, S. Kamrup, 600 ft. In one the head, nape, and shoulders are yellowish-olive, the annulations of the hairs being clear yellowish-buff, with the bases ashy-grey; the back is brighter and yellower, turning to orange on the loins, and nearly fiery red on the outside of the thighs, the basal portion of the hairs on the red areas being white, the distal portion red and not annulated. The tail is like the

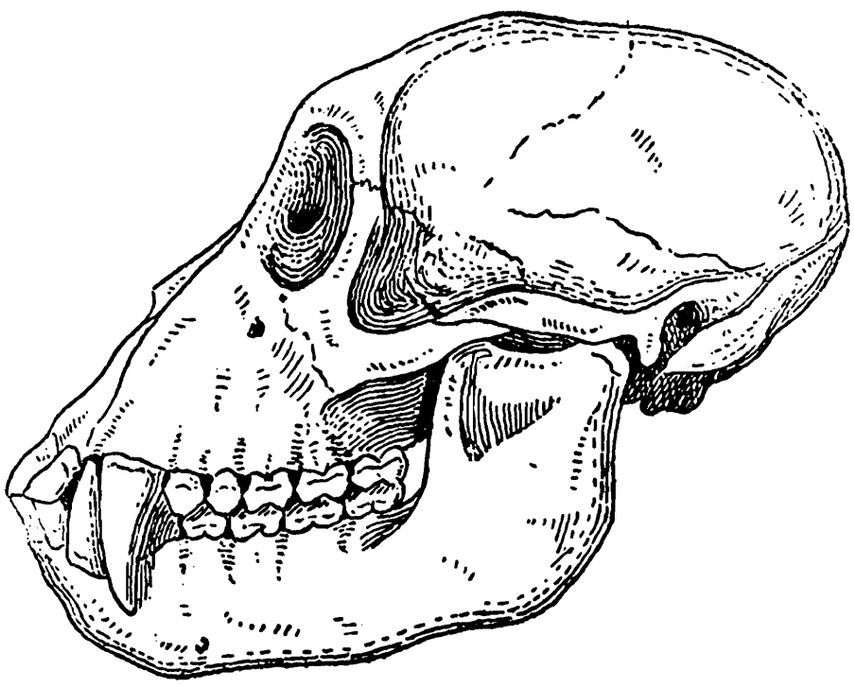


Fig. 12.—Skull of subadult ♂ Rhesus Macaque (*Macaca mulatta mulatta*) from Bhutan Duars.

rump at the base, greyish-olive terminally. The arms are grey, with yellowish-buff speckling; legs washed with bright yellow, paling from the thigh to the foot, which is greyish-yellow. Underside mostly white, slightly red on the belly. The other is much darker, the head, nape, and shoulders being deep greyish-olive, the annulations of the hairs being pallid, greyish-buff, with the bases deeper smoky grey; the back is a more yellowish-olive, with the lumbar region like the head and nape of the first specimen; the buttocks and outside of the thighs are not nearly so fiery or so extensively red in hue. The tail is much darker; the arms also are darker, with grey speckling and blacker hands.

Occasionally the colour of the fresh coat is rich rusty red all over the dorsal surface, although brighter on the rump. One red specimen of this type was secured at Dangs in Surat

together with examples more normally tinted. Another, even redder, came from Baska Nadi, N. Kamrup, 2,000 ft., collected on 5 January. This specimen differs strikingly from the two from S. Kamrup recorded above.

The colour, as well as the length and texture of the coat, also varies greatly in accordance with the season. In the winter, from about November to January, the coat is perfect in colour and soft in texture, the tips of the long hairs tolerably smoothly overlapping, so as to conceal the grey basal portions. Through March, April, May, and June the coat gradually loses its lustre, softness, and colour, the hairs, owing to bleaching, tend to become more uniformly tinted, buffish- or brownish-grey, and to adhere loosely, in long tufts or patches, displaying the grey hue of their basal portions. The coat is then shaggy and streaky, and decidedly harsh to the touch, the terminal portion of the hairs subsequently breaking off, seemingly from brittleness. Before this dead coat is shed the new coat begins to erupt beneath it; and in May or June, as a rule, the old coat begins to be shed, clearing first on the crown, the hands and feet, and the tail, the tail, when its long hairs have dropped, closely resembling that of the Pig-tailed Macaque (*M. nemestrina* Linn.). Even as late as July, or even August, remnants of the old, dead, uniformly greyish coat may be found on parts of the body. Similar variations in the colour, independent of the season and in accordance with the seasonal condition of the coat, occur also in the other two British Indian local races of this species.

The moult is not exactly coincident in time, even in the same locality, and no doubt varies still more with altitude and latitude in accordance with the onset of warm weather.

The following are the flesh-measurements (in English inches) of some specimens of *M. m. mulatta* :—

Locality and sex.	Head and body.	Tail.	Foot.
Chindwin ; ad. ♂ ..	23	8½	5⅘
Mingun, Upper Burma ; ad. ♂.	22	8	6½
S. Kamrup ; ad. ♂	21½	9	5½
Nepal Tarai ; ad. ♂ .	21½	10½	6½
Gorkha, Nepal ; ad. ♂	20⅘	10	6½
Bhutan Duars ; ad. ♂	19	8⅘	6
Darjeeling ; ad. ♀ .	20+	8½	5½
Mishmi Hills, ad. ♀	19⅕	11⅕	5⅘
Sohagpur, C. India ; ad. ♀.	18½	8½	5⅘

The weights of the ♂ specimens from Mingun and S. Kamrup were 15 and 16½ lb. respectively, of the ♀ from Darjeeling 11½ lb. ; but a ♀ of about the same size from the N. Shan States was 13 lb.

About the special habits of this race of *mulatta* there is little to report. Blanford described it as the common monkey

Skull-measurements (in mm.) of the three British Indian races of *Macaca mulatta*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
M. m. mcmahoni.							
Chitral (type); subad. ♂	143	110	98	88	38	46	104
M. m. villosa.							
Lolab, Kashmir (type); ad. ♂	136	—	97	79	—	—	99
Kangra Fort; ad. ♂	132	100	91	72	36	41	94
Kumaun, Bageswar; ad. ♂	127	102	86	71	29	40	94
Kumaun, Ratighat; ad. ♂	125	98	90	69	34	42	90
Kumaun, Ratighat; ad. ♀	112	86	75	62	24	36	78
Kumaun, Bageswar; ad. ♀	106	80	75	61	26	34	75
M. m. mulatta.							
Chittagong Hills; ad. ♂	120	96	82	65	31	39	86
Bhutan Duars; ad. ♂	119	94	84	63	32	44	86
Homalin, Chindwin; ad. ♂	113	87	81	63	31	38	82
Bengal; ad. ♀	110	83	78	65	27	37	77
Darjeeling; ad. ♀	105	83	77	62	34	35	75
Surat; ad. ♀	104	80	71	56	26	37	76
Golaghat, Assam; ad. ♀	102	78	72	58	24	34	34

of Northern India as far south as the Godavari. Although not regarded as sacred by the Hindus, it is left unmolested by them. This no doubt explains its general fearlessness of man, which he reports, and its occasional occurrence in native villages. Otherwise it is most usually seen near cultivated grounds, especially by tanks. In the wilds, he adds, it is commoner amongst trees by streams than in forest jungle. Crump, on the other hand, stated that at Singbhum in Bengal it was very shy and difficult to approach owing to the thick undergrowth it frequented. Apparently its habits vary locally. In Burma Shortridge found it fairly plentiful at Hsipaw in the North Shan States, often near paddy-fields and other cultivated tracts, where small parties of it were observed. But here, too, it was shy of man, possibly because it is sometimes eaten by the Burmese, as recorded by Mackenzie, who stated that 20 miles south-west of Kindat it was common, especially near cultivation, although big herds of it lived in the jungle.

5 *b*. **Macaca mulatta villosa** True.

Macacus rhesus villosus, True, Proc. U.S. Nat. Mus. xvii, p. 2, 1894.
Pithecus villosus, Elliot, Rev. Prim. ii, p. 200, 1913.
Macaca mulatta villosa, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 539, 1932.

Vernacular.—*Wandar*, *Puriz*, *Punj* or *Ponj* (Kashmir); *Gye* (Hokul).

Locality of the *type*, Lolab, at the northern end of Wular Lake, about 40 miles north-west of Srinagar in S. Kashmir.

Distribution.—Southern Kashmir, Upper Punjab (Murree, Dharmsala, and Kangra); also Kumaun, where it blends with typical *mulatta*.

Distinguished from typical *mulatta* by being heavier, slightly larger on the average, with the winter coat a little longer, from about 65 to 90 mm. (=2½ to 3½ in.) on the shoulders, and fuller, and the skull also a little longer, with on the average a deeper muzzle, more pronounced brow-ridges, and the temporal ridges closer together, indicating greater muscular development.

The following are the flesh-measurements (in English inches) of some specimens of *M. m. villosa* :—

Locality and sex.	Head and body.	Tail.	Foot.
Murree ; ad. ♂	25	12	7
Kangra ; ad. ♂	23	10	6½+
Kumaun ; ad. ♂	22	11½	6⅘
Kumaun ; ad. ♂.	21⅘	9½	6⅘
Naini Tal ; ad. ♂	20½	9	6⅕
Naini Tal ; ad ♀	19	10	5½
Kumaun ; ad. ♀	18½	8½	5⅘

The weight of the three ♂ specimens from Kumaun and Naini Tal, in order, were 22, 23, and 17½ lb. respectively, and of the two ♀ specimens 14½ and 13 lb.

Although the ♂ from Murree is a little larger than the ♂ examples of typical *mulatta*, the ♂ and ♀ specimens from Kangra and Kumaun are about the same size as in the typical race; but the weights are greater, suggesting more sturdily built monkeys. The dimensions given by True of two ♂ specimens from the type-locality, Lolab in Kashmir, as head and body and tail 23½+9½ and 22+11 respectively, agree closely with those of the ♂ specimens from Kangra and Kumaun.

True records that the original examples of this Rhesus frequented the pine-forests at Lolab at an altitude of 7,500 ft. The example from Patriata, Murree, in the Upper Punjab, was shot at 7,150 ft. At Dharmsala, 4,500 ft., and in Kangra from 2,450 to 5,000 ft., it is, according to Wells, fairly common, frequenting rocky hill-sides and cliffs bordering streams, but is very difficult to catch owing to its shyness of man from being driven away by the owners of the cultivated fields and gardens it habitually raids. In Kumaun, where it occurs at altitudes ranging from 3,700 to 1,100 ft., it is more abundant, Crump tells us, than the Langurs (*S. entellus schistaceus* or *hector*) in the outer ranges of the hills, where, during cold weather, it is found in large numbers up to 4,000 ft. It sometimes associates with the Langurs by day; but the two species separate at nightfall when retiring to rest.

5 *c*. **Macaca mulatta mcmahoni** Pocock.

Macaca mulatta mcmahoni, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 544, text-fig. of skull and pl., 1932.

Locality of the *type*, Kootai in Lower Chitral, between the Bashgal Valley in Kafiristan and the Chitral Valley, 3,600 ft.

Distribution.—Kafiristan and Chitral.

The largest of the British Indian races of *M. mulatta* and, on the available evidence, differing also from *villosa* by its longer coat, rather duller colour, and bigger skull, which has the brow-ridges higher and more prominent.

Only two specimens of this Macaque have been described in detail. The type, killed at the beginning of February, before the long, loose coat had reached its full length, has the hairs on the shoulder about 100 mm. (4 in.) long. In the general darkness of the hue of the fresh coat the skin differs strikingly from skins of typical *mulatta* at the same time of the year, but closely resembles that of the skin of *villosa* from Murree, shot in the middle of June, with the winter coat deteriorated and in process of moulting. The skull,

although larger than the largest skull of *villosa*, is not quite fully developed. The other specimen, a ♀ from Chitral, presented by Sir H. McMahon to the Zoological Gardens, where it died in January, has the coat shorter, only about 60 mm. on the shoulder, but full and longish everywhere. The colour is a little brighter than in the ♂, but is, on the average, more dusky olive on the fore quarters than in *villosa*.

Although Capt. Raverty may possibly have been the first to record the occurrence of this Macaque in Kafiristan when he wrote (Journ. As. Soc. Beng. xxviii, p. 332, 1859), "In some of the warmer parts of Kafiristan, in the densely wooded

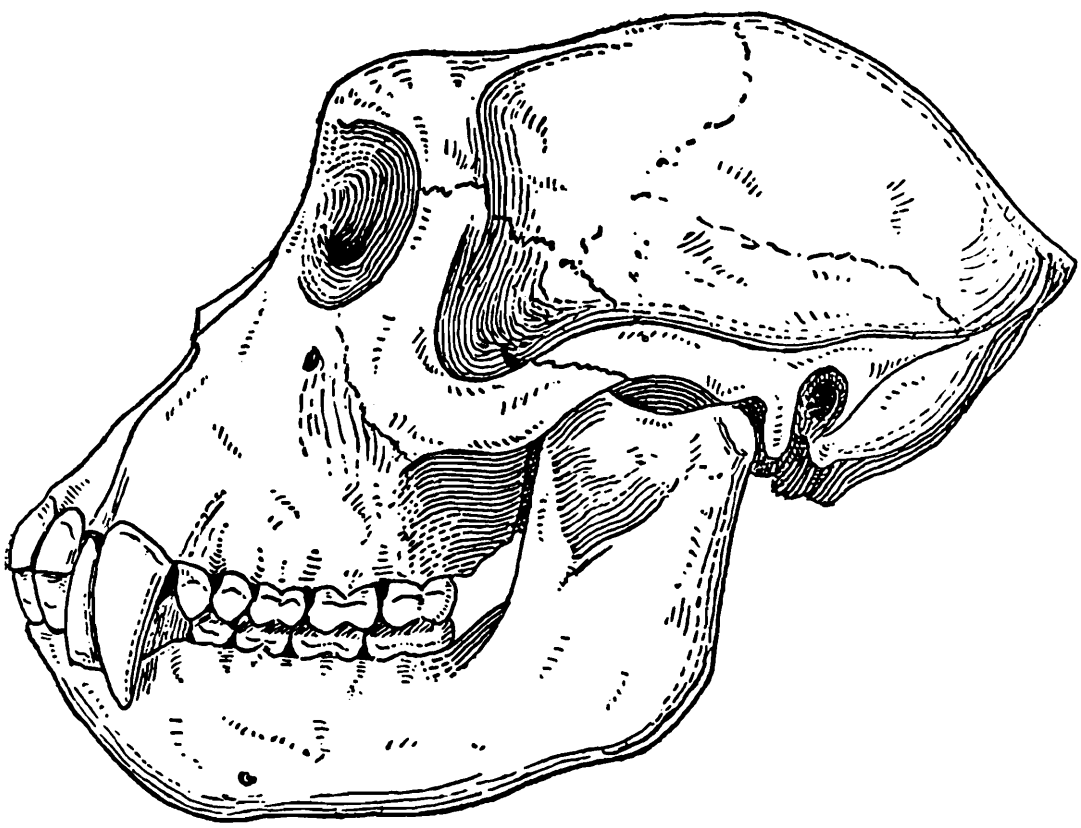


Fig. 13.—Skull of subadult ♂ of McMahon's Rhesus Macaque (*Macaca mulatta mcmahoni*) from Chitral.

districts, monkeys of the largest kind are found, but are not very numerous," I am now inclined to think the species he referred to may have been a Langur. The credit, however, of discovering this race of *M. mulatta* in the Chitral district belongs to Sir Henry McMahon (Journ. As. Soc. Bengal, lxx. pp. 4–5, 1901), who reported, "Monkeys are to be found in the lower end of the Chitral Valley. Capt. Gurdon saw a troop of them at Mirkandi, on the bank of the Chitral River, only 4,000 ft. above sea-level. The general characteristics seem to be those of *Macacus rhesus*, but all the specimens I have seen have, instead of a tapering tail, a tail of about 8 in., coming to an abrupt end as if cut off like

a fox-terrier's." Capt. H. Fulton (Journ. Bomb. Nat. Hist. Soc. xiv, p. 758, 1909) subsequently observed this Macaque in Chitral and, identifying it as *Macacus rhesus*, recorded it as " Very plentiful at the lower end of the Chitral Valley in summer on the right bank of the river. They come up as far as the Utzun Valley in troops at 5,000 ft., and probably come over the pass into Utzun from Kafiristan Valley."

6. **Macaca assamensis** McClelland. The Assamese Macaque.

Macacus assamensis, McClelland in Horsfield, Proc. Zool. Soc. 1839, p. 148.

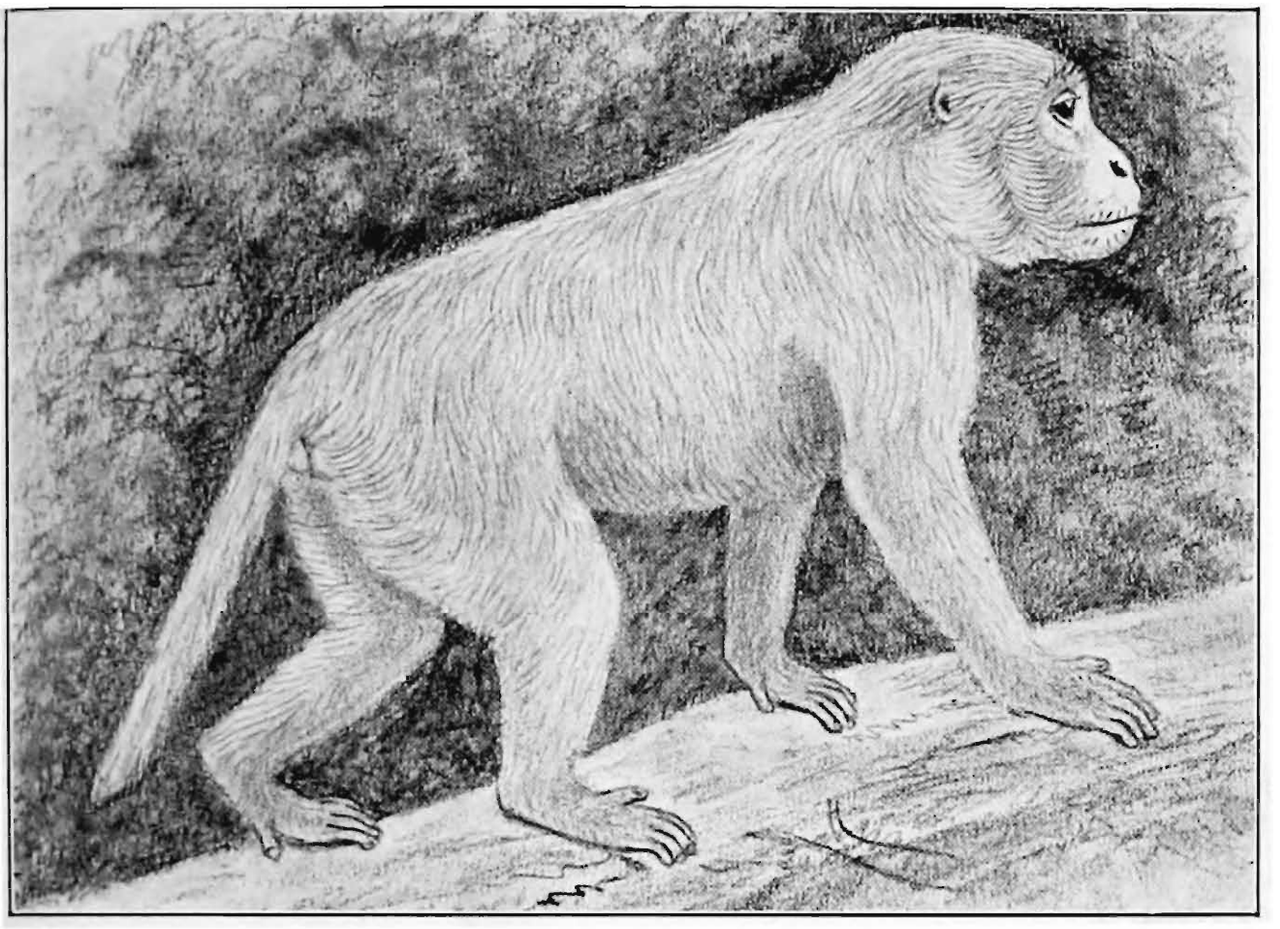
Macaca assamensis, Hinton & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p 669, where the involved synonymy of this species, due to Anderson's confusion of it with *M. mulatta*, is unravelled. (For synonymy and bibliographical references see under the subspecific headings below.)

Distribution.—The HIMALAYAS, at tolerably high altitudes, from Mussooree through NEPAL, SIKKIM, BHUTAN to ASSAM, thence southwards to the SUNDARBANS; UPPER BURMA, N. Siam (?), and Indo-China, Annam, and Tong-king.

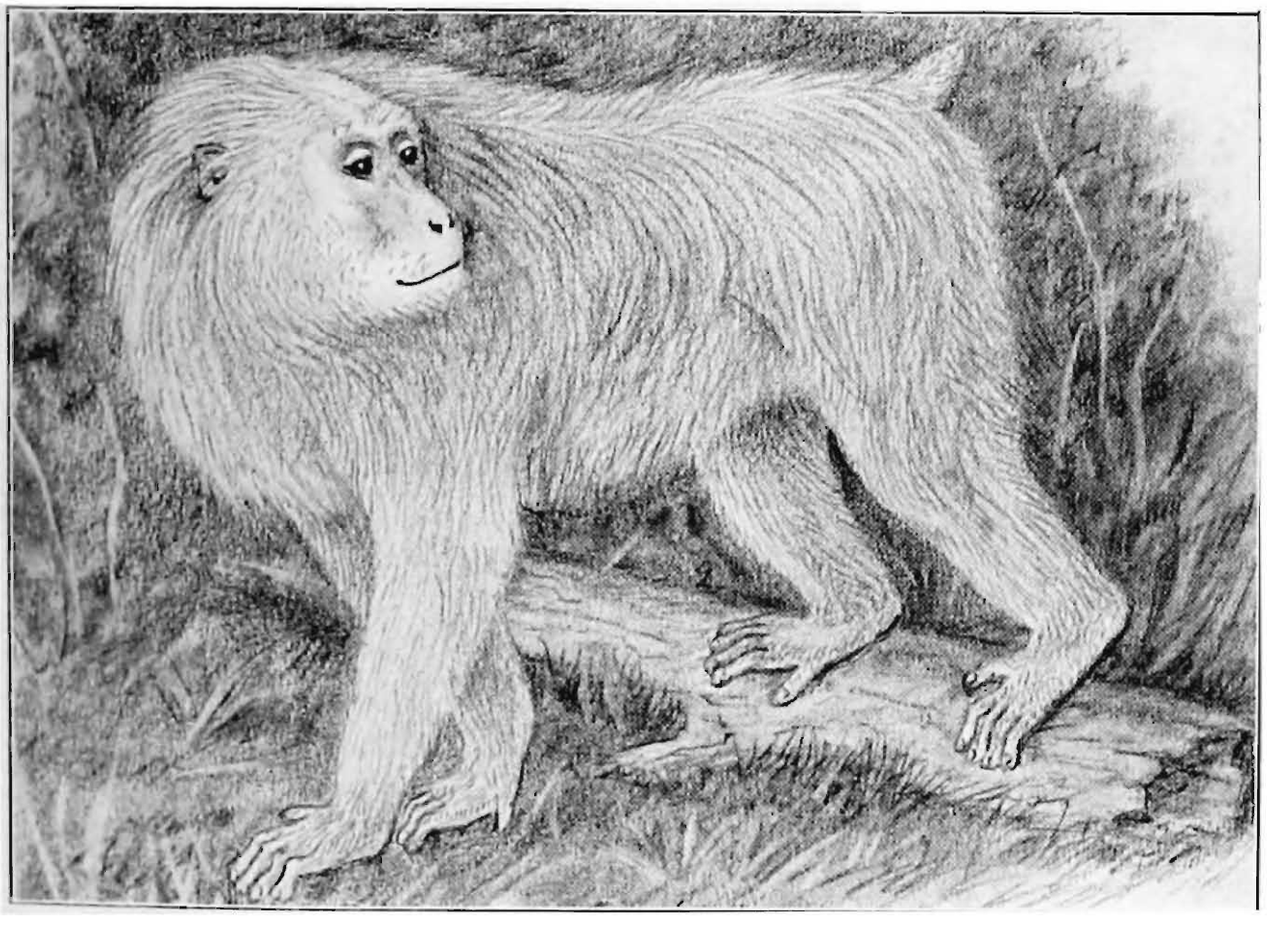
Distinguished from *M mulatta*, which it closely resembles in size and in the length and hairiness of the tail, by the entire absence of orange-red hue on the hind quarters, by the growth-direction of the hair on the head, and by some cranial and dental characters.

The coat is soft and full, wavy or smooth, but without much underwool, and on the shoulders, before the spring moult, may reach a length of about 85 mm. (over 3 in.). The general colour above varies individually from dark brown to lighter yellowish-brown, but the shoulders, nape, crown, and arms are almost invariably brighter and yellower than the hind quarters, legs, and tail, which is exactly the opposite of the condition seen in *M mulatta*; the hairs, however, are scarcely visibly speckled with annulations anywhere; the arms, legs, and tail are approximately the same tint as the adjoining parts of the body; round the face the hairs are black, but to a very variable extent; the cheeks are typically grey, with the hairs pigmented at the tip; the underside and the inner sides of the limbs are also pale, mostly greyish-white, with a brownish tinge sometimes on the abdomen; but the underside of the tail is hardly paler than the upper.

The growth-direction of the hair on the head, not recorded in the living animal, is very variable in made-up skins, but typically, at all events, there is a short median parting just behind the brow-ridges, whence the hair diverges to right and left and sweeps round the sides of the crown above the ears, the rest of the hair on the crown being directed backwards. But in some skins the crown exhibits a distinct whorl, whence the hair radiates in all directions, forming a kind of " cap "



Assamese Macaque (*Macaca assamensis*).



Stump-tailed Macaque (*Macaca speciosa*).

with well-defined anterior edge much resembling that of *M. nemestrina* and *M silenus*. On the fore part of the cheek the hairs typically sweep backwards from the face and, meeting the forwardly-directed hairs from the sides of the neck and hind cheek, form with them a low crest below the level of the ear and in front of it. The condition, however, varies in made-up skins.

The skulls, at least those of adult ♂ specimens, may nearly always be distinguished from those of *M. mulatta* by the following features :—There is a strongly developed, shelf-like occipital crest, and associated with it almost always a sagittal crest which starts from the middle of the frontal bones ; the margins of the orbits are thicker, the muzzle more "pinched" behind the canines, and the posterior nares and mesopterygoid

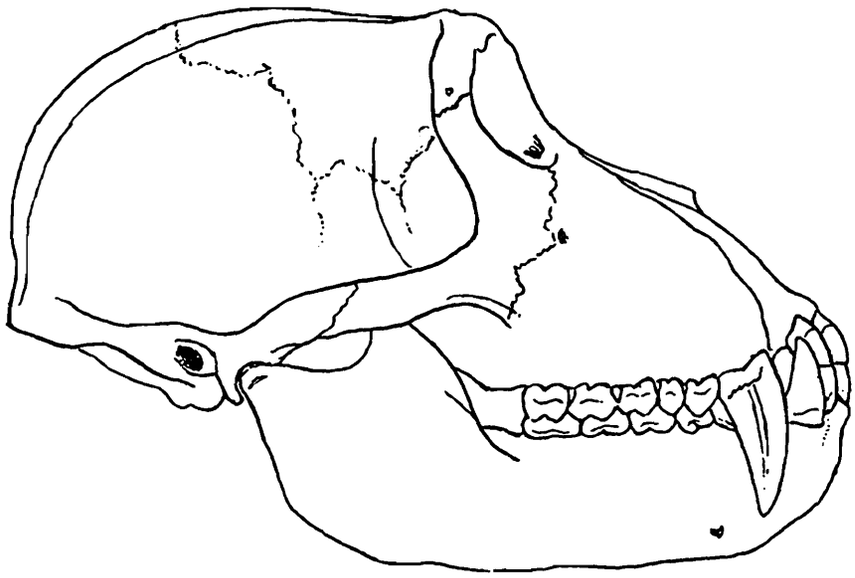


Fig. 14.—Skull of adult ♂ Assamese Macaque (*Macaca assamensis pelops*) from Tonglu, Darjeeling. × ½. (In its facial profile this skull is intermediate between the two adult ♂ skulls of the typical race from the Mishmi Hills described on p. 56.)

fossa narrower. Also the canines are considerably larger, but the molars are relatively, if not actually, smaller. Some skulls approach those of *M mulatta* in poorer muscular development, and the race of *M. mulatta*, which comes nearest to *M. assamensis*, is the large Chitral form, *mcmahoni*.

6 *a*. **Macaca assamensis assamensis** McClelland.

Macaca assamensis, McClelland in Horsfield, Proc. Zool. Soc. 1839, p. 148 ; Anderson, Zool. Res. Yunnan, p. 64, 1879 (description of the type).

Macacus assamensis, Blanford, Mamm. Brit. Ind. p. 15, 1888, and of other authors (in part.).

Macaca assamensis coolidgei, Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 202, 1932.

Locality of the *type* of *assamensis*, Assam, "possibly from

the hills to the northward," according to Blanford; of *coolidgei*, Hoi Xuen, Annam.

Distribution.—ASSAM, the MISHMI and NAGA HILLS; UPPER BURMA; ? the SUNDARBANS; Tong-king and Annam.

Tail short, usually considerably less than a third, and always much less than half, the length of the head and body, and only a little longer than the foot.

Anderson gave the measurements of McClelland's type, a mounted specimen, as: head and body 26¾ in., over the curves; tail 9¼ in., probably including the terminal hairs. These dimensions, making allowance for the method of measurement, agree tolerably well with those of the two adult ♂ specimens from the Tebang River, 2,000 ft., in the Mishmi Hills (Wells) entered below. Unfortunately no flesh-measurements were taken of a considerable number of examples from Mokokchung, 6,000 ft., in the Naga Hills, but on the dried skins the tails are obviously short. The young specimen in the table from the Adung Valley, 6,000 ft., Upper Burma, lat. 28° 10′ N., long. 97° 40′ E., has the tail rather more than one-third the length of the head and body, but only a little longer than the foot. It was collected by Lord Cranbrook. The measurements of the two ♂ specimens from the Mishmi Hills suggest also that this race is a little larger than the next; but the evidence is not sufficient to establish that point.

There is nothing distinctive in the coat, which varies seasonally from about 40 to 80 mm.; the colour also is individually variable to a certain extent, darker or lighter brown in accordance with the amount of yellowish-buff in the pelage; but an unmeasured immature specimen collected on the Tuzu River north of Tamanthi, on the Upper Chindwin, 460 ft. (McMillan), is unusually brightly tinted, almost reddish-ochreous, on the head, nape, and shoulders, with a yellowish wash over the hind quarters and legs. This may be a juvenile character, but it is not certain that the specimen belongs to this race.

Further information is also required about the representatives of this species that occur in the Sundarbans, whence Anderson had at least one specimen (Proc. Zool. Soc. 1872, p. 529), as well as several examples of *M mulatta*. In this low-lying district, the exact spot being about 50 miles east of Calcutta, might well occur a race distinct from typical *assamensis*, which is found at tolerably high altitudes.

This race extends to Indo-China. Osgood described specimens from Annam and Tong-king as representing a new race, *M a. coolidgei*, and diagnosed it as differing from

assamensis by its decidedly shorter tail, more greyish coloration, and possibly heavier dentition. But he compared his specimens with Sikkimese, not Assamese, skins; and the flesh-measurements he gave of two adult ♂ specimens show the tail to be considerably less than half the length of the head and body. Judging from the two specimens, including the type, in the British Museum, I consider *coolidgei* to be a synonym of typical *assamensis*.

6 *b*. **Macaca assamensis pelops** Hodgson.

Macacus (*Pithex*) *pelops*, Hodgson, Journ. As. Soc. Beng. xi, p. 1213, 1840.
Macacus problematicus, Gray, Cat. Monkeys, etc., in Brit. Mus. p. 128, 1870.
Macacus rheso-similis, Sclater, Proc. Zool. Soc. 1872, p. 495.
Macacus assamensis, Blanford, Mamm. Brit. Ind. p. 15, 1888, and of other authors (in part).

Vernacular.—*Sahu* (Lepcha); *Pio* (Bhotia); *Bandar* (Pahari); and *Panah Bandar* (Darjeeling).

Locality of the *type* of *pelops*, the Nepal Kachar; of *problematicus*, Dhalimkot in Bhutan; of *rheso-similis*, "East Indies."

Distribution.—The HIMALAYAS from Mussooree through NEPAL, "the northern range of hills exclusively" (Hodgson), and SIKKIM, from 2,000 to about 6,000 ft., to BHUTAN.

Distinguished from typical *assamensis* by the actually and relatively longer tail, which typically is considerably more than half the length of the head and body and about twice the length of the foot; also, possibly, by being a little smaller. The average lengths of the head and body and of the tail in five adult ♂ examples from Sikkim are $22\frac{2}{5}$ in and 13 in., whereas the same averages of the two adult ♂ examples of typical *assamensis* from the Mishmi Hills are $25\frac{3}{5}$ in. and just under 8 in.

The only available specimens of this race measured in the flesh, according to modern methods, and supplied with full particulars of dates, altitude, etc., were collected for the Survey by Crump and Baptista in Darjeeling and Sikkim; but there is no reason to doubt that these belong to the same race as the Nepalese form named *pelops* and as the Bhutan form named *problematicus*. At all events the types of those two forms, as well as of *rheso-similis*, and all Hodgson's Nepalese skins, have long tails like the skins from Sikkim.

The coat varies from about 55 to over 70 mm. in length on the shoulder; the colour is also individually variable in accordance with the amount of buffy yellow in the pelage, making it lighter or darker brown. An immature specimen

from Rongli, Sikkim, 2,700 ft., is brighter tinted than the adults on the head, nape, shoulders, and arms, and is comparable to the specimen provisionally assigned to typical *assamensis* from the Upper Chindwin River in Burma, but is not so bright on the fore quarters, and lacks the yellow wash on loins and legs.

Flesh-measurements (in English inches) of the two races of this species are as follows :—

Name, locality and sex.	Head and body.	Tail.	Foot.
assamensis.			
Mishmi Hills ; ad. ♂	25⅜	7⅜	6⅘
Mishmi Hills ; ad. ♂	25⅜	8	6⅘
Adung Valley ; yg. ♂	11⅗	4⅖	4
pelops.			
Darjeeling ; ad. ♂	23	12⅕	6⅘
Darjeeling ; ad. ♂	22⅗	11⅓	6⅖
Chuntang ; ad. ♂	22⅖	13+	6⅘
Dikchu ; ad. ♂ .	22	13⅘	6⅗
Darjeeling * ; ad. ♀	20⅘	15⅕	6⅕
Rongli ; yg. ♂	15⅕	8⅘	5½

The recorded weights do not coincide with the size. A ♂ from the Mishmi Hills was 23 lb. ; the first ♂ on the list from Darjeeling was 25 lb. and the ♂ from Chuntang 28 lb.

The measurements in the table (p. 57) suggest that ♂ skulls of typical *assamensis* are a little larger than those of *pelops*.

The two skulls of *assamensis* from the Mishmi Hills differ greatly in the shape of the facial profile. In the first the area between the brow and the anterior nares is comparatively lightly concave and long, the nasals measuring 47 mm. In the second the area is deeply concave and short, the interorbital septum being nearly vertical and the nasals measuring only 31 mm. But this skull was damaged during life in the premaxillary region, and was shortened by about 5 mm., and its total and condylobasal lengths, set in brackets, are estimated.

In the case of *pelops* a point to notice is the great difference in size between the largest and smallest skulls from Darjeeling. The former came from Sakiapokhu, the latter from Pashok. This skull in its general form and size recalls in many respects the skulls of *M mulatta*.

Crump reports that this Macaque occurs throughout Sikkim and Darjeeling at low elevations, its favourite zone in cold

* The head and body of this ♀ from the Rungbong Valley, Darjeeling, 5,200 ft., were given as 620 mm. (=24⅘ in.), but since the skull is considerably shorter than in the ♂ examples from Sikkim, there is, I think, no doubt that 620 was meant for 520, and I have assumed the latter number to be correct.

Skull-measurements (in mm.) of the two subspecies of *Macaca assamensis*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
M. a. assamensis.							
Mishmi Hills ; ad. ♂	155	118	99	77	38	49	110
Mishmi Hills ; ad. ♂	(143±)	(115±)	97	—	38	48	100
Naga Hills ; ad. ♂.	147	115	96	78	39	47	106
Naga Hills ; ad. ♂	145	—	91	72	37	47	100
Naga Hills, ad. ♀	127	—	84	63	35	43	95
M. a. pelops.							
Darjeeling ; ad. ♂	145	117	91	72	36	45	108
Darjeeling ; ad. ♂	144	116	92	73	37	44	105
Chuntang ; ad. ♂	145	113	91	73	38	47	102
Darjeeling ; ad. ♂	135	105	93	—	38	41	95
Nepal ; yg. ad. ♂	133	107	90	76	34	43	99
Darjeeling ; ad. ♀	131	104	85	67	32	42	93

weather being from 2,000 to 4,000 ft. As a rule it frequents heavy forest, where it occurs in large companies. Its ordinary call-note is a loud "pio," rather a musical sound, and frequently repeated. Its warning cry is the same, but uttered once by the sentinel, which is generally on the look-out high up in a tree. On hearing it the whole band descends to the ground and moves away in absolute silence, concealed by the dense undergrowth. It is hunted and eaten by the Lepchas, who think its flesh has medicinal properties. Owing to persecution on this account, and no doubt also to its fondness for raiding maize-fields, as recorded on the label of one specimen, this Macaque is exceedingly shy and wary in certain parts of Sikkim, but on the Nepal border, where it is presumably unmolested, it is much more fearless.

7 **Macaca nemestrina** (Linnæus). The Pig-tailed Macaque.

Simia nemestrina, Linn., Syst. Nat. ed. 12, i, p. 35, 1766.
Macacus nemestrinus of most subsequent authors. (For bibliography and synonymy of British Indian subspecies see below.)

Distribution.—From UPPER BURMA and ARAKAN to Siam, the Malay Peninsula, Sumatra, and Borneo.

A large or very large Macaque, the typical form the largest of the genus, with the tail always less than half the length of the head and body, on the average about one-third, mostly covered with short hair throughout, sometimes with a small terminal tuft and carried in an elevated arch above the anus. Hairs on the crown short, radiating from a whorl and forming a very definite "cap" differentiated from the hairs behind the brow, on the temples, and sides of the crown by colour or direction of growth or both combined. Hairs on fore part of the cheek and temples growing backwards or obliquely upwards to meet the forwardly directed hair in front of the ear, and on the hinder part of the cheek to form a crest or conspicuous thick fringe which curves over the top of the ear on each side of the crown. The penis is long, with the glans of normal form and irregularly subspherical. The female has a conspicuous, monthly hyperæmic swelling of the external genitalia at pairing time.

The skull varies considerably in shape and size, the jaws in the typical form, which does not enter the British Indian area, being exceptionally long, almost "baboon-like"; but in the adult ♂ it is never so muscularly developed as in *M. assamensis* and *M. speciosa*, having a comparatively small occipital crest, and the temporal ridges, typically some distance apart, seldom meeting to form a sagittal crest even on the parietals.

The typical form of this Macaque came from Sumatra. It is also found in Borneo and the Malay Peninsula, but does not extend northwards into British Burma, although Blanford, despite the evidence to the contrary supplied by Tickell (see below, p. 62), ascribed the Tenasserim Pig-tail to typical *nemestrina*, and gave a composite description of it derived from two forms of the Pig-tail and from skulls of three species of *Macaca**.

Owing to the errors into which Blanford was led, partly from want of properly localized material, I have included in the following key to the races of British Indian Pig-tailed Macaques the distinguishing characters of the typical form.

a. General colour much paler; the back only slightly darkened, much paler than the blackish upper side of the tail; jaws short. *leonina* Blyth, p. 59.

a'. Much darker, the back deep blackish-brown, the same tint as the top of the tail.

b. Hair, except on the back, profusely annulated, general tint not so brown; jaws short, brows high . . .. *blythii* Pocock, [p. 62.

b'. Hair generally inconspicuously annulated; colour browner; jaws long, brow-ridge low, with sloping orbits *nemestrina* (Linn.), [p. 58.

Kloss in 1919 was the first author to refer all the described Pig-tailed Macaques to a single species on the evidence of a specimen from Trang in the Malay Peninsula intermediate in colour between typical *nemestrina* and *leonina*. On this and other evidence I entirely concur with his opinion.

7 *a*. **Macaca nemestrina leonina** Blyth.

Macacus leoninus, Blyth, Cat. Mamm. Mus. As. Soc. p. 7, 1863; id., Journ. As. Soc. Beng. xliv, p. 2, 1875 (*Inuus*); Anderson; Cat. Mamm. Ind. Mus. Calc. i, p. 71, 1881 (Blyth's type); Blanford, Mamm. Brit. Ind. p. 18, 1888 (in part).

Macacus andamanensis, Bartlett, Land and Water, viii, p. 57, 1869; Sclater, Proc. Zool. Soc. 1869, p. 467; Elliot, Rev. Primates, ii, p. 208, 1912 (*Pithecus*).

Macacus nemestrinus, Blanford, Mamm. Brit. Ind. p. 20, 1888 (in part; Tenasserim specimens which were not typical *nemestrina* Linn.).

Macaca adusta and *insulana*, Miller, Proc. U.S. Nat. Mus. xxix, pp. 559–60, 1906.

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* The largest skull he measured is that of a menagerie-reared example of typical *M. nemestrina*, the smallest, the skull of an adult ♂ of *M. irus aurea* from Mergui (Oldham) and the skull of the alleged old ♀ from the Toungyeen River (Bingham) is the skull of an adult ♂ of *M. speciosa* (see p. 71). It is, perhaps, not surprising that on the strength of these skulls he thought the ♂ and ♀ of *M. nemestrina* must be approximately equal in size, and that there might be two species of it, a larger and a smaller, living side by side.

Macaca nemestrina indochinensis, Kloss, Journ. Nat. Hist. Soc. Siam, iii, p. 343, 1919.
Macaca nemestrina andamanensis, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 302, 1931 *.

Vernacular.—*Myouk-mai* (Burm.); *Myouk-la-haing* (Arakan); *Myouk-padi* (Burmese); *Ta-o-ti* (Burmese at Tavoy); *Bruh* or *Broh* and *Bruh-tana* (Malay at Bankachon).

Locality of *type* of *leoninus*, N. Arakan; of *andamanensis*, Port Blair, Andamans (introduced); of *adusta*, Champang, Tenasserim; of *insulana*, Chance Island, Mergui Archipelago; of *indochinensis*, Lat Bua Kao, E. Siam.

Distribution.—From UPPER BURMA to TENASSERIM, the MERGUI ARCHIPELAGO, and Siam.

Coat without appreciable underwool, but longish, especially on the shoulders, where at least in the adult ♂ it may form a kind of mantle.

General colour comparatively pale, with an individual tendency to erythrism, ranging from greyish-olive to buffy-yellow, russet or golden-ferruginous, these tints being specially noticeable on the long hairs of the shoulders, which are brighter than the back, the lumbar and sacral regions being duskier,

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* This synonymy is based on descriptions of the type of *leoninus*, on the type of *andamanensis*, on several examples from Tenasserim and the Mergui Archipelago, whence came Miller's examples of *adusta* and *insulana* respectively, and on others from Siam referred by Kloss to *indochinensis*. The alleged differences between these forms seem individual, not racial, and they all agree tolerably closely with Blyth's description of the type of *leoninus* and with the independently published descriptions of it by Anderson, Elliot, and Kloss, who saw it in Calcutta. Elliot substituted the name *andamanensis* for *leoninus* under the mistaken belief that *leoninus* was preoccupied in the genus *Macaca* by *Simia leonina* Shaw (Gen. Zool. i, p. 34, 1800), which he relegated to the synonymy of the species described below as *Macaca silenus*. In this he was followed by Kloss; and, unwisely, by myself, without verifying the reference. On consulting Shaw's work I find there is no occasion for the change. The name *leonina* was given by Shaw to a monkey, described by Buffon, and believed to have come from Abyssinia, which agrees with no species of *Macaca*, and differs essentially from *M. silenus* in the tail being longer than the head and body, the former measuring 27 in., the latter 24 in., the precise dimension attesting their derivation from an actual specimen. I am unable to identify *Simia leonina*, but its general features, apart from the long beard, agree better with John's Leaf-Monkey (*Kasi johnii*) than with *M. silenus*.

It is satisfactory to resuscitate the appropriate name *leonina* for the Burmese Pig-tailed Macaque and drop the inappropriate name *andamanensis* given to a specimen not indigenous in the Andaman Islands. According to Hamilton (Proc. Zool. Soc. 1870, p. 220) it was one of several imported from the adjoining mainland of Burma. Quite possibly it came from Akyab in Arakan, the home of typical *leonina*. At all events Tickell, in his MS., said that the Pig-tailed Macaque, which he knew in Tenasserim, inhabited the hills to the interior of Akyab, and was exported alive from that seaport and taken to Chittagong. Equally likely some were taken thence to the Andamans.

especially in the middle lines; hairs of the upper side, as a rule, profusely annulated with buff, yellow or russet, and dark brown or black bands. These vary in distinctness, being less conspicuous on the hind back and legs than on the shoulders and arms, and may be quite inconspicuous, especially in the old faded coat before the moult sets in. Crown the same tint as the nape or darker; cheeks greyish or buffy, the hairs forming a longish and thick apically annulated fringe. Underside greyish-white, with some darker annulations on the abdomen and the inner side of the limbs in some specimens. Buttocks grey or buffy, sometimes indistinctly annulated, sometimes sharply contrasted with the back. Tail usually with whitish fringe at the base on each side; its upper side dark and contrasted with the paler hue of the loins.

Flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.
Bankachon, Tenasserim; ad. ♂	23	$7\frac{3}{5}$	$6\frac{3}{5}$
Champang, Tenasserim; ad. ♂	$22\frac{2}{5}$	$9\frac{1}{5}$	$6\frac{1}{2}$
Red Point, Tenasserim; ad. ♂ .	20	$7\frac{1}{5}$	$6\frac{1}{5}$
Sullivan Island, Mergui; yg. ad. ♂	21	7	6
Chance Island, Mergui; ad. ♂ ..	$20\frac{4}{5}$	7+	$5\frac{3}{4}$
Chance Island, Mergui; ad. ♂	$20\frac{1}{3}$	$6\frac{1}{3}$	6—
Bankachon, Tenasserim; ad. ♀	$19\frac{2}{5}$	$5\frac{2}{5}$	$5\frac{3}{5}$
H'Kamti, Upper Burma; ♀.	$18\frac{2}{5}$	$7\frac{1}{5}$	$5\frac{4}{5}$

The measurements of the specimens from Champang and Red Point, Tenasserim, and from Chance Island are taken from Miller's records of *adusta* and *insulana* respectively. The specimens from Bankachon and H'Kamti were collected and measured by G. C. Shortridge, and the one from Sullivan Island by C. Primrose. The tail varies from considerably more to a little less than the length of the foot.

Miller's ♂ specimens from Champang and Red Point weighed 20 lb. and 14 lb. respectively, his two from Chance Island $13\frac{3}{4}$ lb.; the ♂ from Bankachon was 18 lb. and the ♀ $10\frac{1}{4}$ lb. The ♂ specimens, although not very much shorter in head and body, were much lighter than three adult males of the typical form from Sumatra, which were 25, 27, and 30 lb. respectively, as recorded by Miller.

The skulls of this Macaque are about the same size as those of *M mulatta villosa* True, and I am unable to find any constant difference between the two, particularly in the ♀ skull*, but the ♂ skull seems to have slightly more elevated brows

* By an error in registration two skulls carry the same number as the skin of the ♀ *andamanensis* collected by Shortridge at H'Kamti on the Upper Chindwin. One is the skull of *M. mulatta*, the other of *M. nemestrina leonina*, and I do not know which of the two belongs to the skin.

and stronger temporal ridges. The skull of the adult ♂ from Bankachon is, unfortunately, not available; but the skull of an old ♂ from Tavoy figured by Tickell in his MS. has the ridges strong and converging posteriorly, only about 7 mm. apart on the parietals, with a short median ridge between them. In the skulls of typical *nemestrina* that I have seen the ridges are farther apart, and this is accompanied by longer jaws. But the difference in size between these two races is not always very great. For instance, the skull of an adult ♂ of *nemestrina* from Perak is only 143 mm. in total length, but two from Pahang and Selangore are 151, a third from Borneo is 161, and an adult ♀ from Sumatra is 134 mm., indicating considerably greater average length in *nemestrina*. (For measurements of *leonina*, see p. 64.)

Tickell* in his MS. recorded this Macaque from Ye in Amherst where it occurs in the thick jungles at the foot of the hills, but is not nearly so common as the "fishing monkey" (*M. irus aurea*), although it seems to increase in numbers farther south in Tenasserim. The voice of the young is the same, he says, as that of the Rhesus (*M mulatta*). Shortridge, who was acquainted with it at Bankachon, says it is plentiful there, though not to the same degree as the Gibbon (*H. lar entelloides* Geoffr.) and the Leaf-Monkey (*Trachypithecus obscurus* Reid). It is gregarious, and when occurring round villages is said to be very destructive to the rice-fields. He found the cheek-pouches filled with pieces of this cereal. With the specimen Shortridge collected at H'Kamti was a note stating that it was secured on the west bank of the Chindwin River and probably represented a hill-form, possibly common enough round Sarameti and other hill regions†

7 *b*. **Macaca nemestrina blythii** Pocock. Blyth's Pig-tailed Macaque.

Macacus leoninus, Sclater, Proc. Zool. Soc. 1870, p. 663, pl. xxxv (♂); Anderson, Zool. Res. Yunnan, 1878, p. 52 (fig. skull); Blanford, Mamm. Brit. Ind. 1891, p. 18 (♂, fig.). Not *M. leoninus*, Blyth.

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* This able naturalist, to whom Blanford was much indebted, published an admirable description, illustrated by good coloured figures, of a ♂ and two young specimens of this Macaque. There is also an accurate figure of the skull of a very old ♂. The description and the figures agree as precisely as can be with the description of *leonina* given above. If Blanford, who saw this account, had paid heed to it, he might have seen that the Pig-tail of Tenasserim is not typical *nemestrina*, and that its skull has the characters he regarded as distinctive of his *leoninus*.

† Anderson's accounts in 1878 and 1881 of the specimens of *M. leoninus* and *M. assamensis* he said he collected near Bhamo are so confused that I cannot make up my mind whether he secured a ♀ of each or of only one of the species, and, if only one, which it was.

Pithecus andamanensis, Elliot, Rev. Primates, ii, p. 208, 1912 (in part., fig. of ♂).
Macaca nemestrina andamanensis, Kloss, Journ. Nat. Hist. Soc. Siam, iii, p. 344, 1919 (skull only).
Macaca nemestrina blythii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 305, 1931.
? *Macaca nemestrina*, McCann, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 808, 1933.

Vernacular.—? *Kangh* (Nagas).

Locality of the *type* unknown.

Distribution.—Unknown, but probably some district of BRITISH INDIA east of the Ganges ; ? Naga Hills in Assam.

Distinguished from *n. leonina* Blyth by the blackish-brown tint of the crown and of the back behind the shoulders, which



Fig. 15.—Blyth's Pig-tailed Macaque (*Macaca nemestrina blythii*). (From a drawing by Wolf of the type when living in the Zoological Gardens, London.)

resembles the tint of the upper side of the tail, resembling in these respects typical *nemestrina*, but distinguished from it by the generally profuse, conspicuous annulation of the pale hairs, and by the shortness of the muzzle, the pronounced brow-ridge, nearly vertical interorbital septum, and other characters of the skull.

Coat full and longish, with well-developed facial ruff.

General colour dark, uniformly blackish-brown on the crown, the back behind the shoulders, and the upper side of the tail ; the nape, shoulders, and fore back paler, annulated orange-red and black ; cheeks dusky grey, annulated, with the tips of the hairs of the ruff black. Towards the root of the

Skull-measurements (in mm.) of *Macaca nemestrina leonina* and *blythii* and of *Macaca silenus*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
M. n. leonina.							
Champang, Tenasserim ; ad. ♂	136	—	94	—	—	47—	100
Red Point, Tenasserim ; ad. ♂	130	—	88	—	—	43	94
Chance Island, Mergui ; ad. ♂	133	—	94	—	—	41	93
Chance Island, Mergui ; ad. ♂	128	—	94	—	—	41	92
Chance Island, Mergui ; ad. ♂	125	—	89	—	—	41	97
Sullivan Island, Mergui ; subad. ♂	123	96	83	68	34	41	90
Andamans (*andamanensis* type) ; ad. ♀	113	86	75	64	26	40	—
Bankachon, Tenasserim ; ad. ♀	109	82	73	59	27	38	79
M. n. blythii.							
Locality unknown (type) ; ad. ♂	134	110	101	85	39	44	101
Naga Hills ; ad. ♀ (? this race)	120	—	82	—	—	—	—
M. silenus.							
Cochin, S. India ; ad. ♂	(140±)	(110±)	100	72	40	44	106
Travancore ? (Blanf.) ; ad. ♀	112	—	74	—	—	—	—

tail, which is white below, with a white basal tuft on each side, the bases of the hairs turn grey, the hairs beneath the callosities on the buttocks white; arms and hands paler than shoulders; legs dark olive; underside greyish and conspicuously annulated on the chest, browner, unannulated on the belly.

This description is taken from the type and only available specimen. The dimensions (in English inches) of the dried, made-up skin are:—Head and body 24±, tail 8½, foot 6. The size is about the same as in the adult ♂ of *n. leonina*.

The skull, well figured by Anderson, is about the same length as that of *n. leonina* and has similar short jaws; but the cranial portion is relatively short, owing to the unusual uptilting of the occipital plane. It is exceptionally massive, with high thick brow-ridges and strong temporal crests about 16 mm. apart on the frontals, but coalescing on the parietals to form a low, thick, sagittal crest, a feature not observed in any skull of *n. leonina* or typical *nemestrina*. These features, however, may be a question of age, the skull being that of an old animal.

This monkey has a curious history. It was imported to the Zoological Gardens in London in 1870 as a full-grown animal and was there seen by Blyth, who identified it as his *leoninus*, overlooking the marked differences in colour between it and his type of *leoninus* from Arakan. Sclater naturally accepted this determination and was followed by Anderson and Blanford. Sclater published a coloured plate of it, with the type of *andamanensis* in the background, and considered them to represent the sexes of the same species. Later Anderson saw Blyth's type of *leoninus* in Calcutta and described it, as well as this specimen, without commenting on the differences between them. These were detected by Kloss, who was naturally completely puzzled by the discrepancies.

There is no proof that the type of *blythii* falls within the limits of the fauna of British India. But Elliot says that he saw a living specimen in the Calcutta Zoological Gardens which resembled it. Not improbably this specimen came from some nearby district, possibly northern Burma or Assam.

I have tentatively suggested that the specimens named *M. nemestrina* which McCann collected at Changchang Pani, 500 ft., in the Naga Hills, may represent this race, because he says they have much longer and darker coats than a specimen from Bankachon sent to Bombay as *M. adusta*, the hairs being tipped with brown, especially on the hinder dorsal region. He had three adult ♀♀ and one immature ♂, which in the flesh resembled Sclater's figure of *M. leonina*, the

reference presumably being to the ♂ in the foreground. His description suggests that they are not as dark as the old ♂, the type of *blythii*, but the difference may be a matter of sex and age. His largest ♀ measured: head and body 22⅕ in. tail 7⅗, foot 6. Two dimensions of its skull are entered in the list below.

Assuming the correctness of this identification, *M. n. blythii* inhabits, according to McCann, the same forests in the Naga Hills as *M. speciosa*, but is far more arboreal and keeps strictly to dense evergreen forests, which makes it difficult to observe and secure. This may account for the comparative rarity of specimens of this race in museums and for its having been previously, so far as I am aware, unrecorded from Assam.

8. **Macaca silenus** (Linnæus). The Lion-tailed Macaque.

Simia silenus, Linn., Syst. Nat. ed. 10, p. 26, 1858; Schreber, Säug. i, p. 87, 1775.
Macacus silenus of most subsequent authors, including Thomas, Proc. Zool. Soc. 1911, p. 126.
Simia (Cercopithecus) veter albibarbatus and *Silenus albibarbatus*, Kerr, Anim. Kingd. p. 64, 1792.
Simia ferox, Shaw, Mus. Leverian. ii, p. 69, 1793.

Vernacular.—*Shia bandar* (Hindi); *Nil bandar* (Beng.); *Nella manthi*, *Chingala* (Mal.); *Singalika* (Can.); *Karingode* (Kurg.); *Kondamachu* (Tel.); *Kurankarangu* (Tamil); *Carapu corongu* (Nelliampathi).

Locality of the *type* of *silenus*, "Ceylon"*; *albibarbatus*, "Ceylon"; *ferox*, "Ceylon."

Distribution.—S.W India, the Western Ghats, principally of Travancore and Cochin, but alleged to occur from about 14° N. lat. to Cape Comorin.

Distinguished from all the other species of *Macaca* by the combination of two characters: the growth of the hairs on the temples and cheeks to form a long, thick, dark grey or brownish-grey ruff or mane, which hangs down on each side of the face like long whiskers and passes on to the throat as a shorter, paler beard, and by the shining, black hue of the

* Nearly all the early records of this species give Ceylon as its locality, and many of them, including the popular natural histories, cite it in consequence as the "Ouanderu" or "Wanderoo," the vernacular name for the so-called "Purple-faced Leaf-Monkey" or Langur of that island. One or two comparatively recent authors have objected to the use of *silenus* as its specific name because of the discrepancies between Linnæus's description of *silenus* in the 10th and 12th editions of the 'Systema.' But I agree with Thomas that the description of 1758 is sufficiently exact to justify Schreber's allocation of the name in 1775, and the acceptance of it by nearly all recent zoologists, Elliot being an exception, in calling it *albibarbata*. For the erroneous application of the name *leonina* to this Macaque see p. 60, footnote.

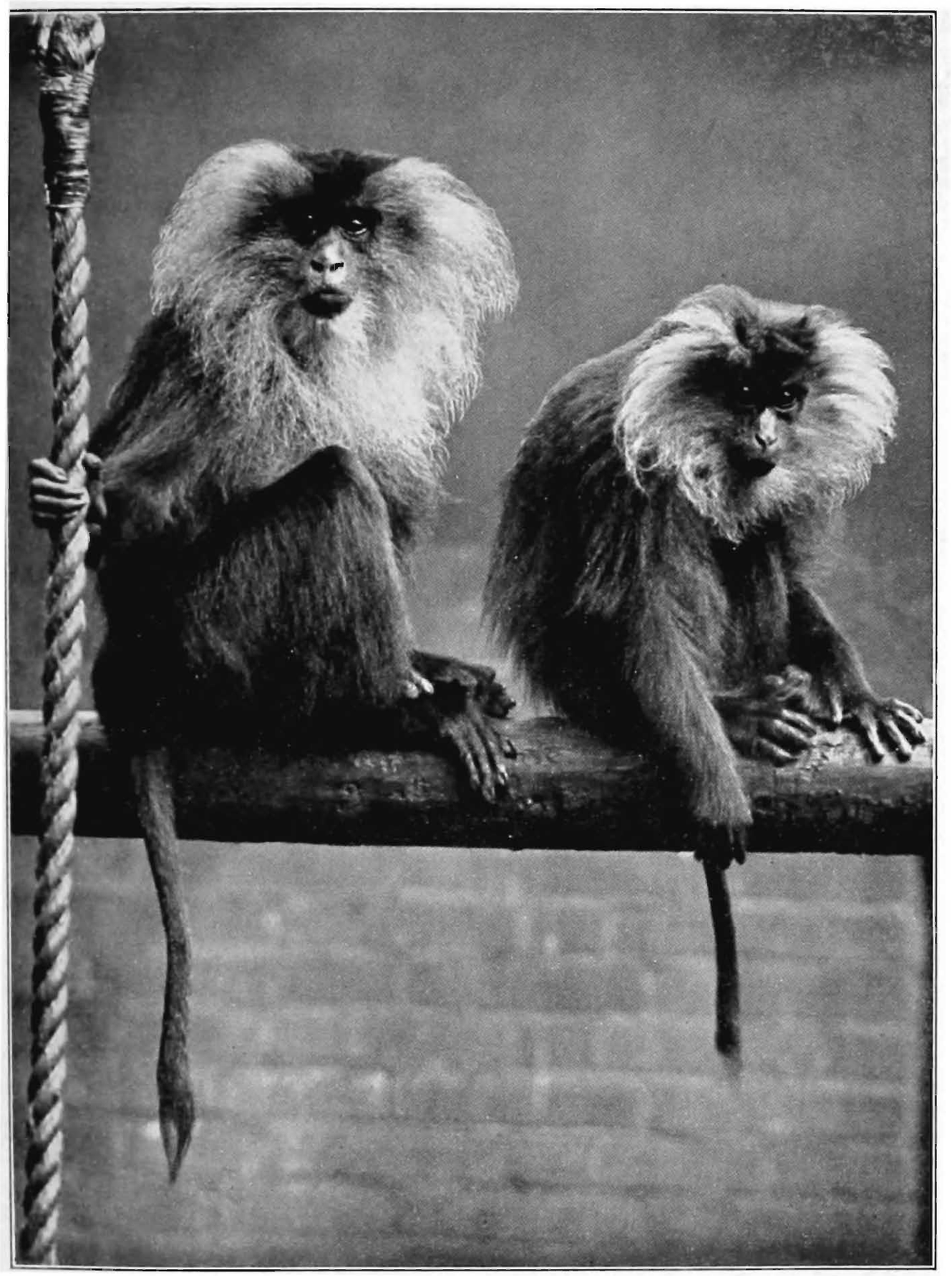


Photo D. Seth-Smith.

Lion-tailed Macaque (*Macaca silenus*).

rest of the head, body, limbs, and tail, although the underside, at least in the young, may be dark brown or greyish-brown.

Despite the striking and distinctive appearance of this species, there is no doubt that it is not very remotely related to *M. nemestrina leonina*. The arrangement of the hairs on the crown and cheeks is the same, and the huge mane or ruff is merely an exaggeration of the shorter ruff seen in the Burmese Pig-tailed Macaque. In both of them, also, the coat is in general long and full, and the hairs of the greater part of the tail are short, although in *M silenus* the terminal tuft is apparently always present and larger, and the tail itself is longer typically, apparently about two-thirds the length of

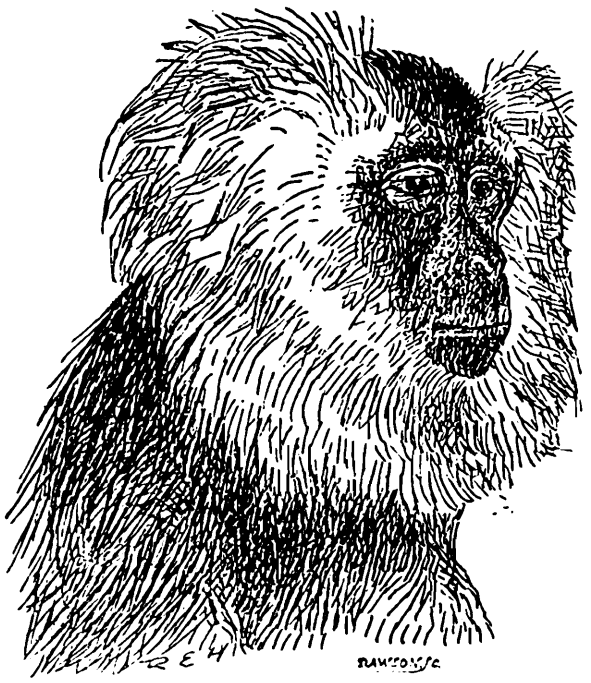


Fig. 16.—Head of Lion-tailed Macaque (*Macaca silenus*).

the head and body and about twice as long as the foot. Additional resemblances to *M. nemestrina* are found in the structure of the penis in the ♂ and the occurrence of the catamenial swelling in the ♀, as recorded in my paper (Proc. Zool. Soc. 1926, p. 1571).

The following are some recorded measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Foot.
Loc. unknown (Anderson); ad. ♂ . . .	24	10	—
Loc. unknown (B.M.); ad. ♂	23±	14½	7—
Loc. unknown (Elliot); ad. ♂	21⅕	15⅕	7⅕
Travancore (Bourdillon); ad. ♂ . . .	21	13½	—
Travancore (Bourdillon); ad. ♂ .	20	15	—
Cochin (Riley O'Brien); yg. ♂	17¾	10⅛	5
Travancore (Bourdillon); ad. ♀ . .	18	12½	—
Travancore (Bourdillon); ad. ♀ . . .	18	10	—

Of these the only one known to have been measured in the flesh is the young specimen from Cochin collected by the Survey. The records of the Travancore specimens were quoted by Blanford. They may be flesh-measurements, but the dimensions given by Elliot were admittedly taken from the made-up skin; and there is very little doubt that Anderson's were also. The tail of Anderson's specimen is relatively very short, suggesting that the head and body may be stretched. The records, for what they are worth, show that *M. silenus* is about the same size as *M. nemestrina leonina*.

The skull* of this Macaque is little known. Anderson described one of an adult ♂ as characterized by its widely bulging zygomatic arches, greatly developed orbital ridges, etc. The only adult skull I have seen is that of a ♂ from Cochin

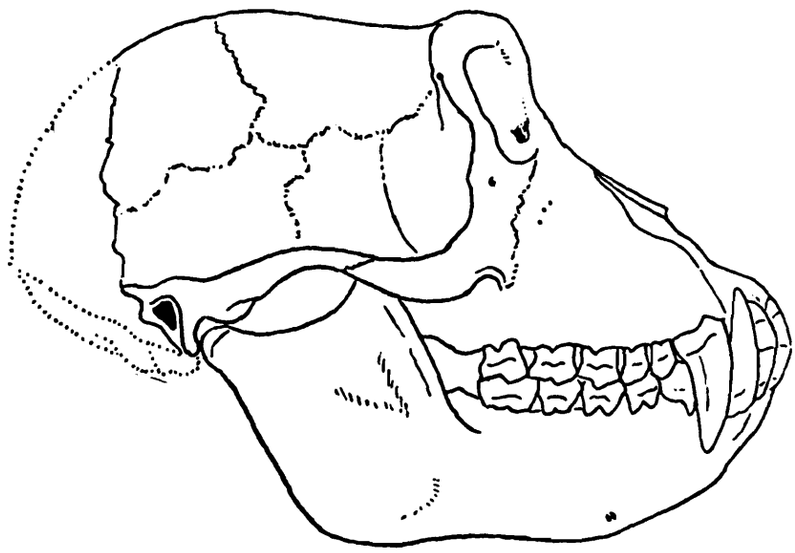


Fig. 17.—Skull of adult ♂ Lion-tailed Macaque (*Macaca silenus*), with occipital region restored. × ½. From Cochin.

presented by Sir Frank Colyer, which, unfortunately, has its occipital area broken away; hence the total and condylo-basal lengths entered on the table (p. 64) were estimated; but it agrees with Anderson's skull in the expanded zygomata, prominent brow-ridges, and other points. The temporal ridges are well defined and 13 mm. apart on the fronto-parietal suture, but converge, without apparently meeting, on the parietals. The muzzle is longer than in the type of *M n. blythii*; but the facial profile is very similar to that of the subadult ♂ of *M n. leonina* from Sullivan's Island.

In the Nelliampathi Hills, according to R. P. Kinloch, this Macaque is rare and occurs in small troops up to about

* The photographs which Elliot published to illustrate the skull of this species were taken from an adult ♂ skull of the Bonnet Macaque (*M. radiata*) from the Nilgiri Hills in the British Museum.

a dozen. It is sparingly distributed throughout the evergreen forest and is a quiet monkey, its call-note being a deep " O."

In 1859 this Macaque was recorded by Baker (Journ. As. Soc. Beng. xxviii, p. 238) as occurring in the Western Ghats as far north as Goa, but only in the lonely dense forests. In Travancore, according to Hill (Proc. Zool. Soc. 1937, Syst. p. 215), it is not found below 2,000 ft., its altitude being usually from 2,500 to 3,000 ft. Like other Macaques it is gregarious, living in parties of from twelve to twenty individuals or more. In the rest of its habits it no doubt resembles its congeners. Baker compared the call of the ♂ to the " cooyeh " of a native astray in the forest and trying to keep in touch with his companions. O'Brien secured for the Survey only one half grown specimen at Cotengady 3,500 ft., in Cochin, and tersely summed up his impression of the species by writing on the label " rare, shy, and silent." These attributes help to explain the comparative paucity of specimens in the museums of the world.

The general likeness in colour between this Macaque and John's Leaf-Monkey, both being alike mainly black with brownish whiskers, is worth noting as an independently acquired characteristic, probably in response to similarity in habitat.

9. **Macaca speciosa** Cuvier. The Stump-tailed Macaque.

[*Macacus*] *speciosus*, F. Cuvier, Hist. Nat. Mamm. no. 46, 1825.
Inuus speciosus, Blyth, Cat. Mamm. Burma, p. 6, 1875, and of most recent authors under *Macaca* or *Lyssodes*.
Macacus arctoides, Anderson, Zool. Res. Yunnan, p. 45, 1878; Blanford, Mamm. Brit. Ind. p. 17, 1888. (For further bibliography and synonymy see under subspecific headings.)

Distribution.—Tibet, South China, ASSAM, BURMA, Malay Peninsula, Siam, and Indo-China.

Distinguished from all the British Indian species by the shortness of the tail, which is reduced to a conical, sparsely hairy stump, not more than one-third the length of the foot, and by the excessive elongation of the glans penis. The hairs on the crown, radiating from a central whorl, are elongated laterally and posteriorly over the occiput, but in the adult are very short anteriorly, leaving a nearly naked area behind the brow-ridges; hairs on the cheeks sweeping backwards, concealing the ears, and downwards to the throat, where they meet the hairs growing upwards from a whorl behind the chin and forwards along the side of the neck, forming with them a tufted crest. Typically, at all events, there is an area of naked skin round the callosities. General colour usually dark brown, but varying from nearly black to reddish, with the underside at most a little lighter than the upper. Face pink.

In the shortness of the tail *M. speciosa* closely resembles the Macaque from Celebes, *M. maura*. The tail is also tolerably short in the Japanese Macaque, *M. fuscata*; but it is still more reduced than in these three species in the so-called "Gibraltar Ape," *M sylvana*, which is indigenous in Morocco. But *M. speciosa* differs fundamentally from these species, as it does from all the other species of Cynomorph Primates, in the structure of the glans penis, which is remarkably long, gradually tapers to a slightly upturned point, and is supported by a correspondingly long bone, the *baculum*. This peculiarity was first described by Anderson (Proc. Zool. Soc. 1872, p. 209) and later by Murie in the same volume (p. 784), who, however, wrongly identified his specimen as a Japanese Macaque. The systematic importance of this structure was first insisted

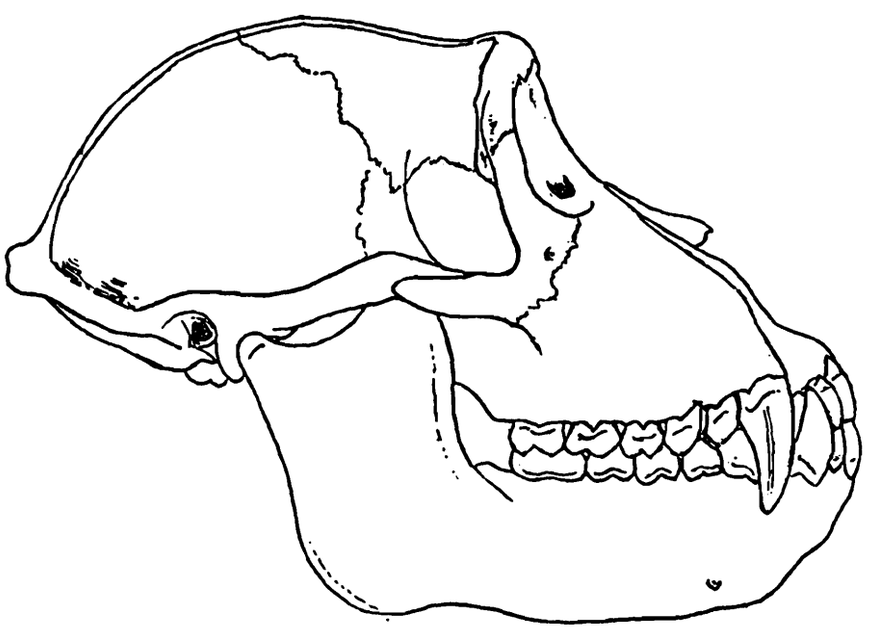


Fig. 18.—Skull of adult ♂ Stump-tailed Macaque (*Macaca speciosa speciosa*) from the Dikchu River, Naga Hills.

on by de Beaux (Giorn. Morf. dell' Uomo e del Primati, i, pt. 1, 1917) and independently by myself (Ann. Mag. Nat. Hist. (9) vii, p. 224, 1921, and later, Proc. Zool. Soc. 1925, p. 1557). If *M. speciosa* be regarded as representing a distinct genus or subgenus on account of the peculiarity of the penis, the name available for it is *Lyssodes* Gistel, 1848.

Considering the great differences between this species and *M. assamensis* McClell. in the length of the tail and the structure of the glans penis, it is perhaps surprising that the skulls of the two are not easily distinguishable, that of *speciosus* having similar massive brows and orbital margins, well-developed occipital and sagittal crests, large upper canines, etc.; but it is on the whole more massive, and has the outer edge of the orbits more vertical, straighter, and less concave where they pass into the anterior root of the zygomatic arch.

Many specific or subspecific names have been given to Macaques with the short tail and crimson face, described by Cuvier as characteristic of the type of *speciosus*. There is no doubt that all belong to that species, but the number of subspecies is as yet unsettled. I provisionally assign the British Indian representatives to two subspecies, a northern and a southern.

9 *a*. **Macaca speciosa speciosa** Cuvier.

[*Macacus*] *speciosus*, F. Cuvier, Hist. Nat. Mamm. no. 46, 1825.
Macacus brunneus, Anderson, Proc. Zool. Soc. 1871, p. 628, and 1872, p. 203; also Zool. Res. Yunnan, p. 45, 1878, where *brunneus* is dropped as a synonym of *arctoides*.
Macacus (*Magus*) *arctoides melli* and *esau*, Matschie, SB. Ges. Nat. Fr. Berlin, 1912, p. 308.
Pithecus pullus, Howell, Proc. Biol. Soc. Wash. xli, p. 41, 1928.
Lyssodes speciosus melli, G. M. Allen, Amer. Mus. Novit. no. 429, p. 3, 1930.
Macaca speciosa, Osgood, Field Mus. Nat. Hist. Zool. xviii, p. 202, 1932; McCann, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 797, pls., 1933.

Vernacular.—*Chantee* (Nagas).

Locality of the *type* of *speciosa*, " E. Indies "; of *brunneus*, Kakhyen Hills, east of Bhamo; of *melli* and *esau*, west of Lo-chang, in western Kwantung; of *pullus*, near Kuatun in Fukien.

Distribution.—Assam, Upper Burma, S. China, Tong-king, and Annam.

Coat in winter very long, on the shoulders up to about 112 mm. or more (4½ in.). Colour above varying from deep olivaceous-grey to chocolate-brown, the hairs, at least in the olivaceous-grey phase, speckled, but obscurely, with dull buffish annulations; the underside paler, greyish-brown to brown.

Cuvier described *speciosus* from a coloured drawing that was sent to him of a specimen in the Barrackpore Menagerie, near Calcutta, and Blyth was the first to adopt this name for specimens from Cachar and the Kakhyen Hills, east of Bhamo. Anderson entirely agreed with the correctness of Blyth's opinion, adding that the Macaque illustrated was probably locally caught either in Assam or Cachar; but for no intelligible reason he chose for the species the later name *arctoides*, given by Geoffroy to an example he received from Cochin China. Blanford also adopted *arctoides*, because he followed Temminck's erroneous and highly improbable view that the type of *speciosus* was a Japanese Macaque (*M fuscata*). I unhesitatingly follow Blyth's verdict and Anderson's reasoning, with the additional reason that specimens from the Naga Hills, described below, agree better with Cuvier s description of the colour of the upper side of *speciosus* as " grisvineux " than

most examples of the species, although they are not so grey below and on the inside of the limbs; but a reproduced coloured drawing cannot be implicitly relied on.

Anderson's type of *brunneus* from the hills on the western border of Yunnan, a young specimen, had the coat long, thick, and woolly, the colour dark brown above, washed with yellowish below. Specimens he received later varied somewhat in tint, and one that was kept alive acquired a speckled, annulated coat during captivity. He also had an example from Cachar, just south-west of the Naga Hills. I can find no reliable characters, embodied in the descriptions, by which the southern Chinese specimens named *melli*, *esau*, and *pullus* can be distinguished from *brunneus*.

The only available British Indian examples of this race were collected by J. P. Mills in the Naga Hills, an adult ♂ on the Dikho River, 21 February, and an adult ♀ at Merangkong, 15 January. The ♂ has the hairs on the shoulder about 118 mm., and the general colour dark greyish-olivaceous above, with the hairs obscurely annulated blackish and dull buff; the crown has a grey hoary tinge, the limbs are a little browner and paler than the back, there is some redder brown on the tail and round the callosities, and the underside is also browner and paler than the upper. The ♀ has the shoulder-hairs about 110 mm.; the general colour is very similar, but the flanks and underside are a trifle browner, and the crown not so hoary.

In a good series of skins which he collected at Changchang Pani in the Naga Hills, 500 ft., McCann traced the colour-change from the newly-born young to extreme old age. The general colour of the newly-born young is mainly creamy-white, with a light brown tint on the rump and some brown patches elsewhere. The brown increases rapidly in extent and intensity. In the juvenile the tint is all brown. In the adult the coat becomes speckled owing to a varying number of pale annulations, usually about eight to ten, on the individual hairs. In old age the colour is more grizzled, the pale annulations turning grey. In the skin of one aged ♂ there were as many as sixteen annulations on the individual hairs and some wholly grey hairs mixed with the rest. These observations confirm Anderson's statement that his brown example of *brunneus* became speckled during the time it was in captivity.

McCann also referred to an adult specimen from the western slope of the Divide between the Salween and the Irrawaddy, 5,000 ft., which was more ferruginous along the flanks than in the Naga Hills skins.

Two adult ♀ skins from Chapa in Tong-king and Col de Nuages, Annam (Delacour and Lowe), are very like my two

skins from the Naga Hills, but the hair of the shoulders is only about 75 mm. long, and the Annam skin has a lot of long grey hairs on the crown and nape.

9 *b*. **Macaca speciosa melanotus** (Ogilby).

Papio melanotus Ogilby, Proc. Zool. Soc. 1839, p. 31.
Macacus rufescens, Anderson, Proc. Zool. Soc. 1872, p. 204.
Macacus harmandi, Trouessart, Le Natural. 1897, p. 10.
Pithecus rufescens, Robinson & Kloss, Ann. Mag. Nat. Hist. (8) xiii, p. 392, 1914.

Locality of the *type* of *melanotus* "said to be Madras"; of *rufescens*, "Singapore"; of *harmandi*, Chantaboun, S. Siam.

Distribution.—TENASSERIM, the Malay Peninsula, and Siam.

Distinguished from typical *speciosa* by its thinner, shorter coat, up to about 70 mm. (less than 3 in.), in winter, by its blacker or redder colour, and by the absence or more obscure indications of pale speckling in the dorsal pelage.

The type of *melanotus* Ogilby, which was probably shipped from the Malay Peninsula or Tenasserim to Madras, is mostly glossy blackish above, browner on the flanks, and still browner below, with the limbs a little lighter than the back, and with scarcely a trace anywhere of pale speckling in the pelage. It is a half-grown ♂, with the hair on the forehead not conspicuously short as in the adult. The dry skin of the face is quite pallid, showing that the specimen cannot be assigned to the short-tailed black Celebean Macaque, *M. maura*, which has a black face. The type of *rufescens*, bought alive in Singapore, may have come from almost anywhere in the East, but it so closely resembles some skins from the Malay Peninsula that that country may be taken as its home. Like the type of *melanotus*, it is a half-grown ♂, with the hair on the forehead longish, but differs in its generally brightish red colour above, with some black-tipped hairs on the head and nape and brighter brown hue below, the pale speckling in the hairs being negligible. The type of *harmandi* does not seem to differ in any way from that of *melanotus*. It was described as very deep glossy brown, approaching black above, reddish-brown below, with the face carmine, apart from the blackish muzzle. The young was said to be tawny grey.

Although this Macaque has been recorded from districts in Tenasserim as remote as the Toungyeen River, a tributary of the Salween, in the north and Bankachon, Victoria Point, in the south, the only available skin is that of a subadult ♂ collected by H. Cecil Smith in Tavoy, December. The coat is about 70 mm. on the shoulder and everywhere thinner and shorter than in the Assamese skins, with the hairs browner at the base, a little darker, less olivaceous, and less annulated

distally; there is no appreciable reddish-brown on the buttocks, but the crown is a trifle greyer. Bingham saw black specimens at the foot of Mt. Mulai-yit, and a couple of obviously young individuals; cream in colour, with a rusty tinge above, were recorded by Davison from Bankachon (see p. 77). These were probably not very different from the "tawny grey" young of *harmandi* mentioned by Trouessart.

From the Malay Peninsula, in addition to the type of *rufescens*, the British Museum has several skins collected at Trang by Robinson and Kloss in December and January. One adult ♂ is glossy black above, with hardly a trace of annulations and no grey on the crown or brown on the rump. A younger ♂ is like it, but browner, and a ♀ is still browner. A young ♀ from Patalung (Skeat Expedition) is tolerably uniformly rufous-brown, yellower on the crown and on the limbs below the elbows and knees, closely approaching the type of *rufescens*; and a young ♂ from Nangkok Grabi, Siam (Kloss), is very like the ♀ from Trang. The coat in these skins is from about 55 to 70 mm. long. They were identified as *M arctoides rufescens* by Robinson and Kloss, who declared that the reddish and brown colour was characteristic of ♀ and young ♂ specimens. There is, however, the skin of an adult ♂ killed in April at Hat Sanuh, near Koh Lak, Rajburi, S.W Siam, of special interest from the closeness of its likeness to the skins from the Naga Hills assigned to typical *speciosa*. The coat is a little thinner, in no sense woolly, but quite as long, about 100 mm. on the shoulder; the colour is only a trifle browner and less olivaceous, but the hairs are a little more conspicuously speckled with redder annulations. This skin comes nearer typical *M speciosa arctoides*, provisionally regarded as a distinct race, than any I have seen (*cf. infra*, p. 75).

The only flesh-measurements of British Indian specimens of *speciosa* with which I am acquainted are those recorded by McCann in his valuable paper. To these I have added the dimensions (in English inches) of a few from other districts belonging to both races :—

Name, locality and sex.	Head and body.	Tail.	Foot.
speciosa.			
Changchang Pani, Naga Hills; ad. ♂	25⅕	2⅘	7—
Changchang Pani, Naga Hills; ad. ♂	23⅖	1⅗	7⅖
Changchang Pani, Naga Hills; ad. ♂	22⅗	3	6⅘
Kuatan, Fukien (*pullus* type); yg. ad. ♂.	24	2½	7+
Changchang Pani, Naga Hills; ad. ♀	21⅕	2⅖	6⅕
Col de Nuages, Annam; ad. ♀	22⅖	⅖	5⅘
Chapa, Tong-king; ad. ♀	21⅗	1⅗	5⅘
melanotus.			
Koh Lak, Rajburi, S.W. Siam; ad. ♂	21⅗	1⅘	7
Trang, Malay Peninsula; ad. ♀	19⅘	2	6⅖

These dimensions suggest that typical *speciosa* is larger than *melanotus*, since the adult ♂ of the latter is about the size of the ♀ specimens of the former, and smaller than the young adult ♂ from Kuatan; but that conclusion is not borne out by the skulls (table, p. 76).

The female skull of *speciosa* from the Naga Hills, received from Merangkong, without a skin, I identify as *speciosa* because it has broad orbits, and a skin of this species was collected at that locality, as recorded above. The skull of *melanotus* from the Toungyeen River is the one Blanford identified as an old ♀ of *M. nemestrinus* collected by Bingham in the Meplay Valley. It has no skin, but is unquestionably that of an old ♂ *M. speciosa*, and the largest recorded.

The type of *Macacus arctoides* Geoffroy (Zool. Voy. de Bélanger, p. 61, 1831, and Mag. de Zool., Mammif. Cl. i, pl. 2, 1833), from Cochin China, apparently represents a subspecies of *M. speciosa*. It was said to be an adult ♂, with the head and body about 32 in. long, and to differ from the type of *speciosa* in its conspicuously annulated coat. The annulation was red and black, yielding a brownish-red general hue. On this account I provisionally regard *arctoides* as a distinct subspecies from *melanotus*, in which there is evidence that the adult ♂ is black or nearly black above and unannulated, and the annulations hardly appreciable even in the browner or redder ♀ and young ♂. It was the blackish, unspeckled colour of *harmandi* that induced Trouessart to describe his Chantaboun skin as representing a distinct race from *arctoides*. Gervais substituted the name *ursinus* for *arctoides* (Hist. Nat. Mamm. i, p. 93, 1854).

Geoffroy's description of *arctoides* suggests that it more nearly resembles *speciosus* than *melanotus*. This is not unlikely, since *speciosus* occurs in Annam just to the north of Cochin. If the two are inseparable, *arctoides* comes into the synonymy of *speciosus*.

The records* by Bingham and Davison of the occurrence of this species both at the foot of Mt. Mulai-yit in Tenasserim and at 7,000 ft., showing that it is found at comparatively low and high altitudes above sea-level, were confirmed by McCann's statements that in the Naga Hills it ranges from about

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* Communicated *in litt.* by the observers to Blanford, who inserted them under his account of the Lar Gibbon, being under the impression at the time that they referred to an undescribed species of Anthropoid Ape. Later in his volume he surmised that they might apply to a species related to his *M. arctoides*, but bigger. His estimate of the size was derived from Davison's guess that one he saw standing erect was about 4 ft. high and Bingham's guess that an old ♀ sent to him would have been 3½ ft. high upright.

Skull-measurements (in mm.) of the two races of *Macaca speciosa*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
M. s. speciosa.							
Naga Hills, Dikho River; ad. ♂	148	114	106	87	38	48	110
Khasi Hills, Laitura; ad. ♂	144	111	97	89	40	49	—
Naga Hills, Merankong; ad. ♀.	126	96	93	76	30	42	92
Annam, Col de Nuages; ad. ♀	122	91	82	62	30	40	—
Tong-king, Chapa; ad. ♀	120	93½	85	66	29	42	86
M. s. melanotus.							
Toungyeen River, Tenasserim, ad. ♂	160	119	108	86	40	50	—
Tavoy, Tenasserim; subad. ♂	141	110	94	82	40	49	100
Trang, Malay Peninsula; ad. ♂	147	113	104	85	42	50	105
Koh Lak, Rajburi, S.W. Siam; ad. ♂	148	117	102	84	40	49	106
Trang, Malay Peninsula; ad. ♀	125	97	87	71	32	43	91
Nangkok Grabi, S.W. Siam; ad. ♀	119	94	85	70	30	42	88

500 to 1,800 ft., and was taken at 5,000 ft. on the Salween–Irrawady Divide. As might be expected from its abbreviated tail, this Macaque is mainly terrestrial. On the label of one of Mills's skins from the Naga Hills is written: "A ground monkey which rarely climbs, and is found in bands which may number 50 or more individuals." McCann says the parties consist of twenty-five or thirty individuals of both sexes and all ages, apparently under a leader, but that occasionally solitary old males, probably expelled from the troop, may be seen. The party, however, seen by Bingham, as reported by Blanford, at the foot of Mt. Mulai-yit, and described as "large tailless black apes," numbered only four or five. These, like the specimens recorded by Davison as inhabiting a very dense part of the forest at 7,000 ft. on the mountain, were on the ground, and McCann confirms these accounts, stating that the species is found in dense forests and is essentially terrestrial, feeding mainly on the ground and making its way rapidly through the thick undergrowth when alarmed, and only climbing trees when pushed or to feed on fruits or foliage. The alarm-note is a short, harsh bark; but, when feeding, the bands keep up a continuous squealing and chattering and are at all times apparently extremely noisy. They are also exceptionally fearless and frequently show fight when driven from potato fields and other cultivated crops, which they are addicted to raiding. Their diet consists mainly of leaves, fruits, and roots, but McCann thinks that they are probably omnivorous—and no doubt rightly, because two young specimens* kept alive at Bankachon by Davison were "excessively insectivorous, preferring insects to fruit or bread."

Davison made the interesting observation that they exhaled a peculiarly fœtid odour. This, too, was confirmed by McCann, who found that none of his party would tolerate nursing a young captured specimen because of its unpleasant smell, which adhered to clothing. These accounts suggest that the odour, evidently much more potent than that of other Macaques, which are frequently petted when young, may be protective, rendering this species distasteful. It possesses, at all events, two other attributes often associated with distastefulness, namely fearlessness and noisiness. The odour no doubt emanates from the skin and is probably restricted to it, since, according to McCann, some Nagas will eat the flesh.

* Referred to by Blanford under his account of *M. arctoides*. Accepting Davison's almost certainly erroneous statement that they had adult dentition, although standing only about 15 in. high, Blanford supposed they represented an undescribed species.

10. **Macaca irus** Cuvier. The Crab-eating Macaque.

Simia cynamolgus, Schreber, Säug. i, p. 91, 1775 (not *S. cynamolgus* Linn.).

Macacus irus, Cuvier, Mém. Mus. Hist. Nat. Paris, iv, p. 120, 1818 (substituted for *cynamolgus*, given by Linnæus to an African Baboon).

Locality of the *type* unknown—said to be W Africa*.

Distribution.—From Lower Burma eastwards to Borneo and the Philippine Islands.

Superficially resembling *M. radiata* (Geoffr.) and *M. sinica* (Linn.) in size, proportions, and the length of the tail, which is at most only a little shorter than the head and body, short-haired and tolerably cylindrical throughout, but distinguished by the hair-growth of the head, the hairs of the crown typically growing backwards from the brow, as in *M. mulatta* (Zimm.),

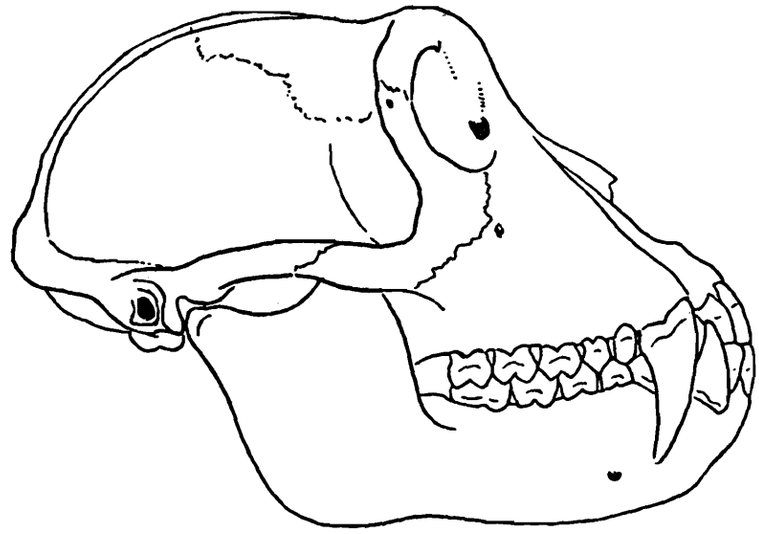
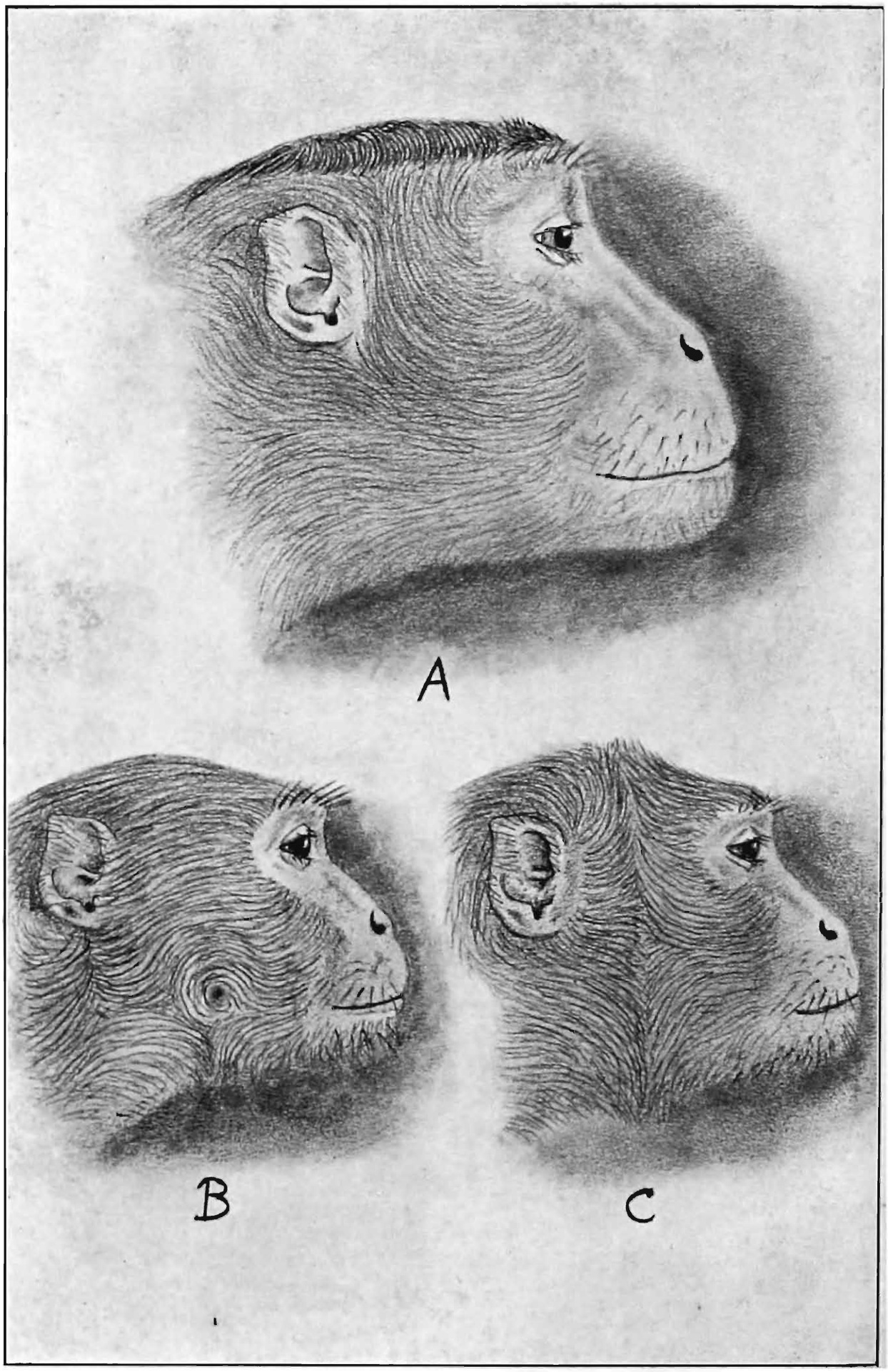


Fig. 19.—Skull of adult ♂ Crab-eating Macaque (*Macaca irus aurea*) from Tavoy.

and only very rarely showing signs of a parting or whorl, and then never exhibiting the very definite radiating arrangement constituting the "cap" or "toque" of the S. Indian and Ceylonese species. The whiskers also are typically much more bushy. But the greatest difference lies in the structure of the penis, which is small, and has a small, subspherical glans quite unlike the large, elongated glans of the other two; but, as in them, there is no periodic catamenial swelling in the ♀ at pairing time.

* The type of *cynamolgus* Schreb. was a specimen, figured and described by Buffon, said to have come from Senegal or Guinea. Cuvier accepted this locality when he substituted *irus* for *cynamolgus* in 1818 and when he figured *cynamolgus* in Hist. Nat. Mamm. pls. 30 and 31, 1819. But in the same work (pl. 32, 1825), when he described and figured *M. carbonaria* (=*M. irus carbonaria*) from Sumatra, he corrected the error on the evidence of specimens resembling Buffon's, which he received from the same island.



A. Head of Pig-tailed Macaque (*Macaca nemestrina*), typical form.
B. Head of Burmese Crab-eating Macaque (*Macaca irus aurea*).
C. Head of typical *Macaca irus*, showing hair-growth on the cheek.

The colour is very variable both individually and racially, and also the size and the length of the tail ; but the British Indian race is larger, both in its skull- and body-measurements than *M. radiata* (Geoffr.), and has the tail a little shorter than the head and body.

10 *a*. **Macaca irus aurea** Geoffroy. The Burmese Crab-eating Macaque.

Macacus aureus, Geoffroy, Zool. Voy. de Bélanger, pp. 58 and 76, 1831 ; Gervais, Hist. Nat. Mamm. p. 87, fig., 1854.
Macacus cynomolgus, Blyth, Cat. Mamm. Burma, p. 8, 1875 ; Blanford, Mamm. Brit. Ind. p. 21, 1888 ; and of other writers on the Burmese fauna (not *cynamolgus* Linn.).
Pithecus fascicularis, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 700, 1915 (not *fascicularis* Raffles, from Sumatra).
Pithecus vitiis, Elliot, Proc. U.S. Nat. Mus. xxxviii, p. 346, 1910.

Locality of the *type* of *aurea*, Pegu* ; of *vitiis*, Domel Island, Mergui Archipelago.

Distribution.—Lower Burma, Tenasserim, Mergui Archipelago, and S.W Siam.

Distinguished from typical *irus* and other forms occurring in Malaya, Sumatra, Java, etc., by the arrangement of the hairs on the cheek. In the southern races the long hairs below and in front of the ears sweep forwards and, meeting the backwardly-directed hairs from the face, form with them the characteristic fringe or crest on each side of the face, rising sometimes to form a crest on the side of the head above the ear. In *aureus* the hairs of the temple and upper part of the cheek sweep backwards from the face, partly concealing the ear, then turn downwards and forwards towards the corner of the mouth and finally upwards, the general arrangement being circular and resulting in a definite whorl and a small crest low down on each side of the muzzle.

The colour and length of the coat vary considerably in

* Geoffroy cited Bengal and Pegu as the localities of this Macaque, which he named *aureus* on account of the reddish-ochreous hue of the specimens he saw. I have selected Pegu as the type-locality because the species is not indigenous in Bengal. Bélanger's specimen, which Geoffroy was told came from Bengal, was no doubt bought in the Calcutta Bazaar, where captive specimens, according to Bélanger, were offered for sale. Pegu, on the other hand, is a certain locality for this Macaque.

The characteristic arrangement of the hairs of the cheek, which I have used as the main diagnostic feature of this race, was illustrated, though not commented on, by Gervais is 1854 when he figured, side by side, the heads of *aureus* and *carbonarius*, which no doubt he saw in the Paris Museum. Tickell's unpublished figures, quoted so frequently by Blanford, also show the same feature in specimens from northern Tenasserim, one sketch indicating, though not emphatically, the hair-whorl behind the mouth. I have added *vitiis* Elliot to the synonymy of *aurea* entirely because of its locality, the description being valueless.

Skull-measurements (in mm.) of *Macaca irus aurea*.

Locality and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-teeth.	Mandi-bular length.
Tenasserim Town ; ad. ♂	133	105	93	67	37	41	100
King Island, Mergui ; ad. ♂	130	103	90	66	34	42	97
Mergui (Oldham) * ; ad. ♂	128	100	90	72	35	41	—
Tavoy ; ad. ♂	128	—	87	69	34	43	101
Tavoy ; ad. ♀	115	—	77	64	29	40	87
Nr. Bankachon ; ad. ♀	115	89	77	60	25	37	85
Tenasserim Town ; ad. ♀	112	88	72	60	27	36	80
Ye Forest, Moulmein ; ad. ♀	110	85	74	60	26	36	—

* This is the skull of *M. irus* that Blanford assigned to *M. nemestrina*.

specimens from the same locality in accordance with the moult and independently of it. A skin from Kathema Island, Tavoy (H. C. Smith), 22 April, with the moult just finished, has the hair of the new coat about 13 and 20 mm. on the hind back and shoulders respectively, and the general hue of the upper side at a little distance is dark greyish- or olivaceous-brown, due to the blend of the blackish and ochreous annulations of the hairs; the limbs externally are a little paler, but the upper side of the tail is black, becoming gradually paler towards the tip; the lower surface and insides of the limbs are ashy grey, and there are some wholly black hairs behind the brow-ridge.

Another, with the same locality and date, retains the old coat everywhere, and its hairs are about twice the length of those of the skin in fresh coat. It is also much paler, faded to brightish tawny above, passing into dull ochreous-buff on the flanks and hind quarters, its general hue recalling that of the Rhesus Macaque (*M. mulatta* (Zimm.)), the hairs having scarcely a trace of annulations, except on the head; the arms are duller and paler than the body, the legs below the knee are grey, the tail is only slightly brownish above, and the underside is paler grey. This skin is in the "red" phase, like the type from Pegu.

All intermediates in coat-length and colour between these two occur in skins from the Tavoy district (H. C. Smith), two additional skins being "red"; and a good series collected by G. C. Shortridge in Southern Tenasserim between Tenasserim Town and Victoria Point agrees generally with the Tavoy skins, although none of them exhibits the "red" phase. But the coat may be longer and richer in colour, an exceptionally handsome skin being that of a ♂ from King Island, 200 ft., Mergui Archipelago (Primrose), October, which has a long glossy coat, 35 and 60 mm. long on the hind back and shoulders, and the colour darker, with deeper black and richer ochreous annulations. Another skin from the Ye Forest near Ataran, in Amherst District, November, is very like the King Island specimen, except that the coat is shorter. An "orange-coloured" specimen, like the type from Pegu, was recorded from Mergui by Blyth in 1875.

The size varies considerably, as shown by the following flesh-measurements (in English inches) of specimens collected for the Survey by Shortridge and Primrose:—

Locality and sex.	Head and body.	Tail.	Foot.
Tenasserim Town; ad. ♂	25½	21⅖	5⅘
Thaget, Tenasserim; ad. ♂	22⅕	20⅘	5⅘
King Island, Mergui; ad. ♂	21⅕	19⅗	5+
Pakchan River, Tenasserim; ad. ♀	19⅘	17⅖	5¼
Tenasserim Town; ad. ♀	19⅕	18⅕	4⅘

The weights of the ♂ specimens from Tenasserim Town and Thaget were 18¼ and 13 lb. respectively, and of the two ♀ specimens 10½ and 9 lb.

Habits.—The only peculiarity in the mode of life of this monkey is its habit of frequenting tidal creeks and mangrove swamps to hunt for crabs, upon which it feeds to a great extent. Shortridge, who came across it in Tenasserim, said that "although extremely plentiful where it occurs, this species is here [in Tenasserim] confined to the neighbourhood of mangrove swamps along the sea-shore and the banks of rivers. Its chief habitat is along the edge of tidal creeks, where at low tide it feeds on molluscs, crustaceans, and other marine animals. It was so local round Victoria Point that, although swarming along the banks of the Pakchan River, it was not once seen near Bankachon, only a few miles away from the river." The monkey does not, however, appear to be absolutely restricted to the coast and river-beds, since Primrose shot one 200 ft. above sea-level on King Island, Mergui. Nor does its diet consist solely of crabs. No doubt, like other Macaques, it eats insects as well; and H. C. Smith, who examined the stomachs of a number of specimens secured at Tavoy, found that although a large percentage contained the remains of crabs, these were generally mixed with vegetable food, and in some cases the contents were entirely vegetable.

Tickell in his MS. states that since the tidal creeks in Arakan, at the mouths of the Irrawaddy and in Tenasserim, are the only high roads of the districts, the monkeys have become familiarized to the sight of man and sufficiently fearless to come near enough to pick up rice and fruits thrown to them. This was confirmed by Blanford, who observed them in Pegu follow a boat for some distance. Very naturally also they are not only fearless of water but are adept swimmers. Tickell tells of a wounded male jumping out of a boat, swimming away, diving repeatedly and once swimming under water for a distance of 50 yards.

10 *b*. **Macaca irus umbrosa** Miller. The Nicobar Crab-eating Macaque.

Macacus cynomolgus, Blyth ,Journ. As. Soc. Beng. xv, p. 367, 1846; Blanford, Mamm. Brit. Ind. p. 22, 1888.
Macacus umbrosus, Miller, Proc. U.S. Nat. Mus. xxiv, p. 789, 1902.

Locality of *type*, Little Nicobar Island.

Distribution.—Nicobar Archipelago, Great Nicobar, Little Nicobar, and Katchal.

Distinguished from *M. irus aurea* and resembling typical representatives of the species from the Malay Peninsula and Sumatra in the mode of growth of the cheek-hairs, which on the fore part of the cheek sweep backwards from the

face and on the hind part forwards from in front of the ear and neck, the upturned points of the two hair-streams meeting to form a conspicuous vertical crest which descends from the edge of the crown to the throat; the eye-brow vibrissæ are also less well developed, at least on the average*. The general colour of the upper side and of the limbs is nearly uniform hair-brown, with a faint tinge of drab more pronounced on the sides; the hairs are marked with a cream ring which is sharp on the crown and nape, less so on the buttocks and thighs; the tail is dark drab above, almost black in its proximal half, pale drab below. The underside of the body is pale drab. According to Miller the general colour differs from that of specimens of *irus* from the Malay Peninsula by being much darker and less yellowish.

Flesh-measurements (in English inches) :—

	Head and body.	Tail.	Foot.
Ad. ♂	20⅖	21⅕	5⅖
Ad. ♂ (type)	20⅕	23⅕	5⅘
Ad. ♀	18⅖	20	5⅓

Skull-measurements of *type* :—♂. Total length 134; zygomatic width 90; orbital width 67; mandibular length 97 mm.

Although the flesh-measurements suggest that this Macaque is on the average smaller, sex for sex, than *M. irus aurea*, the skull of the ♂ appears to be about the same size.

Family COLOBIDÆ.

The essential characters distinguishing this family from the Cercopithecidæ are given on p. 32; but in addition to the sacculated stomach and absence of cheek-pouches, the British Indian members of this family differ from the Macaques in their longer, narrower hands and feet, with the pollex and hallux shorter.

This family of monkeys is represented in Africa by the so-called Guerezas or *Colobus*, whence its name is derived; but the Oriental Region, where it ranges from India, Tibet, and South China to Borneo, may be regarded as its headquarters.

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* I am indebted to Mr. Miller for telling me (*in litt.*, 1937) about the hair-growth on the cheeks and the eyebrows in his skins of *umbrosa*. In these particulars, he says, they differ markedly from the specimens from the Mergui Archipelago described by Elliot as *vitiis*, thus justifying the conclusion I had already reached that *vitiis* is a synonym of *aurea*. From a comparison of Elliot's Mergui specimens with Geoffroy's account of *aurea*, Miller suggested to me that the former should perhaps rank as a local insular race distinguished by its duller colour; but a majority of mainland skins is dull-tinted. The rest of the characters of *umbrosa* I have entered above are derived from Miller's original description.

In this region there are several well-defined genera, the Proboscis Monkey (*Nasalis*) and three Snub-nosed Monkeys (*Rhinopithecus*, *Presbytiscus*, and *Simias*), which are unrepresented in the British Indian fauna. The genera occuring within Indian limits are not so well defined from each other. They have been popularly called Langurs, a name open to the objection that, strictly speaking, it belongs to a particular kind found only in parts of India. The title Leaf-Monkey, recently adopted by Hill, is perhaps the most appropriate.

Although some of the different kinds are fond of frequenting rocks, or even old buildings, the Leaf-Monkeys are essentially arboreal, inhabiting for the most part high forest trees and feeding upon foliage, flowers, fruits and seeds of various kinds, sometimes perhaps occasionally taking animal food and

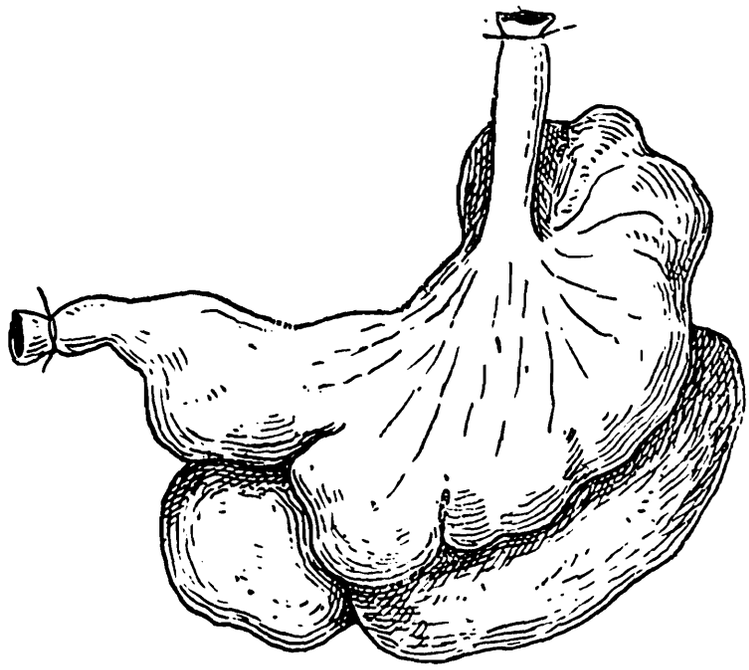


Fig. 20.—Sacculated stomach of Ceylonese Leaf-Monkey (*Kasi senex*).

but seldom coming to the ground except for water or a garden raid. On the ground they can gallop, and bound along at a good pace on all fours; but it is in the trees that their remarkable agility is chiefly manifested. They run with speed and surety along the big branches, spring lightly from one to another or take prodigious leaps from tree to tree, often landing, spread-eagle fashion, on a mass of foliage. Their structure is essentially adapted to this form of activity. The loins are powerfully developed for the "take off," the tail is exceptionally long and used as a balance, and the hands are long and narrow to play the part of grasping hooks. The palm is about twice as long as wide, the thumb is greatly reduced in size and nearly functionless, but the four remaining digits are long and strong, the two middle ones being subequal

and a good deal longer than the others. The hand differs greatly from that of the Macaques, in which it is comparatively broad and stumpy, with the palm much wider, the thumb longer, and the remaining digits about as long or shorter. The feet also differ tolerably similarly.

There have been many confusing changes in the nomenclature of the Oriental monkeys of this family. So long as they were all considered to represent a single genus they were cited as *Presbytis* or *Semnopithecus*, the latter mostly being preferred, *e. g.*, by Anderson and Blanford, until Miller pointed out that *Presbytis* is the older name. Then Thomas recommended

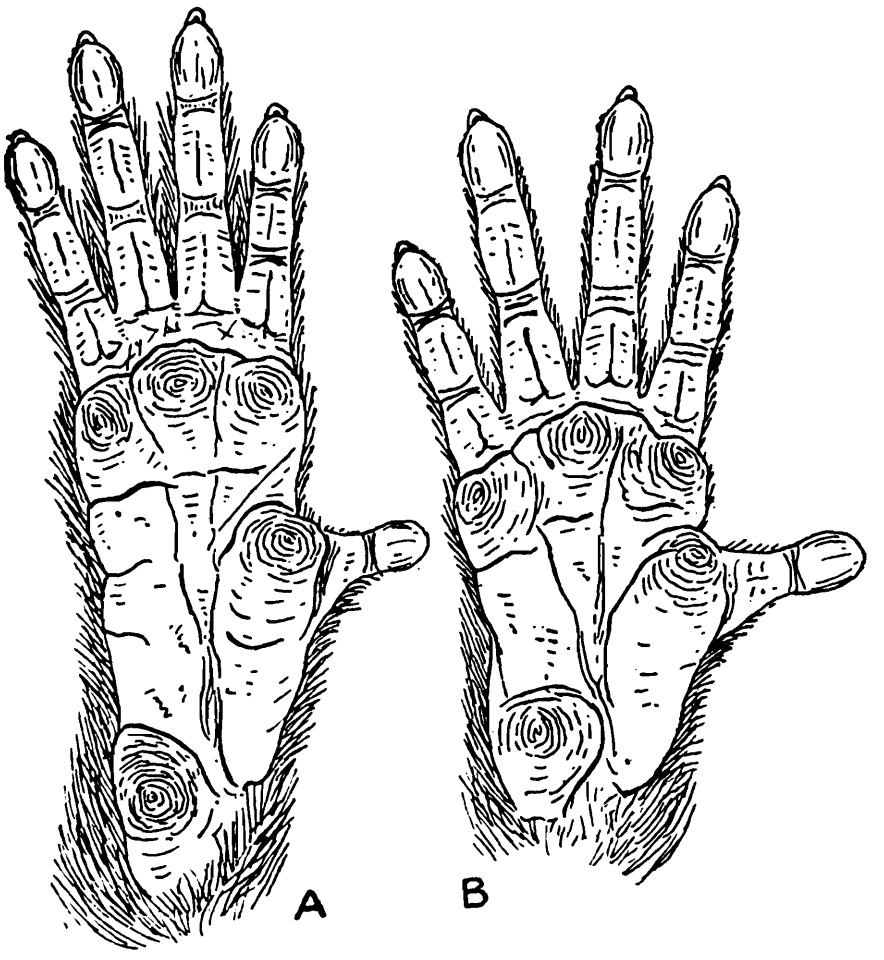


Fig. 21.—A. Right hand of Indian Langur (*Semnopithecus entellus*).
B. The same of Lion-tailed Macaque (*Macaca silenus*).

the still older name *Pithecus*, and in this he was followed by Wroughton, Fry, Hinton, myself, Phillips, and Hill. But *Pithecus* was later authoritatively ruled out of use because its type-species, *veter* Linn., cannot be identified from the description, and its type-specimen has disappeared.

In captivity at least the Leaf-Monkeys are sedate and dignified in appearance and behaviour as compared with the Macaques. The latter may be regarded as the "plebeians," the former as the "patricians" of the Indian monkey-population.

That the species fall into a number of natural groups was realized by practically all modern systematists; but the overlap in external characters and the individual variability in skulls made very difficult any satisfactory definition of the groups. I made such an attempt in 1928 and, adopting the name *Pithecus*, divided the genus into three sections, based upon the colour of the newly-born young, namely, the *Entellus*-group, containing the species found in India and Ceylon, in

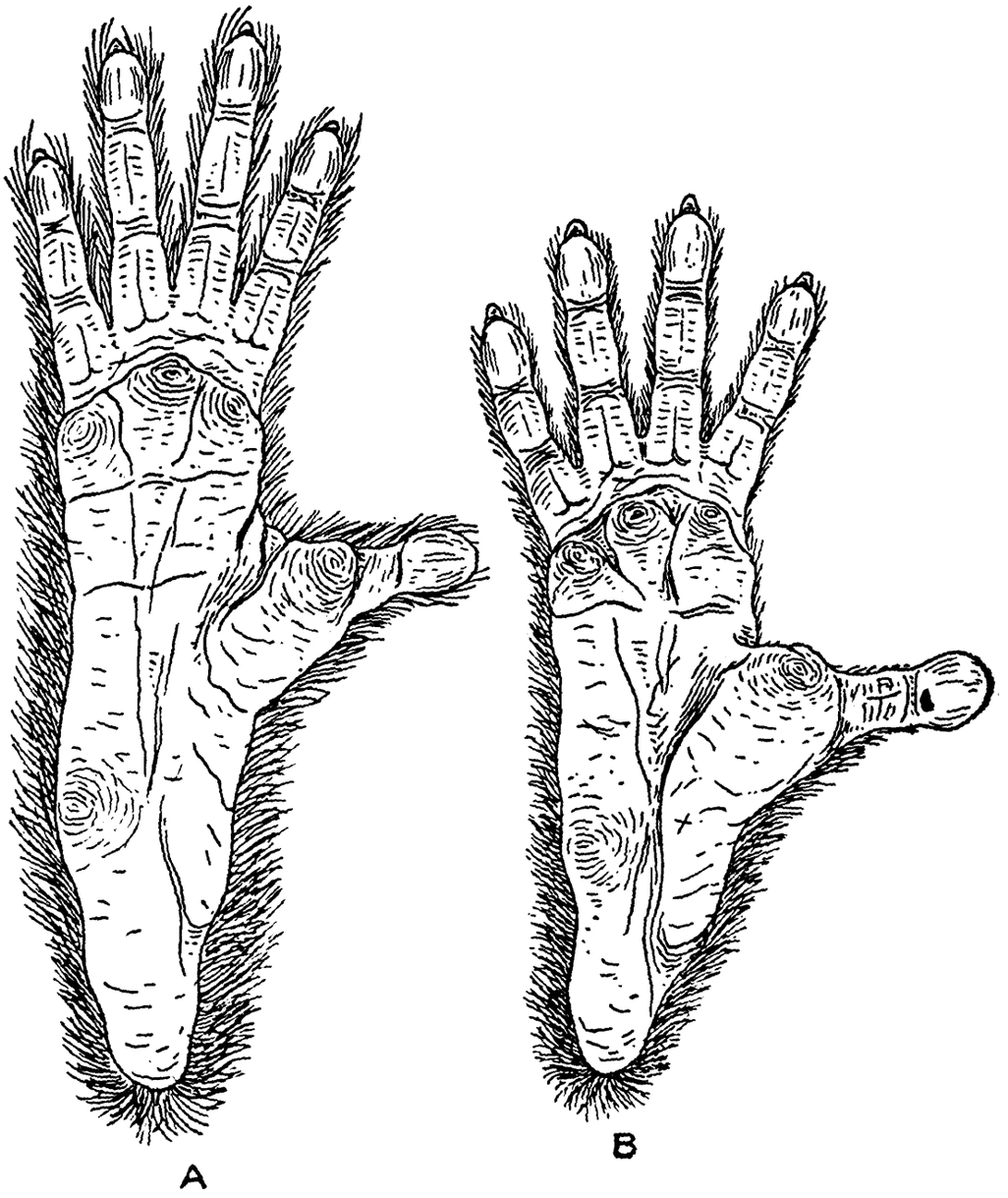


Fig. 22.—A. Right foot of Indian Langur (*Semnopithecus entellus*).
B. The same of Lion-tailed Macaque (*Macaca silenus*).

which the young is uniformly black; the *Pyrrhus*-group found to the east of the Bay of Bengal, in which it is golden-red; and the *Aygula*-group, also found to the east of the Bay of Bengal, in which it is typically of the "cruciger"-type, white with a black cross-mark on the back, the group-names being taken from the oldest or most familiar specific names in each section.

But in 1934, in an attempted revision of the species of the *Pyrrhus-* and *Aygula*-groups found to the east of British Indian territory, I took for these groups the generic names *Trachypithecus* and *Presbytis*. The Indian and Ceylonese species I left as in my earlier paper, with the remark that, if *Pithecus* be upheld, *Semnopithecus* Desm. (*entellus*) and *Kasi* Reichenbach (*johnii*) would be synonyms of it. *Pithecus*, however, was condemned; and Hill in 1934 showed that my association of *johnii* and its Ceylonese allies with the typical Indian Langurs on the evidence of the colour of the young was wrong. It is true they are black in *johnii* and in the races of *entellus*, in which they have been recorded, the only ones known to me, but not in the Ceylon species, to which *johnii* is very closely akin. Hill therefore in 1936, accepting the burial of *Pithecus*, divided my unnatural *Entellus*-group into two genera, *Semnopithecus* and *Kasi*, which are respectively precisely equivalent to the two species, *entellus* and *senex*, which I adopted in 1928.

The four genera mentioned above occur within the British Indian area; but their distinguishing characters are not very convincing, and in some respects are average rather than absolute, owing to deviations from the typical form which may crop up.

The characters given in the analytical key and in the definitions which follow are taken from the British Indian species.

Key to the Genera based on British Indian Species.

a. Newly-born young never exhibiting "cruciger" pattern; no conspicuous white band on inside of thigh and continued as streak down leg; skull with nasal profile straight or concave, and brow-ridges usually more or less prominent above interorbital septum, at least in adult ♂.

b. Hairs of croup not appreciably shorter than of area of back in front.

c. Newly-born young black, where known; head always with hair radiating from frontal whorl and with long bristly eyebrows; coat coarser; skull, at least in adult ♂, with very prominent brows. (India and Ceylon.) . . .. .. [Desm., p. 88. SEMNOPITHECUS

c'. Newly-born young typically golden-red, never black; hair of crown smooth or shaggy (a frontal whorl only in one race), and eyebrows less well developed; coat finer; skull with weaker brow-ridges. (E. of Brahmaputra.) .. .. .. [Reichenb., p. 120. TRACHYPITHECUS

b'. Hairs of croup noticeably shorter than of area of back in front; newly-born young typically grey with white cheeks, black only in one species; other characters as in *Trachypithecus*. (S. India and Ceylon.) [p. 146. KASI Reichenb.,

a'. Newly-born young of "cruciger"-type, white with cross-shaped blackish pattern on back; a conspicuous broad white stripe on inside of thigh and continued as streak down leg below knee; skull with convex nasal profile and brow-ridges obsolete mesially above interorbital septum. (Tenasserim.) [scholtz, p. 158. PRESBYTIS Esch-

Genus **SEMNOPITHECUS** Desmarest.

Semnopithecus, Desmarest, Mamm. ii, p. 533, 1822 (latinized form of Semnopithèque, F. Cuvier, Hist. Nat. Mamm. iii, pt. 30, 1821, which has often been cited as the source and date of the scientific name); F. Cuvier, Dents Mamm. p. 247, 1825; and of many later authors, including Anderson and Blanford (in part); Pocock, Proc. Zool. Soc. 1934, p. 895, and Hill, Ceyl. J. Sci. (B) xx, p. 117, etc., 1936 (*sensu stricto*).

Type of the genus, *entellus* Dufresne.

Distribution.—Practically the whole of INDIA, except the western deserts, from the Himalayas southwards, and CEYLON.

Newly-born young, where known, black throughout. Adult always with the hair behind the brow radiating from a frontal whorl and the eyebrows well developed; hair on the crown sometimes rising into a crest or tuft; on the sacral area (croup) not shorter than on the mid-back; individual hairs of the back comparatively thick, with coarse surface imbrication and somewhat scanty pigmentation in the medulla and cortex (Hill). Male and female alike in colour of the pubic region. Clitoris sometimes elongated and pendulous, with its tip projecting below the labia of the vulva*. End of the penis with median notch on the corona and tumid margins to the orifice. The skull is powerfully developed, especially in the adult ♂, the brow-ridges being prominent and the area behind them forming a wide depressed platform.

In the days gone by, before the admission of "subspecies," the Langurs of this genus, only known from the geographically isolated and extreme modifications of the type, were of course assigned to several distinct species, notably by Blyth and, following him, by Blanford, who accepted four, namely, *schistaceus* from the Himalayas, *entellus* from the northern plains, *hypoleucos* from the Malabar coast, and *priamus* from the Coromandel coast and Ceylon. But Blanford's acquaintance with Himalayan Langurs was apparently almost limited to a few Nepalese skins procured by Hodgson, which are not typical *schistaceus* of that author, and his knowledge of the Langurs of Peninsular India was apparently equally imperfect owing to want of specimens.

* According to Hill this condition of the clitoris indicates recent parturition. That was not the case in the specimen in which I recorded it (Proc. Zool. Soc. 1926, p. 1554). She was imported alive from India and exhibited in the London Zoological Gardens, and had not bred for some time.

The Mammal Survey of British India, however, obtained a large number of skins and skulls from many localities in India and Ceylon, providing far more material than was available to Blanford and his predecessors. The examination of this material in 1928 revealed the existence of a number of previously undescribed kinds and confirmed the distinctness of those described by Blyth, but convinced me that the best way of dealing with them was to regard them as subspecies of a single species because they are definable by characters which actually or inferentially intergrade, the differences being mainly differences in size, in the length of the tail, in the length and fulness of the coat, and modifications of the same style of coloration, all of which fall within the limits of subspecific variation, whether the distribution be continuous or not.

That some of the differences in colour are associated with wetter or drier environment is illustrated by the various forms that inhabit Peninsular India. Typical *entellus*, occurring in the plains of Northern India, south and south-west of the Ganges, is mainly characterized by the strong contrast between its black hands and feet and the rest of the limbs, which is pale. When this monkey is traced southwards on the eastern and western sides of Peninsular India it gradually changes. In parts of the Deccan and towards the Coromandel coast, and as far south at least as Kurnool and the Nallamalai Hills, it is represented by a race, *anchises*, in which the black of the hands and feet is to a considerable extent replaced by white. Farther south in the hills near Salem occurs a race, *priam*, in which the hands and feet are wholly whitish, matching the arms and legs, and the pelage is generally paler. But in this kind another feature sets in, namely, the uplifting of the hair on the crown behind the frontal whorl to form a tuft or longitudinal crest. This is not invariably present, at least in made-up skins, and its systematic value is doubtful. Two races with similar crests, but darker in general hue, especially on the limbs, occur farther to the west in S. India, namely, *elissa* in S.E. Coorg, which has black hands and feet, and a form in Travancore closely related to the Ceylonese race *thersites*. There is also a form in Cochin, *priamellus*, known from a single specimen, which, although tuftless, seems to be akin to those with that ornament. These three tufted Langurs from Salem, S.E. Coorg, and Travancore show that in the drier eastern zone the colour is paler than in the wetter western zone.

A similar general darkening of hue is revealed when *entellus* is traced from the plains of the north southward into the wetter zone of the Western Ghats. The most northern of these darker forms, *achates*, found in Bellary, Dharwar, and Kanara, intergrades with *entellus*, but is on the average darker, especially

on the arms and legs, and has a blackish tinge between the eye and ear. A little farther south on the Kanara–Mysore boundary is another form, *iulus*, which has still darker arms and legs. Farther south, in S. Coorg, is the darkest form of all, *æneas*, darker even than *hypoleucos*, alleged to have come from Travancore, which is nearly intermediate between *æneas* and *iulus*.

Proof of the intergradation of all these forms is not yet forthcoming, there is much yet to be learnt about them, and future collecting may increase or diminish the number of local races.

The distribution of the Himalayan forms is discontinuous from that of *entellus*, which is apparently not indigenous north of the Ganges and Chambal River. Nevertheless the differences between the former and Peninsular Indian forms are practically only definable as average differences, justifying Anderson's view that "*schistaceus*" is only a "variety" of *entellus*; and Blanford himself thought typical *schistaceus* from the Nepal Tarai must be the same as *entellus*. But neither of these authors was personally acquainted with the Langur of Kangra and Chamba, *ajax*, which has black hands like *entellus*, and it is possible that in the past the distribution of these two forms was continuous west of the Jumna.

In this volume I have adhered to my original treatment of these Langurs as subspecies of *entellus*; but Hill (Proc. Zool. Soc. 1937, pp. 209–11, and Ceyl. J Sci. (B), xx, p. 213, 1937) has recently reverted to Blanford's opinion that *schistaceus*, *entellus*, *hypoleucos*, and *priam* represent distinct species, each probably represented by several subspecies, a conclusion derived, partly at all events, from embryological differences observed between *priam* and *entellus*. There will be time to consider the systematic value of this evidence and its possible application to the problem when it has been tested in several specimens of each of the different kinds of Indian Langurs. The matter, however, is of no great moment, since authors seldom agree about "species" and "subspecies"; and some I have no doubt would give full specific status to all or most of the forms to which I have accorded the lower rank. There is also the seeming paradox to be borne in mind that two forms may intergrade and interbreed in one district, where they are "subspecies," and keep apart in another, where they are "species."

Owing to the intergradation between most of the races of this Leaf-Monkey and to some individual variation within the limits of each, the construction of a satisfactory analytical key for their ready determination is not an easy matter. In the following key an attempt has been made to enumerate the principal features upon which they have been separated.

But of two of the races described nearly a century ago, namely, *hypoleucos* and *dussumieri*, I have been unable to examine specimens and have been compelled to judge their characters from what the authors said. I have been unable to match any of the skins at my disposal with either of them, as described, but both were based upon a single individual.

Key to the described forms of Semnopithecus.

a. Whiskers long and thick, mostly or completely hiding the ears; head and whiskers uniformly whitish or pale buff and contrasted with the tint of the back.
  b. Arms below the elbows black and strongly contrasted with the paler hue of the body; coat long, shaggy and mane-like . . *ajax* (Poc.), p. 96.
  b'. Arms and hands not black and not sharply contrasted with the dark hue of the body; coat shorter, not shaggy and mane-like.
    c. General colour dark earthy brown; coat thick and woolly. . *achilles* (Poc.), p. 95.
    c'. General colour paler, slaty or greyish-buff; coat shorter and less woolly . *schistaceus* Hodgs., [p. 92.
a'. Whiskers shorter, not or only partly covering ears; head and whiskers variable, but never so white and strongly contrasted with the body as in section *a*.
  d. Hands and feet black; generally contrasted with arms and legs.
    e. Crown of head at most a little paler than nape and shoulders; hands and feet black or brown and typically strongly contrasted with arms and legs . . *entellus* (Dufr.), p. 98.
    e'. Crown of head clearly defined from shoulders and back by its paler tint.
      f. No tuft on crown; upper portion of whiskers typically clouded with blackish.
        g. Paler; crown of head uniformly buffish in tint; tail and outside and inside of legs below knees not black.
          h. Arms below elbows not black, contrasted with black hands . *achates* (Poc.), p. 103.
          h'. Arms below elbows black, blending with hands. [p. 107.
            i. Paler; cheeks pale like crown. *dussumieri* Geoffr.,
            i'. Darker; cheeks infuscate above. *iulus* (Poc.), p. 104.
        g'. Darker; crown suffused with dusky hairs; tail and leg below the knee black.
          j. Inner side of thigh clothed with white hairs; apparently smaller and not so dark above and below . *hypoleucos* Blyth, [p. 108.
          j' Inner side of thigh mostly clothed with black hairs; apparently larger and darker above and below. *æneas* (Poc.), p. 106.

f'. A tuft on the crown; upper portion of whiskers pale like the crown ... *elissa* (Poc.), p. 113.
d'. Hands and feet not black, either white mottled with black or brown or whole coloured, but matching the arms and legs.
k. Hands and feet white mottled with dark patches . . . . [p. 101. *anchises* (Blyth),
k'. Hands and feet not mottled, the feet at least typically whitish, and the hands darker, but both matching respectively the legs and arms.
l. Cheeks, crown of head, and nape practically the same pale tint, and much paler than the back; no tuft on crown .. . . . [p. 112. *priamellus* (Poc.),
l'. Cheeks lighter than crown, which is tufted and usually nearly the same tint as the back.
m. General hue paler .. *priam* Blyth, p. 109.
m'. General hue on the average darker; smaller [p. 115. *thersites* (Blyth),

If in this key the presence and absence of the head-tuft, to which Blanford attached importance, had been taken as an alternative character to the black feet under the headings *d* and *d'*, *elissa* would have been transferred to *d'* and distinguished from *priam* and *thersites* by the pronounced contrast between its black hands and feet and pale arms and legs, and *anchises* and *priamellus* would have come under *d* and be distinguished from the rest under that heading, the former by its mottled hands and feet, the latter by its white feet.

11 *a*. **Semnopithecus entellus schistaceus** Hodgson.

Semnopithecus schistaceus and *nipalensis*, Hodgson, Journ. As. Soc. Beng. ix, pt. 2, p. 1212, 1840 (not *schistaceus* Blanf.).
Pithecus schistaceus, Hinton & Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 404, 1923.
Pithecus entellus schistaceus and *hector*, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, pp. 477 and 481, 1928.

Vernacular.—Langur (Mallaha); *Derdca* (Pahari); *Gooni* (Hindi in Kumaun).

Locality of *type* of *schistaceus*, the Nepal Terai; of *hector*, Sitabani, Ramnagar in Kumaon, 2,000 ft.

Distribution.—The Nepal Terai, OUDH, KUMAUN and GARHWAL in the drainage of the Ganges and its northern tributaries.

"Dark slate-grey above with the hands and feet somewhat darkened; the head and underside pale yellow; the coat more or less wavy."

This epitome of Hodgson's description does not apply exactly to any of the skins, here assigned to *schistaceus*,

available for examination. The only example from the Nepalese area is a subadult ♀ collected at Hazaria Pathergatti, 300 ft. It evidently differs from Hodgson's type in its paler colour, being uniformly pale greyish buffy-brown, not dark slaty-grey, above and on the outside of the arms, with the legs and tail a little paler, the general effect being concolorous, except for the creamy-white head and nape; the chest is yellowish. The winter coat, 15 February, in accordance with the low altitude, is comparatively short, with the hairs subequal and about 50 mm. (2 in.) on the shoulder.

The examples I described as *hector* from Kumaun may, I now think, be assigned to this race, as Hinton and Fry supposed. They tolerably closely resemble the skin from

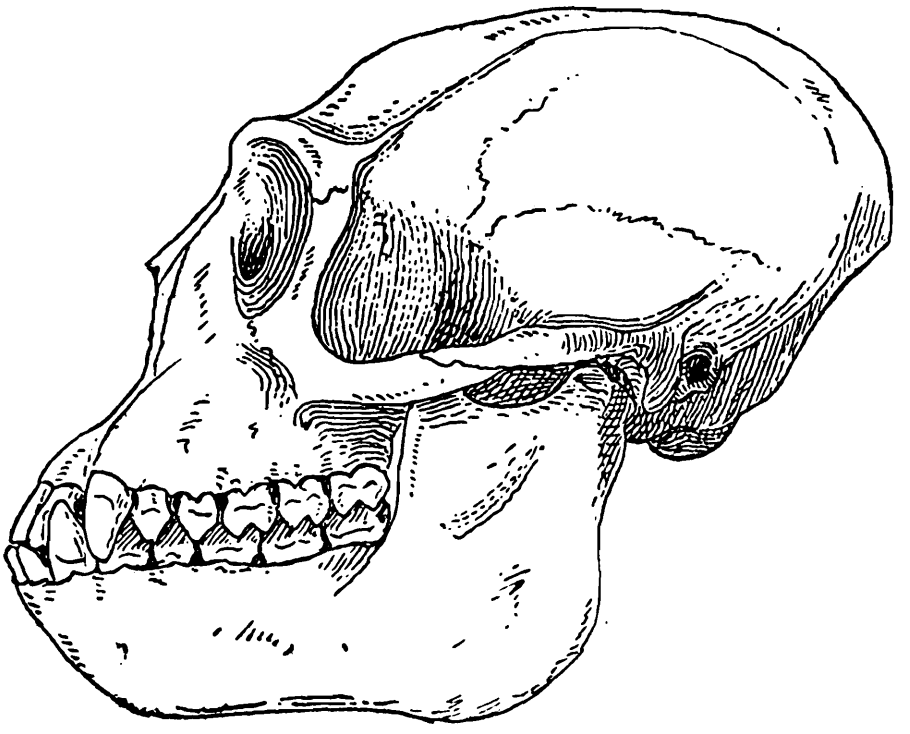


Fig. 23.—Skull of subadult ♀ of *Semnopithecus entellus schistaceus* from Hazaria Pathergatti in the Nepal Terai. × ⅔.

Hazaria in colour, the general hue of the upper side being slaty-grey tinged with buff or pale brown, with the arms slightly darker, more fuscous-grey than the back. But the coat in November, January, and February is longer than in the Hazaria skin, being from about 65 to 80 mm. (3 in.) in length on the shoulder.

The flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.
Nepal Terai (Hodgson's type); ad. ♂?.	30	36	8½
Nepal, Hazaria Pathergatti; subad. ♀	23	36	7½
Kumaun, Almora (*hector*); ad. ♂.	27½	39	9
Kumaun, Ramnagar (*hector*); ad. ♂.	26	37	8½
Kumaun, Ramnagar (*hector*); ad. ♀	24	33½	7½

The weight of the ♂ from Ramnagar was 38 lb., of the ♀ 39 lb.

The skulls of the Kumaun specimens assigned originally to *hector* have the nose projecting, the plane of the nasals being sloped at an angle of approximately 45°, a very familiar but not invariable feature in the other Himalayan races. But in the skull from Hazaria Pathergatti, which from its locality I regard as typical *schistaceus*, the nose is not nearly so prominent, having more of a concave dip at the base of the nasals.

Of the specimens I have seen and assigned to this race the only one that came from the Nepal Terai, the type-locality

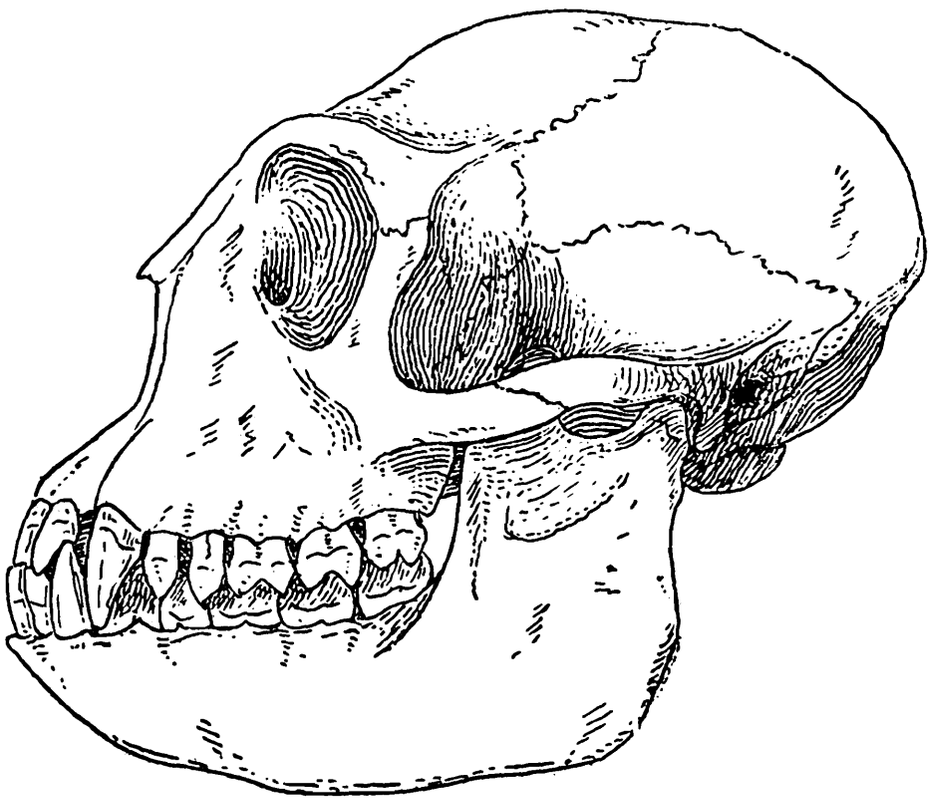


Fig. 24.—Skull of adult ♀ of *Semnopithecus entellus schistaceus* from Naini Tal, one of the specimens originally assigned to *hector*. This skull differs considerably in shape from the skull from Hazaria Pathergatti, but the differences are probably individual, not racial. × ⅔.

of *schistaceus*, is the subadult ♀ from Hazaria Pathergatti. This is approximately full-sized, yet neither in its flesh- nor skull-measurements does it exceed large ♀ specimens of *entellus* and *priam* from Peninsular India. Blanford, indeed, thought the Langurs from the foothills of the Himalayas would prove to be *entellus*, not *schistaceus*. But not realizing that Hodgson described *schistaceus* from the Nepal Tarai, he applied that name to the larger, darker form, *achilles*, of the highlands of Nepal. So far as size is concerned *schistaceus* is intermediate between the highland Himalayan races and those of Peninsular India. Evidence of the existence of this

race in Oudh and Garhwal is supplied by an adult ♂ skull from Bahraich in the former province and of three adult ♂ skulls from Garhwal (B. B. Osmaston), all received without skins. The condylobasal length of the first is 112 mm., and its average in the others is 111⅓. These dimensions are practically the same as in the skull of an adult ♂ from Almora in Kumaun, entered in the table (p. 117), one of the specimens I described as *hector*. These skulls are only 6 mm., about a quarter of an inch, longer in that dimension than the largest skull of typical *entellus* from Hazaribagh.

Habits.—In Kumaun, according to Crump, this Langur ranges from 1,100 ft. at Ramnagar to about 7,650 ft. at Khati, but may extend up to about 9,000 ft. Apparently it seasonally migrates from higher to lower levels and *vice versa*. It is not, for example, found at Lohaghat, 5,600 ft., in February, but arrives later, in warmer weather. It is common in all the heavy forests, sometimes associating during the day with the Rhesus Macaque (*Macaca mulatta villosa* True), although the two species separate in the evening before settling down for the night. Baptista found it fairly plentiful in Hazaria near the Soonson River, where it was not very shy. The call is "hoop! hoop!" generally uttered as a warning cry by one of the troop.

Regarding the breeding habits the evidence is conflicting. Blanford quoted a MS. remark by Hodgson that in *schistaceus* pairing takes place in February and young are born in April and May, the period of gestation being only two months. This is clearly an erroneous inference. Young born in April and May must be the product of pairing some time in the latter half of the previous year. McCann, on the contrary, found that females in the Terai were pregnant, or with newly-born young, in February. It is not improbable that Hodgson's statement referred to *achilles*, which occurs at high altitudes in Nepal and Sikkim, since his specimens, originally named *schistaceus* in the British Museum, belong to that race. If there is a definite breeding season, as McCann thinks, it is likely enough that the young would be born earlier in the warmer Terai than in the colder mountains of Nepal.

11 *b*. **Semnopithecus entellus achilles** (Pocock).

Semnopithecus schistaceus, Blanford, Mamm. Brit. Ind. p. 30, 1888 (not of Hodgson).

Pithecus entellus achilles, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 478, pl. ii, fig. 2, 1928.

Vernacular.—*Sahu Kaboo* (Lepcha); *Propyaka* (Bhotia).

Locality of the *type*, Sathar Hill, Gorkha, 12,000 ft., 50 miles north-west of Katmandu.

Distribution.—SIKKIM and NEPAL at high altitudes; ? KASHMIR.

Distinguished from *schistaceus* by the nearly uniform chocolate or dusky sepia-brown colour of the body, tail and outside of the limbs sometimes with a paler brown or buffy sheen, a pale tail-tip and patches of black on the hands and feet; nape, whiskers, and crown, except for the black hairs on the brow, cream or dirty white and sharply contrasted with the shoulders; lower side and inside of limbs whitish or tinged with buff. Coat full and moderately long, the hairs subequal in length, on the shoulder from 50 mm. in ♀ (December 19th) to 90 mm. in ♂ (January 18th) (type).

Flesh-measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Foot.
Nepal, Gorkha (type); ad. ♂	30	36½	8⅘
Sikkim, Chuntang; ad. ♀	26⅕	33	8
Sikkim, Chuntang; ad. ♀	24	30¼	8

An adult ♀ from Lachen, Sikkim, weighed 35 lb. The skull of *achilles* is a little larger than that of *schistaceus*, exceeding it in condylobasal length by about the same amount as the skull of *schistaceus* exceeds that of *entellus*.

The recorded altitudes for this race are: Chuntang in Sikkim, 5,350 ft.; Lachen, Sikkim, 8,800 ft.; and Gorkha, Nepal, 12,000 ft.

Habits.—In Sikkim Crump recorded this Langur as fairly plentiful in the Lachen Valley from about 5,000 to 10,000 ft. Apparently it does not descend below Chuntang. He found it always shy and wary and confined entirely to the heavy forests, where it goes about in troops composed of a small number of individuals. It is a very silent animal, even when fired at, and he never heard its call-note.

11 *c.* **Semnopithecus entellus ajax** (Pocock).

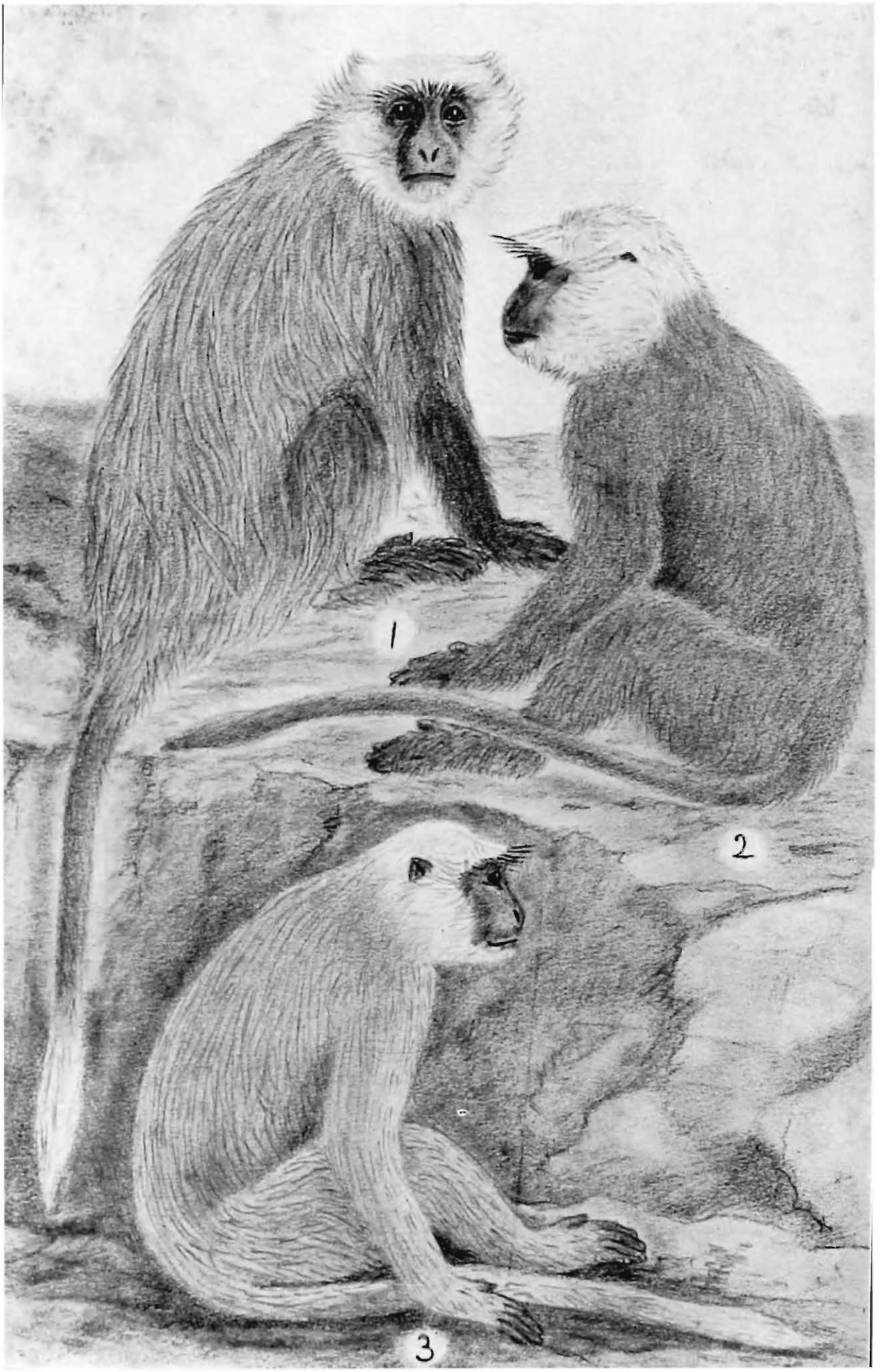
Pithecus entellus, Lindsay, Journ. Bomb. Nat. Hist. Soc. xxxi, p. 599, 1926.

Pithecus entellus ajax, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 480, pl. ii, fig. 1, 1928.

Locality of the *type*, Deolah in Chamba, 6,000 ft.

Distribution.—CHAMBA, KANGRA, and KULU, at high altitudes, districts drained by tributaries of the Indus. ? KASHMIR.

Distinguished from *achilles* by its much longer, shaggier winter coat and colour. General colour above greyish-brown, greyer and paler than in *achilles*, with the pale hue of the crown less sharply defined as a rule by the greyish tinge on the nape blending with that of the shoulders; also in adults the arms below the elbows and the hands are black or blackish-brown,



1 The Kangra Langur (*Semnopithecus entellus ajax*).
2. The Nepal Langur (*Semnopithecus entellus achilles*).
3. The Tarai Langur (*Semnopithecus entellus schistaceus*).

and darker than the legs, which are paler greyish-brown, with some sooty-grey on the thigh and knee, the feet a little darker than the shin, bordered with white, and with white hairs on the toes ; the tail like the back, but with the terminal three or four inches white ; underside and inside of limbs white. The coat is loose and shaggy owing to the inequality in the length of its hairs, which form a kind of mane over the shoulders, upper arms, and flanks, especially in the ♂, where the longest hairs may be from 150 mm. (6 in.) to about 240 mm. (about 9½ in in the type) ; whereas in the ♀ they are from about 100 mm. (4 in.) to 145 mm. (nearly 6 in.).

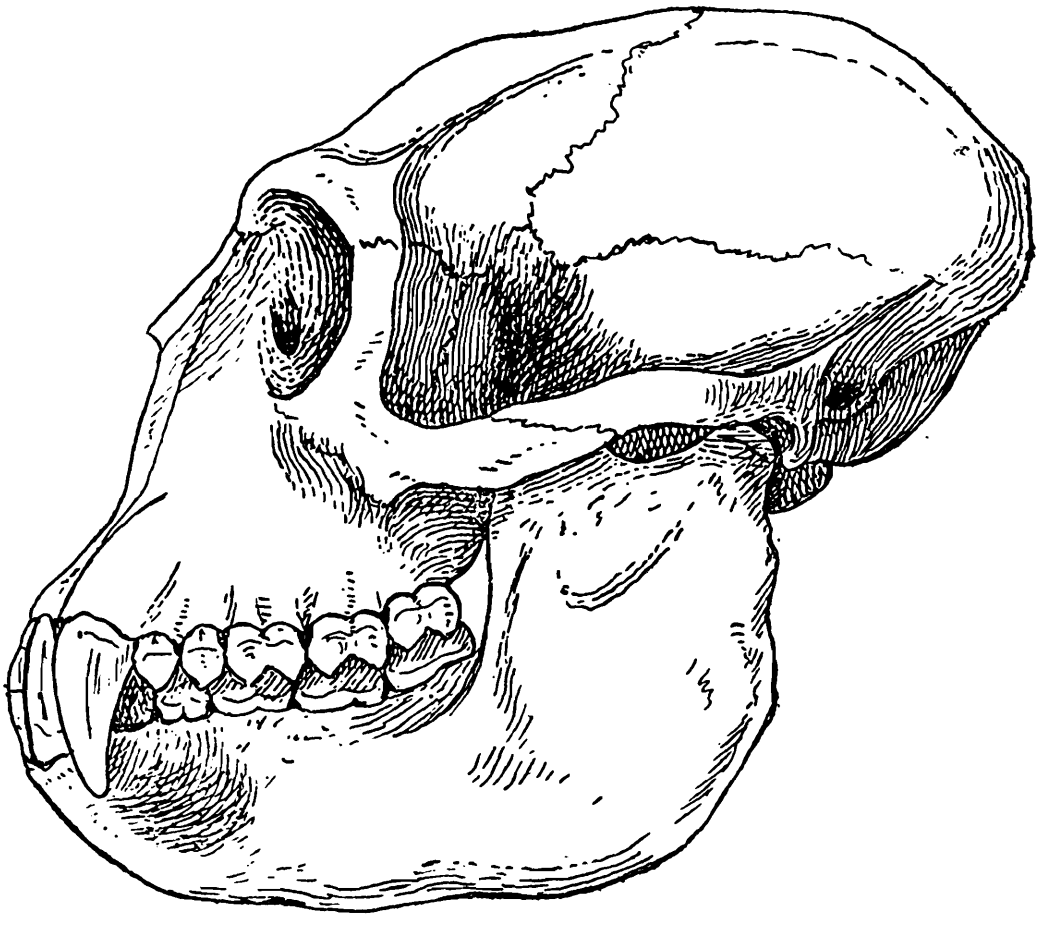


Fig. 25.—Skull of adult ♂ of *Semnopithecus entellus ajax* from Chamba. × ⅔.

Flesh-measurements (in English inches) about the same as in *achilles* :—

Locality and sex.	Head and body.	Tail.	Foot.
Kangra Fort ; ad. ♂	31	34½	8½
Chamba (type) ; ad. ♂	30	38	9
Chamba ; ad. ♂	30	32	8
Kangra ; ad. ♀	27	28½	8½
Kangra ; ad. ♀ ;	23	34	8½

The weight of the ♂ from Kangra was 46 lb., of a ♂ from Chamba 43 lb., and of the larger ♀ from Kangra 28 lb.

The skull is about the same as in *achilles*.

The recorded localities and altitudes of this race are as follows :—Chamba, from 6,000 to 7,500 ft. ; Kangra, 2,450 to 9,500 ft. ; Kulu, 9,800 ft. The specimens from Chamba and Kangra were collected in December, January, March, and April, those from Kulu in June, and the last were still carrying their winter coats.

Habits.—The Langurs seen by Hutton at Simla amongst the fir-trees laden with snow were probably representatives of *ajax*. At Kangra Wells made the interesting observation that the troops of this Langur consisted of a single adult ♂, a number of females with young, and also young males. McCann later reported the same habit in typical *entellus* during the breeding season (see below). Wells was greatly impressed by the muscular development of the largest ♂, its biceps being quite as large as an ordinary man's.

11 *d.* **Semnopithecus entellus entellus** (Dufresne).

Simia entellus, Dufresne, Bull. Soc. Phil. Paris, i, p. 49, 1797 ; and of most subsequent authors, at least in part.
Pithecus entellus entellus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 477, pl. ii, fig. 3, 1928.

Vernacular.—Langúr and *Hanùmân* (Hindi) ; *Vandra* (Kathiawar).

Locality of *type*, Bengal.

Distribution.—Northern Peninsular India, south of the Ganges from Bengal to Kathiawar.

Distinguished from the races, above described, occurring north of the Ganges and in the western Himalayas by its smaller size, thinner, typically shorter coat, the whisker-hairs concealing the ears to a much less extent, by the darker, less contrasted tint of the head, and by the sharp contrast between the black hands and feet and the rest of the arms and legs.

Colour of the upper side usually tolerably uniform, darker or lighter shining sepia-brown, rather paler on the shoulders and head ; the crown sometimes noticeably paler than the shoulders, but blending through the intermediate tint of the nape ; limbs, apart from the hands and feet, and the tail nearly the same as the back, but the tail-tip often pale, and the leg below the knee often paler than the thigh.

Flesh-measurements (in English inches) of some specimens :—

Locality and sex.	Head and body.	Tail.	Foot.
Hazaribagh, Bengal ; ad. ♂	25½	42½	8¼
Junagadh, Kathiawar ; ad. ♂	23	37½	7½
Midnapore, Bengal ; ad. ♀ . . .	22½	38	7
Palanpur, Gujerat ; ad. ♀. .	21½	35	7½

A ♂ and ♀ from Midnapore weighed respectively 35 and 25 lb.

The range in altitude is approximately from 200 ft. in Midnapore and Palanpur to 1,000 ft. in Hazaribagh.

The skull of *entellus* is smaller on the average than that of *schistaceus*; it is on the whole less prognathous and has the plane of the nasals more vertical, the nose not projecting to the same extent, so that the facial profile is differently shaped. But there is a skull of *entellus* from Midnapore with the nose projecting in the way characteristic of the northern races, and in one or two skulls of the latter the nose is approximately as vertical as in the majority of *entellus* skulls.

Habits.—The habits of this race are better known than those of any other. Blanford described them at great length, and

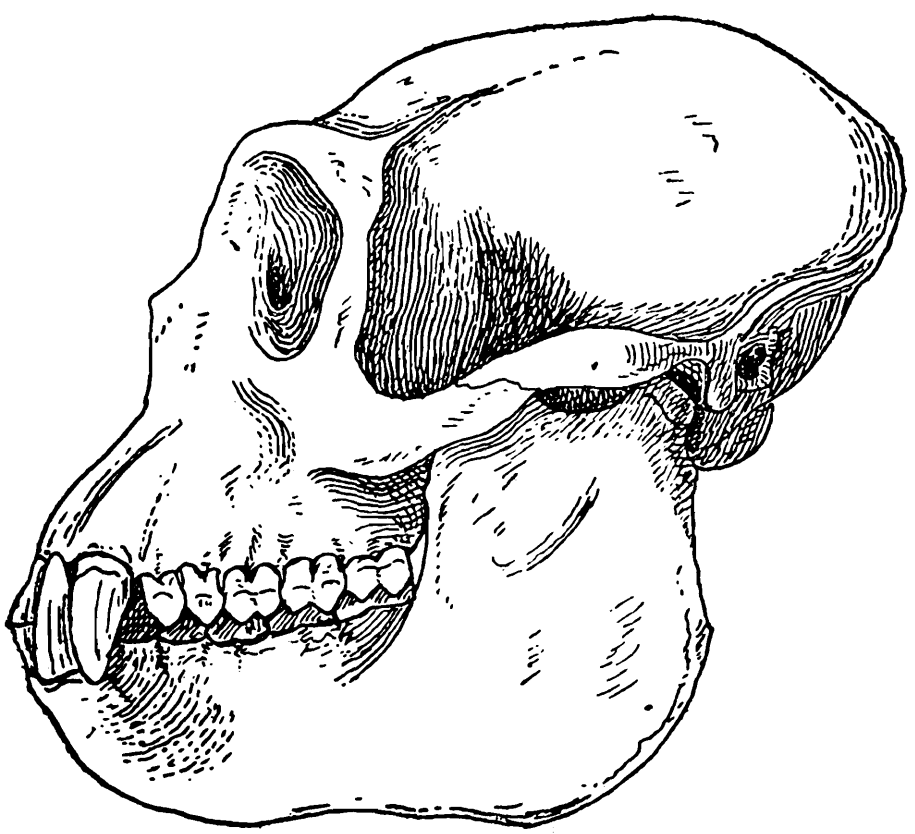


Fig. 26.—Skull of adult ♂ of *Semnopithecus entellus entellus* from Hazaribagh. × ⅔.

some interesting information, corroborating, extending, and in a few particulars emending his account, have recently been supplied by McCann (Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 622, 1934). Probably all the more southern races, enumerated below, on which few observations have been made, resemble *entellus* in all essentials connected with mode of life.

By many Hindus they are regarded as sacred, and by being unmolested they have no fear of man, and frequently invade villages and houses and make themselves a great nuisance by pilfering food and pillaging fruit-gardens and fields of crops. Away from the villages they mostly frequent high trees and rocky hills, never far from water. They are exceedingly active, and can leap from one tree to another

20 or 30 ft. away, with a drop of perhaps 40 or 50 ft. in descent. They bound from rock to rock with similar ease, and run on all fours with a succession of long leaps, covering the ground with considerable speed. They go about in troops composed of females and young of both sexes under the leadership and guardianship of a single large male. According to McCann, who has studied their daily life, the troop sets off in the early morning and spends the forenoon feeding and sitting about, their food consisting of leaves, buds, flowers, shoots, and a great variety of fruits. Towards mid-day they usually return to their resting place and sit about on branches and rocks, dozing or sleeping for a couple of hours or so. The troop then sets off again to its feeding ground, and towards evening returns homeward for the night, the male being usually the last to retire to sleep when the others have settled down after much quarrelling for places near the ends of the branches—not on the thicker boughs. Every member of the troop is at all times on the watch for danger, and if one utters a warning cry and bolts, the rest follow in the same direction without waiting to investigate the cause. Alarm or anger is expressed by a loud, harsh, guttural cry, uttered, as sportsmen well know, at the sight of a tiger or leopard, and repeated as the beast is followed through the jungle. But, as Blanford says, the cry may be provoked by the sight of a running deer.

Crump supplied the following note on this Langur in the parts of Bengal where he collected and observed them. In the small State of Chainpur they are plentiful and protected. In parts of the Hazaribagh district they appear to be remarkably scarce, only four specimens being seen. A few living on Parasnath Hill are rigidly protected. In the Santara Range, Singhbhum, they are well distributed, though not very abundant. Owing to persecution by the Jumsare tribe, who kill them for food, and by the Kols, who shoot them with arrows when threatening the crops, they have taken to the thick forests, seldom venturing into the open, and have become so shy and wary that it was impossible to get near them through the undergrowth.

To the west in Kathiawar Crump found them fairly well distributed in the Gir Forest, although he did not meet with many. In the Girna Mountains, where they are held sacred and are fed by the natives, they were reported to occur in great numbers. At Danta they were tolerably common, and some were seen at Uria ; but in and near the town of Palanpur, where the Hindoos hold them sacred, they were plentiful, and might be seen on the house-tops and verandahs. Crump also made some interesting observations on their habits at Hewra in Nimar. He saw some come down to the ground from the top of a very lofty tree by a quick succession of about

four vertical drops in an upright position, not as a rule from one thick branch to another, but amongst the foliage. When alarmed and running through long grass they move with great bounds, frequently stopping and raising themselves to their full height to take a look round. He saw one female, playing with her young one, throw it into the air and catch it by its two hands as it fell. She was no doubt instinctively giving it practice in the use of its hands for grasping branches. These Langurs from Hewra in Nimar were not typical *entellus*, having paler hands and feet. One of them that was shot is referred to below as an example provisionally assigned to *anchises*.

As evidence of what he considered to be a difference in the courage and prowess of these Langurs, Mr. Alison Minchin recently published the following accounts of the behaviour of two specimens (' Field,' Oct. 31, 1936). In Ganjam District, on the Coromandel coast, a large male, one of a big party raiding the crops, was attacked by pariah dogs and, being unable to escape, buried his face in his paws on the ground and resigned himself to his fate, without apparently making any attempt at defence. In the second instance another male was the tyrant of a little village near Attikan, robbing the huts as he pleased, and was a terror to the pariah dogs. One evening he visited a rest-shed, where a man was staying with a fine bull terrier, and was taking fruit off the table when the dog intervened. The first intimation the occupier had of the contest that ensued was the yelling of the dog, and on rushing into the room he found the Langur had seized his assailant by the fore legs and was pulling them apart. On the man's appearance the monkey released the dog and retreated to the other end of the room, but when the man picked up the dog the Langur returned furiously to the attack and made him release the dog, and the desperate fight that followed ended ultimately in the Langur being killed by the bull terrier, which, however, was badly bitten. The Langurs concerned in these two episodes were identified by the writer as "*entellus*." They were probably referable to the next race, *anchises*, or to *priam* (p. 109).

11 *e*. **Semnopithecus entellus anchises** (Blyth).

Presbytis anchises, Blyth, Journ. As. Soc. Beng. xiii, p. 470, 1844 ; and xvi, p. 733, 1847.

Pithecus entellus anchises, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 488, 1928, and xxxv, p. 53, 1931.

Locality of the *type*, " the Deccan."

Distribution.—South of the area occupied by typical *entellus* ; the CENTRAL PROVINCES, and KURNOOL in the Eastern Ghats.

Distinguished, according to Blyth, from typical *entellus* by its paler hands and feet which, instead of being all black and sharply contrasted with the areas of the arms and legs above, as in that race, are mottled, the hands being mixed white and blackish and the feet whitish with dusky black above

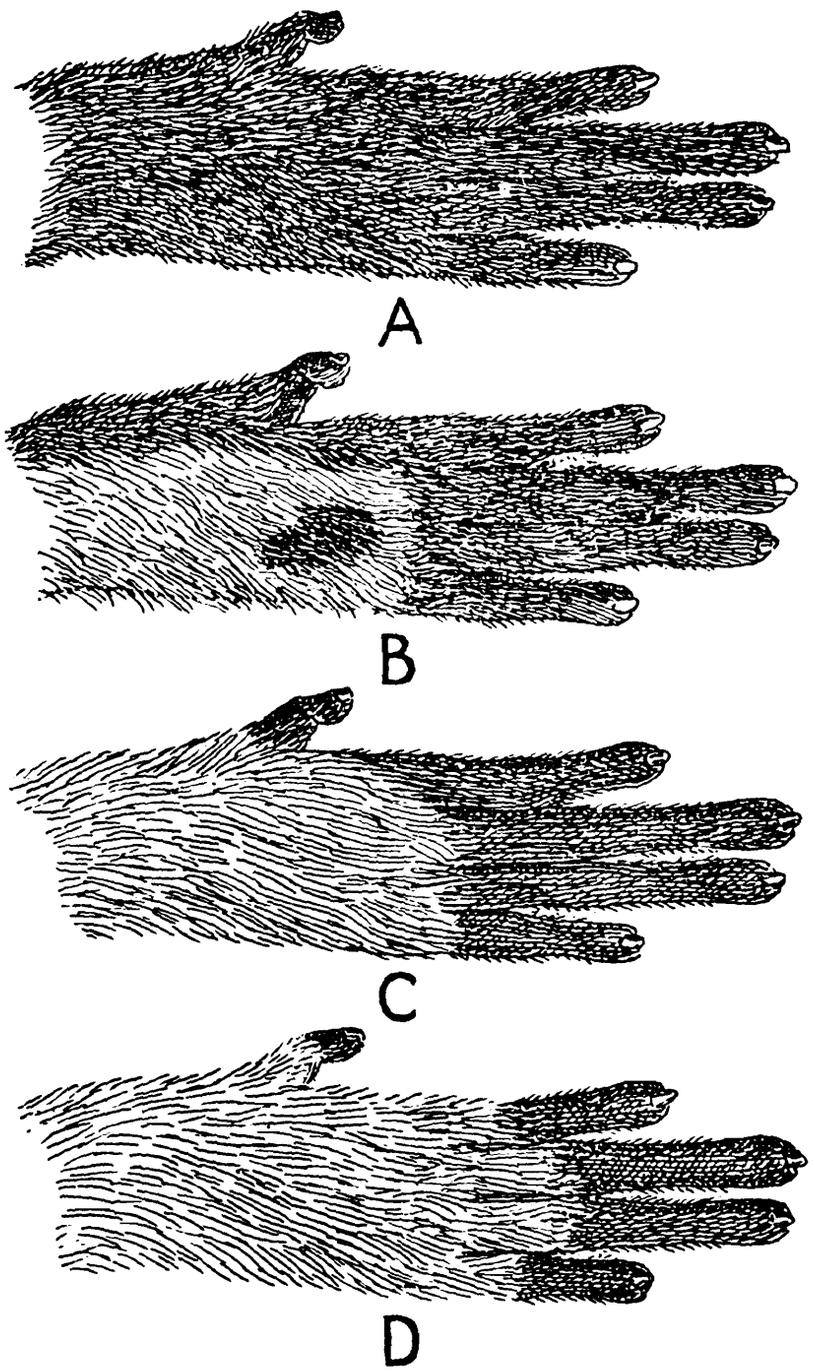


Fig. 27.—A, hand of *Semnopithecus entellus entellus* from Hazaribagh; B and C, of two specimens identified as *S. entellus anchises* from Kurnool; D, of *S. entellus priam* from Salem. The figures illustrate the gradual whitening of the hairs when the Langurs are traced from Bengal to the Eastern Ghats.

the base of the toes and on the terminal phalanges, the leg from the knee downwards being whitish, and the coat very long.

The interest of this monkey, of which Blyth had only one specimen, lies in its being intermediate in the colouring of the hands and feet between typical *entellus* and the more southern race described below as *priam*. Blanford dismissed it as questionably the same as *entellus*.

In 1928 I provisionally assigned to *anchises* some specimens collected at Hewra in Nimar, 1,000 ft. (Crump), and at Seoni-Malwa (S. H. Prater), and in 1931 specimens were received from Diguvametta and the Nallamalai Range, 2,000 ft., in the Kurnool district (A. S. Vernay's collection). These specimens are not all alike in the tint of the head and dorsal surface, one from Seoni-Malwa approaching the race described below as *achates* in the tint of the crown ; but all agree with Blyth's description in the reduction of the black on the hands and feet, although this varies in extent, and it is to be noted that the skins from Diguvametta, Kurnool, the most southern locality known for the race, have the least black on the extremities, thus coming nearer the white-handed, white-footed *priam*, which occurs in the Palkonda and Shevaroy Hills farther south in the Eastern Ghats.

The flesh-measurements (in English inches) of two examples are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.
Diguvametta, Kurnool ; old ♀	25½	39	—
Diguvametta, Kurnool ; ad. ♀	23	38	—

The weights of the two specimens were 24 and 23 lb. respectively.

In five adult ♀ skulls the condylobasal length is 85 mm. or a trifle less, about the same as in *entellus* and *priam*.

11 *f*. **Semnopithecus entellus achates** (Pocock).

Semnopithecus anchises var., Blyth, Journ. As. Soc. Beng. xiii, pp. 471, 844.

Pithecus entellus achates, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 488, 1928.

Vernacular.—Mushya, *Kari-Koti*, *Adari-Koti* (Kanarese) ; *Yerpa-Moti-Koti Karrimikka Mungyá* (Waddars) ; *Kari-Mangyá* (Haran Shikaris) ; *Wanga*, *Wanar*, *Maka* (Marathi) ; *Langur* (Dekhan) ; *Kumdamuchu* (Telegu).

Locality of the *type*, Haunsbhavi in Dharwar, 2,000 ft.

Distribution.—DHARWAR, BELLARY, and KANARA.

Distinguished from typical *entellus*, with which it intergrades, principally by its slightly darker dorsal colour, by its paler crown, which is buff or greyish-buff, and noticeably contrasted with the shoulders, although not to the same extent as in *schistaceus* and other northern races, by the blackish-grey tint of the area between the eye and the ear, and by

the darker hue of the limbs below the elbow and knee, so that the black hands and feet are not nearly so emphasized.

Flesh-measurements (in English inches), apparently slightly exceeding those of typical *entellus*, are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.
Haunsbhavi, S. Dharwar; ad. ♂..	27	43	8
Vijayanagar, Bellary; ad. ♂ . .	26½	40	8½
Samasgi, Dharwar–Kanara boundary; ad. ♂ . .	24	34	7
Vijayanagar; ad. ♀	26	35	7½
Haunsbhavi; ad. ♀	24½	33	7
Samasgi; ad. ♀	22½	31½	6½

The weights of the three ♂ specimens, in order, were 30, 35, and 22¾ lb., and of the three ♀ specimens 27, 22½, and 17 lb.

The skull is like that of *entellus*, but is on the average decidedly smaller (see tables, pp. 117–19).

The recorded ranges in altitude of this race are: Bellary, 1,500 to 1,600 ft.; Dharwar and the Kanara–Dharwar boundary, 2,000 ft.

Habits.—According to Shortridge this race is extremely plentiful in Dharwar, and is generally fearless and inquisitive, easily distinguishing between Europeans and natives and much more suspicious in the presence of the former. He confirmed the observation made in the case of other kinds of Leaf-Monkeys that, when frightened, they can crouch amongst the tops of thick trees and by drawing the branches together become completely hidden. It is equally abundant apparently throughout Kanara, where it extends to the coast. Among the hills round Vijayanagar at Bellary it was fairly plentiful and unusually large. Its habitat is varied, and Shortridge noticed that where it occurs in the open country it is much less shy and suspicious than in the forests.

Newly-born young, probably not more than a few weeks old, from Kanara, dated January 18 and 30 and March 22, suggest the same breeding habits for *achates* as for typical *entellus*; but the data are obviously insufficient to warrant the conclusion that the young are born only at that time of year approximately.

11 *g*. **Semnopithecus entellus iulus** (Pocock).

Pithecus entellus iulus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 490, 1928.

Locality of the *type*, Jog, Gersoppa Falls, on the Kanara–Mysore boundary, 1,300 ft.

Distribution.—Unknown, except from the type-locality.

Distinguished from *achates* by its closer, softer fur, smaller size, and generally darker colour, especially of the arms and legs below the elbow and knee.

General colour of the back deep brown, sharply contrasted with the head, which is buff and has, as in *achates*, a good deal of blackish hair between the eye and ear; arms in ♂ black, a little paler in ♀; legs deep greyish-brown outside; tail blackish-brown, with its terminal third whitish and strongly contrasted, as in many examples of *achates*. Underside and inside of limbs pale.

Flesh-measurements (in English inches) of the only two specimens known :—

Locality and sex.	Head and body.	Tail.	Foot.
Gersoppa Falls; ad. ♂	20½	34	6½
Gersoppa Falls; ad. ♀	20	36	6¾

The weights of the two specimens were : ♂ 21 lb., ♀ 18½ lb.

Judging from these two specimens, which, like those of *achates*, were obtained and measured by the same collector,

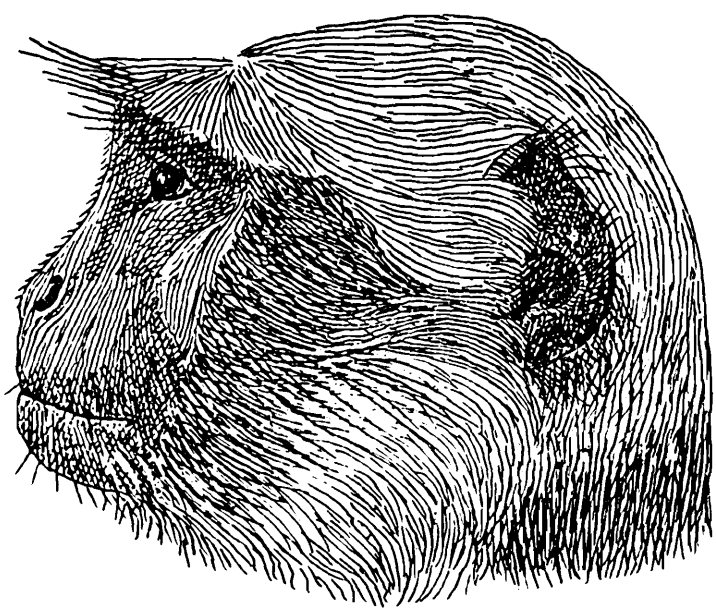


Fig. 28.—Head of *Semnopithecus entellus iulus* from the Gersoppa Falls, showing the black hair on the cheeks and the contrast in tint between the light-tinted head and the dark nape, which is like the back, two characters also exhibited by *S. entellus achates*.

G. C. Shortridge, the tail of *iulus* is as long on the average as that of *achates*, whereas the head and body and the foot are shorter. The shortness of the head and body is borne out by the smaller skull, although that of the ♀ is about the same length as the skull of the small ♀ from Samasgi. No doubt the two forms completely intergrade.

In his note on the Langurs of Kanara (*achates*) Shortridge has the following pertinent remark :—"Adults vary considerably in size and weight and also in the amount of black on the hands and arms, specimens from Jog and Gersoppa (below Ghats) being unusually dark." The detection by the

collector in the field of the characters upon which this subspecies was established supports the view that it is a distinguishable form.

11 *h*. **Semnopithecus entellus æneas** (Pocock).

Presbytis hypoleucos, Dollman, Journ. Bomb. Nat. Hist. Soc. xxii, p. 493, 1913.
Pithecus entellus æneas, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 492, 1928.

Locality of the *type*, Makut, S. Coorg, 250 ft.

Distribution.—MAKUT, 250 ft., and WOTTEKOLLE, 2,000 ft.

Distinguished from *achates* and *iulus* by its generally darker colour everywhere, noticeably on the inside of the legs.

Back dark brown; crown of head much darker than in *achates* and *iulus*, and blending with the fore back; whiskers

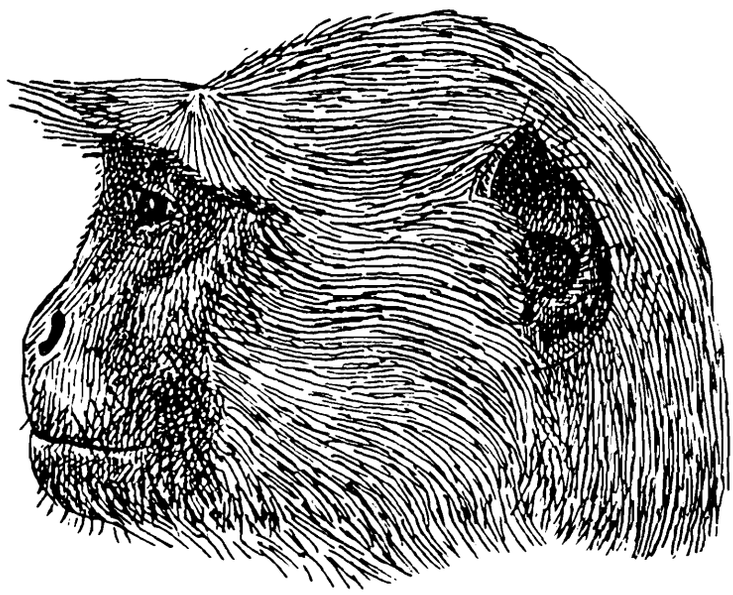


Fig. 29.—Head of *Semnopithecus entellus æneas*, from Wottekolle, S. Coorg, showing the tolerably uniform dark hue of the cheeks, crown, and nape, features in which this race differs from *achates* and *iulus*, but resembles *S. entellus entellus*, which, however, is much lighter on those areas and elsewhere.

reddish-white, blackish above; limbs dark brown close to the body, but black elsewhere externally below to the hands and feet; tail black to the tip; throat and chest reddish-white, like whiskers, but inside of arms and legs black, as are the thighs to the pubic region, where the colour is sharply contrasted with the whitish hue of the belly.

Flesh-measurements (in English inches) are about the same as in *achates*:—

Locality and sex.	Head and body.	Tail.	Foot.
Makut, S. Coorg; ad. ♂	28	37	7
Makut, S. Coorg; ad. ♀	25	36	6½

The weights of the ♂ and ♀ were respectively 25½ and 22 lb.

The measured skulls are very slightly larger than those of *iulus*. The data are insufficient to justify a definite conclusion on that point, except that they are in keeping with the superiority in the flesh-measurements.

Shortridge recorded this Langur as fairly plentiful on the slopes and at the foot of the Ghats around Wottekolle and Makut. It is replaced by *elissa* to the east of the Brahmagiri Hills, which appear to separate the two at this point. He added that he could get no information about the occurrence of Langurs in North Coorg.

11 *i*. **Semnopithecus entellus dussumieri** Geoffroy.

Semnopithecus dussumieri, I. Geoffroy, C. R. Acad. Sci. Paris, xv, p. 719, 1842 ; Arch Mus. ii, p. 538, pl. 1843.
Semnopithecus entellus dussumieri, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 491, 1928.

Locality of the *type*, Malabar coast. (Probably exported from Mahe.)

Distribution.—Unknown apart from type-locality.

Distinguished apparently from *hypoleucos*, to which it is nearly allied, by the paler colour of the back, which is greyish-brown, not " deep dusky brown " ; by the inner surface of the limbs being brown throughout, like the back, not black below the elbows and knees and white above them ; and by the terminal third of the tail being decidedly paler than the rest instead of blackish throughout.

This Langur, of which only the type, an adult ♀ with its young, has been recorded, is known to me only from the two descriptions, which disagree in one respect, and from the plate, which does not agree precisely with either. In its pale yellowish (*fauve*) nape and head, contrasted with the brownish back, it evidently resembles *achates*, *iulus*, and *hypoleucos* ; but the figure shows no trace of the dusky band between the ear and eye present in *achates* and *iulus*. It further differs from those two races in the brown hue of the inner surface of the limbs, which are like the back, darker than the yellowish under surface of the body and contrasted with it. The arms below the elbow outside and the hands and feet are black ; but the leg outside is darkish brown to the foot, the tail in its basal two-thirds is darker than the back, and its terminal third is slightly paler than the back. The race differs from *æneas* in being much paler everywhere, except on the hands and feet.

The measurements of the type, taken no doubt from the skin, converted into English inches, are : head and body 24⅘, tail 34, which, if correct, are about the same as in ♀ *achates* and *æneas* and considerably larger than in the ♂ of *hypoleucos*.

Blanford cited *dussumieri*, without question or comment, as a synonym of *hypoleucos*. But unquestionably he had not the material to justify the affiliation, and the descriptions of the types of the two enforce their separation, at all events until more is known of these Langurs of the Western Ghats.

11 *j*. **Semnopithecus entellus hypoleucos** Blyth.

Semnopithecus hypoleucos, Blyth, Journ. As. Soc. Bengal, x, p. 839, 1841 ; Anderson, Zool. Res. Yunnan, p. 20, 1878.
Pithecus entellus hypoleucos, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 492, 1928.

Locality of the *type*, Travancore.

Distribution.—TRAVANCORE, so far as at present ascertained.

A race known apparently only from the type-specimen in Calcutta, which, according to Blyth's description, resembles *æneas* in its wholly black tail and in the blackness of the arms and legs below the elbows and knees, but differs in having the inside of these limbs white above the elbows and knees and in its much paler head, which, with the whiskers, was described as " brownish-white, a little darker on the crown," and was evidently much paler than the back, said to be " deep dusky brown." In the contrast between the paler head and the darker back and in the whiteness of the upper half of the limbs inside it is similar to *achates* and *iulus*, but differs from them in its wholly black tail and in the dark hue of the lower half of the limbs inside. It is thus in many respects intermediate between *æneas* on the one hand and *achates* and *iulus* on the other, although its stated locality is remote from those of these three races.

The measurements of the type, an old ♂, taken no doubt from the dried skin, are, according to Anderson : head and body 21 in., tail 36 in., suggesting a small monkey about the size of *iulus*. This conclusion is borne out by the length of the skull, 106 mm., as also recorded by Anderson.

Kinloch identified as *hypoleucos* a Leaf-Monkey in the Nelliampathy Hills which he described as comparatively silent and occurring here and there in troops of about half a dozen on the northern cliffs, but seldom, if ever, in the evergreen forest. The Mulcers eat it, but do not consider its flesh has the medicinal value of that of John's Leaf-Monkey. But since the name *hypoleucos* has been used as a general term for the dark forms of *entellus* found in the Western Ghats, Kinloch's identification cannot be accepted without reserve.

During his recent visit to Travancore Hill failed, in spite of many inquiries, to get satisfactory evidence of the existence of such a Langur there.

11 *k*. **Semnopithecus entellus priam** Blyth.

Semnopithecus pallipes, Blyth, Ann. Mag. Nat. Hist. p. 312, 1844 (April).

Semnopithecus priam, Blyth, Journ. As. Soc. Beng. xiii, p. 470, 1844 (Oct.).

Semnopithecus priamus, Blyth, Journ. As. Soc. Beng. xvi, pp. 732 and 1271, pl. 54, 1847 (in part); Anderson, Zool. Res. Yunnan, p. 19, 1878, and Blanford,

Pithecus entellus pallipes, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 395, 1928 (in part, excluding Ceylonese specimens), and xxxv, p. 55, 1931 *.

Locality of the *type*, the Coromandel coast.

Distribution.—The DHARMAPURI, SHEVAROY, and PALKONDA HILLS. Range elsewhere not certainly ascertained, but recorded from the NILGIRI HILLS.

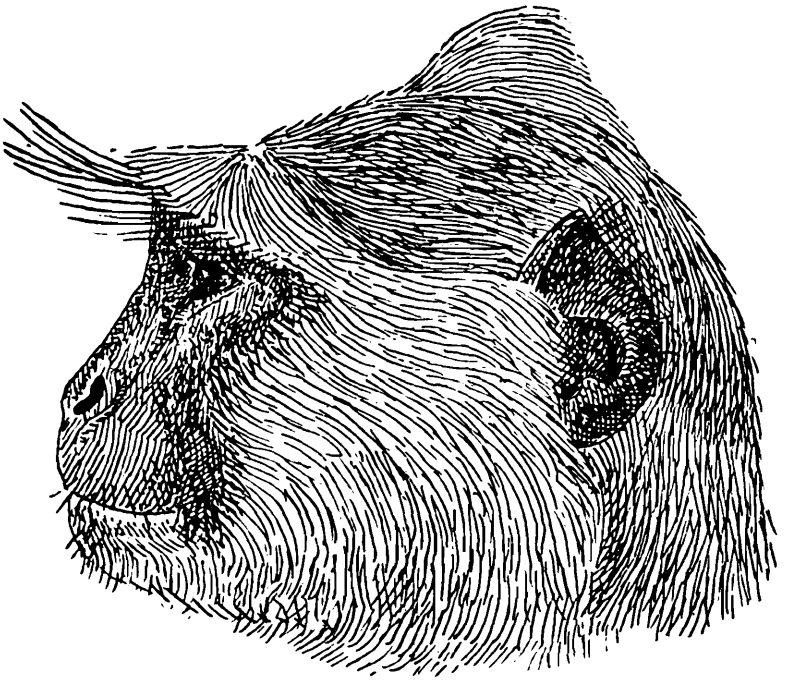


Fig. 30.—Head of *Semnopithecus entellus priam*, the Tufted Langur, with white hands and feet, from Salem, showing the contrast in tint between the crown and the brow and cheeks.

Distinguished at once from the foregoing races by the

* As shown by the synonymy, I formerly called this Langur *pallipes*, the earliest name given to it, and cited by Anderson, Forbes, and Elliot as valid, but apparently not adopted by either of them because they were unaware that it antedates *priam*. But although it is perfectly clear that *pallipes* was given to the pale-footed Entellus of Southern India, Blyth's remark about it does not, in the strict sense of the word, constitute a technical description whereon a name can be based. He merely recorded it as "the reputed Entellus Monkey of Southern India, which is quite distinct from that of Bengal, and will bear the appellation *S. pallipes*." Since the name is not sufficiently important to be established by "fiat," which would be the sensible course, and is not likely, I think, to be accepted in the future, I think it better, for the sake of stability, to adopt here the name *priam*, which will probably ultimately prevail.

presence of an upstanding tuft or longitudinal crest of hair on the crown behind the frontal whorl. This tuft may perhaps sometimes be lost in prepared skins and possibly absent at times in the living animal when moulting; but it is a normal feature of the race.

Colour darker or lighter greyish-brown on the dorsal surface and the middle of the crown, with the nape paler, greyish-tawny; arms greyer than back, the hands whiter than the fore arm; thighs like the loins and back, but the leg becomes gradually paler towards the foot, which is white; the tail

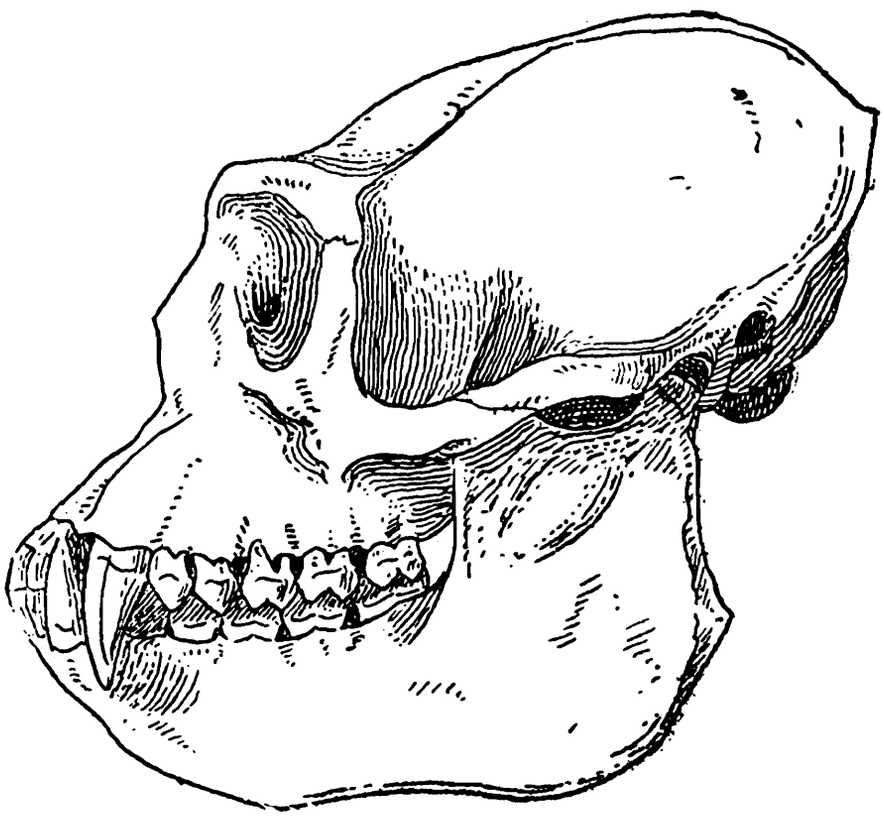


Fig. 31.—Skull of adult ♂, provisionally identified as *Semnopithecus entellus priam*, from the Nilgiri Hills (Davison). × ⅔.

usually a little darker than the back, sometimes blackish-grey, with the tip whitish; sides of the crown, whiskers, throat, and underside whitish.

Flesh-measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Foot.
Shevaroy Hills; ad. ♂..	25½	39½	8⅖
Dharmapuri Range; ad. ♂	25½	37⅖	7⅘
Dharmapuri Range; ad. ♀	25	40	7¾
Palkonda Hills; ad. ♀	23½	37½	7½

The weight of the ♂ from the Shevaroy Hills was 37 lb., of the ♀ from the Palkonda Hills 19½ lb.

Special localities and recorded ranges in altitude for this race are: Hogainakal and Murther in the Dharmapuri Range, 850 and 950 ft.; Tirtamalai in the Shevaroy Hills, 1,000 ft.;

and Dasarladoddi in the Palkonda Hills, 1,600 ft. Davison told Blanford that this monkey ascends the western slopes of the Nilgiri Hills to a height of 6,000 ft.; but since only skulls without skins are available, the identification is doubtful. One of the skulls, that of an adult ♂, taken by Thomas from a head-skin certified to have been tufted, agrees very closely in size with the skulls from the Eastern Ghats and also with the skulls of a couple of specimens from Travancore referred to below. The skull of *priam* does not differ appreciably from that of typical *entellus*.

In the British Museum there are two adult ♂ unmeasured skins, with tufted heads, from Travancore which, although differing from each other a good deal in colour, are darker

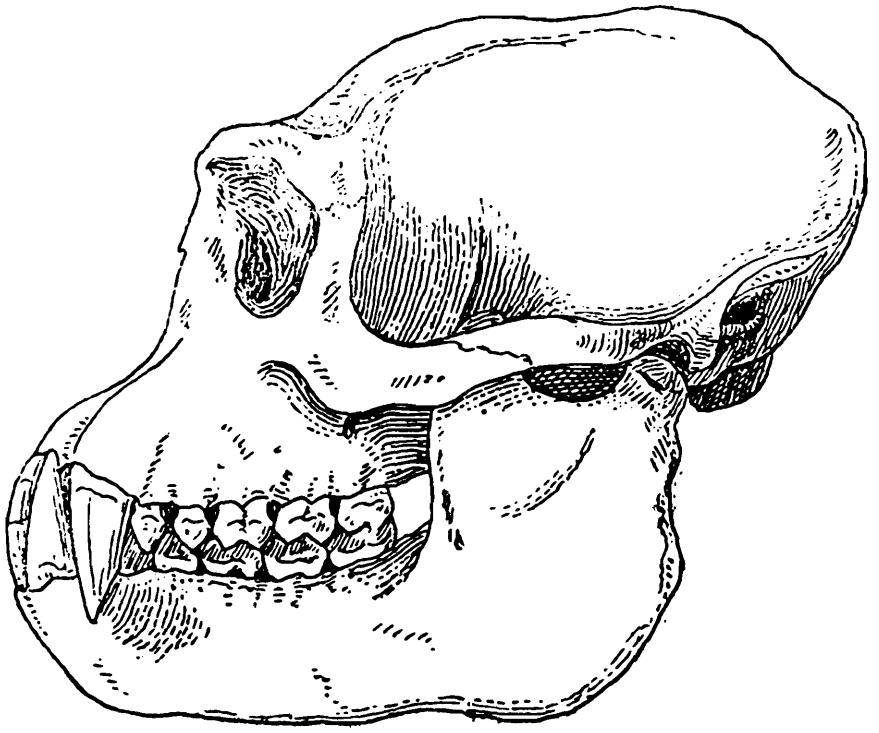


Fig. 32.—Skull of adult ♂, referred to under *Semnopithecus entellus priam*, from the Mahendragiri Range. × ⅔. (For comparison with fig. 31.)

than skins of *priam* from the Eastern Ghats. One came from S. Travancore (Col. Dawson), the other from Aramboly in the Mahendragiri Range (A. S. Pillay). I formerly tentatively identified these as *thersites* on account of their hue. But their skulls, measuring respectively 98 and 97 mm. in condylobasal length, are about the same size as those of *priam* and larger than those of *thersites* I have measured. They may represent a race intermediate between the two, but more specimens are needed. On geographical grounds Hill suggested that they might belong to the next race, *priamellus*, from Cochin; but the only known specimen of the latter, an adult ♂, has a paler head, without the tuft, and a considerably shorter skull, with a condylobasal length of 83 mm. and no crest.

11 *l.* **Semnopithecus entellus priamellus** (Pocock).

Pithecus entellus priamellus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 494, 1928.

Locality of the *type*, Cochin.

Distribution.—COCHIN. Not recorded elsewhere.

Colour of back pale sepia-brown and sharply contrasted with the creamy or slightly buffy-white nape; crown a little paler, and brow and whiskers a little yellower than nape, the general hue of the head and its marked contrast with the nape being very much as in *achates*, but there is no dusky tract between the eye and ear; tail greyish-brown, becoming gradually greyer distally, with a small white tip; arms similar to the back outside, but becoming darker distally and blending

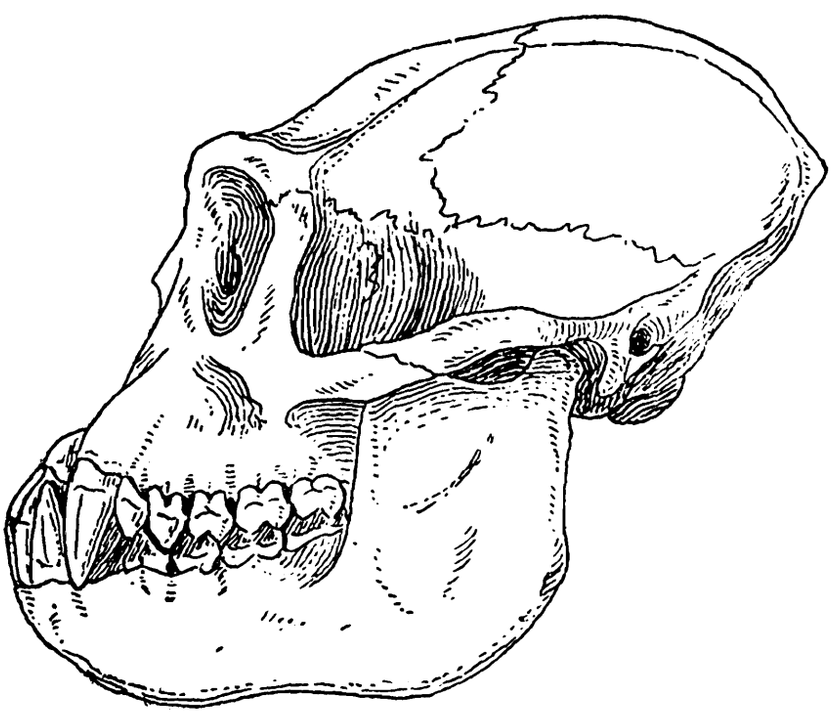


Fig. 33.—Skull of adult ♂ of *Semnopithecus entellus priamellus* from Cochin.

with the hand, which is deep brown with black fingers; legs externally paler and greyer than the arms, the feet mostly covered with dirty white hairs; lower side and inner side of the limbs all white or creamy-white.

There are no flesh-measurements of the only known specimen, an adult ♂, but the skull is small, about the same size as the ♂ skulls of *iulus* and *hypoleucos*.

Of the above-described western Indian forms of *entellus*, which have no tuft on the head, *priamellus* comes nearest to *achates* in coloration, and not to its geographically nearer allies *hypoleucos* and *æneas*; but it differs from *achates* in its pallid feet, in the hands blending with the fore arm, and in its uniformly tinted whiskers, which have no dusky band between the eye and ear. Its affinities are doubtful. In my analytical table of the races of Indian Langurs, in which,

as stated, they were arranged in accordance with my views of their kinship, I placed it under the same heading as *priam* and alongside it, attaching subsidiary importance to the absence of the crest. These opinions were confirmed by Hill, who placed *priamellus* in *priam*, which he regarded as a distinct species, adding that the absence of the crest in the type of *priamellus* was not surprising because part of the skin of the brow had slipped. The condition of the crown does not suggest this to me, but, since its hair is thin and short, the absence of the tuft may be due to moulting. On the assumption that the tuft is potentially present, *priamellus* is distinguished from the other forms of the Langur which possess that ornament—from *elissa* by the blending of the hue of the hands and feet with the area of the limbs above,

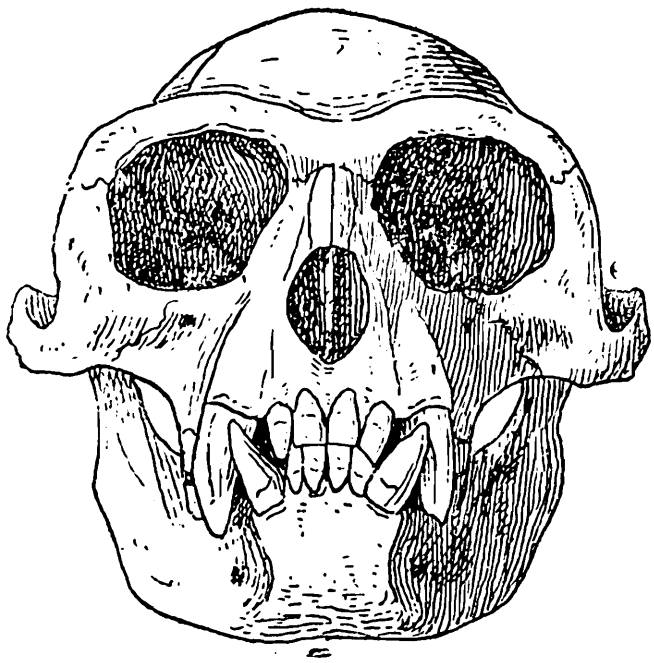


Fig. 34.—Front view of skull of adult ♂ of *Semnopithecus entellus priamellus* from Cochin.

instead of the sharp contrast; from *priam* and *thersites* by the pale hue of the nape and crown and their strong contrast with the back, and by the noticeably smaller skull of the adult ♂, and from *priam* at least, in addition, by its much darker arms and hands.

11 *m.* **Semnopithecus entellus elissa** (Pocock).

Presbytis entellus anchises, Ryley, Journ. Bomb. Nat. Hist. Soc. xxii, p. 494 1913 (not of Blyth).
Pithecus entellus elissa, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 493

Locality of the *type*, Nagarhole, S.E. Coorg.

Distribution.—S.E. Coorg. Hitherto only known from the type-locality.

Resembling *priam* in the presence of an upstanding crest on the crown, but distinguished by its black hands and feet and the sharp contrast between them and the rest of the limbs. The general hue is nearly as in *achates*, but there is no fuscous tint on the cheek, and the end of the tail is less extensively pale.

The upper side is brown ; but the head and nape are buffy- or greyish-white and sharply contrasted with the back, the crown being a trifle darker ; the tail above is like the back, with the extreme tip whitish ; outside of arms and legs as dark as the back, or darker, greyer, not so brown, and the hands

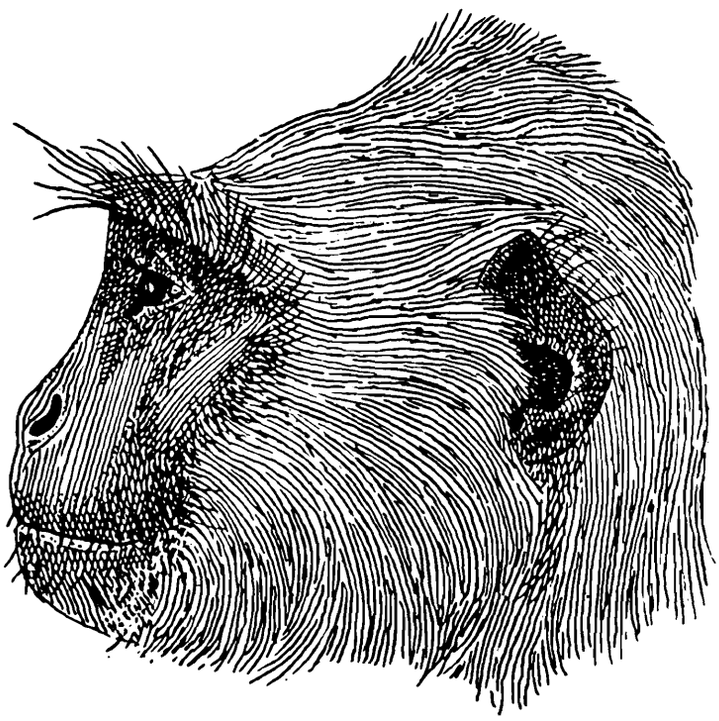


Fig. 35.—Head of *Semnopithecus entellus elissa*, the Tufted Langur, with black hands and feet and pale, uniformly coloured crown, brow, and cheeks.

and the feet black ; lower side and inside of limbs greyish, whitish or creamy.

Flesh-measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Foot.
Nagarhole ; yg. ad. ♂	24	36	7½
Nagarhole ; ad. ♀.	25	36½	7
Nagarhole ; ad. ♀.	24½	31½	6½

Curiously enough the flesh-measurements are about the same as in *priam*, but the skulls are very noticeably smaller, closely approaching those of *iulus*.

According to Shortridge the single troop of this Langur seen north of Srimangala was conspicuous from the crested heads of the individuals. It was plentiful round Nagarhole, and occurs in Coorg only to the east of the Brahmagiri Hills, its place to the west of that range being taken by *æneas*, which has no crest.

11 *n*. Semnopithecus entellus thersites (Blyth).

Presbytis thersites Blyth, Journ As. Soc Beng. xvi, p. 1271, 1847.
Presbytis priamus and *thersites*, Kelaart, Prodr. Faun. Zeyl. pp. 3–5, 1852.
Semnopithecus priamus, Blanford, Mamm. Brit. Ind. p. 31, 1888 (in part).
Pithecus entellus pallipes, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 495, 1928 (in part).
Pithecus entellus thersites, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 56, 1931.
Pithecus (*Semnopithecus*) *entellus thersites*, Phillips, Man. Mamm. Ceylon, p. 25, 1935.

Vernacular.—*Grey Wanderoo*; *Vandhura*, *Kondé vandhura* or *Elli vandhura* (Sinhalese); *Mundi* (Tamil); *Mundu Kurangu* (Jaffna Tamil); according to Phillips.

Locality of *type*, Trincomalee.

Distribution.—CEYLON and apparently TRAVANCORE.

Distinguished from *priam*, on the average at least, by its smaller size and generally darker hue*.

Head typically with a tuft on the crown, but this is occasionally absent† The general colour is individually variable; the upper side is from greyish to darker brown, the tips of the long hairs having a paler sheen; the limbs are like the back near the body, but become gradually paler distally, the hands and feet being the same tint as the forearm and shin, and not contrasted with them, the feet being whitish; the crown is approximately the same hue as the back and darker than the whitish cheeks and chin; the underside and inside of the limbs are mostly greyish-white.

The following approximate dimensions (in English inches) and weights (in lb.) are taken from Phillips's volume:—

	Head and body.	Tail.	Foot.	Weight.
Largest ♂	28	35⅘	7⅕	29½
Average of 6 ♂♂	24½	34½	7	27½
Largest ♀ . .	26½	30½	6⅘	19
Average of 7 ♀♀	21½	31	6½	15½

Of the 4 ♂♂ and 4 ♀♀ from Cheddikulam, Mankeni, and Arucam Bay, whose measurements I recorded in 1931, none,

* Commenting on this race, Hill (Proc. Zool. Soc. 1937, Syst. p. 210) said he was prepared to admit that Ceylonese specimens might be on the average larger and darker above than specimens from the Coromandel coast, justifying their subspecific distinction. In the material at my disposal Coromandel specimens (*priam*) are larger on the average in flesh-dimensions and weights, and also in the skull, than Ceylonese specimens (*thersites*).

† Blyth originally regarded this Ceylon Leaf-Monkey as identical with the Coromandel coast form described as *priam*. He considered the crest an invariable character, and on the receipt of a specimen from Trincomalee without the crest thought it represented a distinct species and described it as *thersites*. In this view he was not followed by later writers.

either ♂ or ♀, was so large as Phillips's largest; but their average length of head and body was almost exactly the same.

Except that the skull is on the average smaller than in *priam*, it does not appear to differ from it. The average condylobasal length of 7 adult ♂ skulls is 87 mm., about half an inch shorter than in the 2 adult ♂ skulls of *priam* from the Eastern Ghats.

Habits.—According to Phillips this Langur is commonly found in the whole of the low-country dry zone, but does not ascend the foothills to any great altitude, and is absent from the wet zone. In its general habits it does not apparently differ from its Indian allies. The troops or family parties,

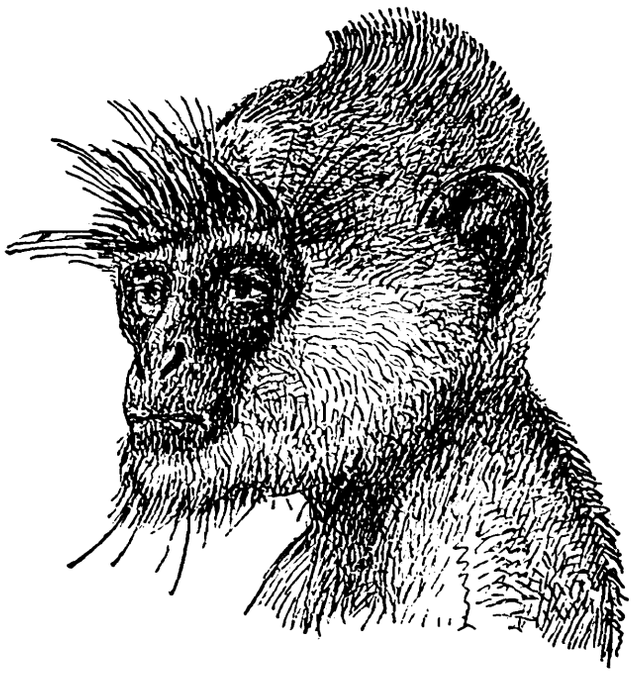


Fig. 36.—Head of *Semnopithecus entellus thersites*, the Ceylonese Tufted Langur, drawn by Blanford's artist from a skin from Ceylon referred to by Blanford as *S. priamus*.

numbering from half a dozen to twenty or thirty, are composed of individuals of all ages and both sexes. Near the villages they are fearless of man because he leaves them unmolested; but in wilder districts they are more timid, especially in the Vedda country, where the jungle men hunt and eat them. They are as often seen on the ground as in trees, especially about rocks and old ruins and near tanks and rivers. They feed upon fruits, leaves, and grain of various kinds, and raid cultivated ground. They are said, indeed, to eat without ill effects the plant from which strychnine is prepared. Practically their only enemy in Ceylon is the leopard, which captures them either by lying in wait or by so frightening them by rushing at the tree in which they have taken refuge that they fall to the ground from panic. This confirms Dunbar Brander's observations on the Entellus of Central India. Breeding apparently takes place at all seasons of the year.

Skull-measurements (in mm.) of the Himalayan and Tarai races of *Semnopithecus entellus*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular length.
S. e. achilles.							
Nepal (Hodgson's coll.) ; ad. ♂	145	120	114	82	44	40	109
Gorkha, Nepal (type) ; ad. ♂	143	117	107	82	42	38	108
Lachem, Sikkim ; ad. ♀..	126	101	104	74	35	38	96
Chuntang, Sikhim ; ad. ♀	127	105	105	74	34	37	99
S. e. ajax.							
Bara Tissa, Chamba ; ad. ♂	144	113	110	82	43	40	106
Chatri, Chamba ; ad. ♂	142	115	110	84	41	39	—
Kangra Fort ; ad. ♂	141	115	110	84	43	42	112
Kangra Valley ; ad. ♀	125	101	94	72	32	39	95
Kangra Valley ; ad. ♀	125	98	94	72	34	41	95
S. e. schistaceus.							
Almora, Kumaon ; ad. ♂.	141	113	108	82	44	38	110
Ramnagar, Kumaon ; ad. ♂	134	110	97	76	38	40	105
Ramnagar, Kumaon ; ad. ♂	132	108	98	74	37	39	114
Naini Tal, Kumaon ; ad. ♀	122	98	94	69	32	39	92
Ramnagar, Kumaon ; ad. ♀	118	95	89	71	30	41	93
Hazaria Pathergatti, Nepal ; subad. ♀	115	89	83	64	30	34	84

Skull-measurements (in mm.) of the races of *Semnopithecus entellus* from the Great Plain, Eastern India, and Ceylon.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular length.
S. e. entellus.							
Hazaribagh, Bengal ; ad. ♂	130	106	106	82	40	35	100
Hazaribagh, Bengal ; ad. ♂	127	102	101	79	37	37	97
Hoshangabad, Bengal ; ad. ♂	125	99	99	76	37	33	96
Deesa, Palanpur ; ad. ♂	124	100	102	81	37	36	93
E. Khandesh ; ad. ♀ . .	115	89	92	71	30	32	86
Midnapur, Bengal ; ad. ♀	109	85	88	66	28	34	83
S. e. anchises.							
Diguvametta, Kurnool ; ad. ♀	107	85	84	69	28	36	80
S. e. priam.							
Eastern Ghats ; ad. ♂ .	125	102	98	77	39	35	95
Hogainakal, Salem ; ad. ♂ ..	123	99	96	80	40	34	93
Murthur, Salem ; ad. ♀	112	89	86	73	28	33	84
Murthur, Salem ; ad. ♀	105	83	83	66	27	30	77
S. e. thersites.							
Cheddikulam, Ceylon ; ad. ♂	116	93	90	75	35	30	86
Welligatta, Ceylon ; ad. ♂	106	83	84	67	34	29	78
Kala Oya, Ceylon ; ad. ♀ .	102	76	80	67	24	29	72
Arucam Bay, Ceylon ; ad. ♀.	96	75	76	59	25	29	71

Skull-measurements (in mm.) of the races of *Semnopithecus entellus*, mostly from the Western Ghats.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper cheek-molars.	Mandi-bular length.
S. e. achates.							
Bellary ; ad. ♂	122	95	93	75	34	37	91
Haunsbhavi S.W. Dharwar ; ad. ♂	120	91	92	73	33	32	87
Karwar, N. Kanara ; ad. ♂.	105	84	82	67	29	31	77
Bellary ; ad. ♀	109	85	89	69	28	33	85
Patoli, N. Kanara ; ad. ♀	104	80	80	63	25	31	77
Samasgi, S.W. Dharwar ; ad. ♀	100	74	80	65	23	30	73
S. e. iulus.							
Gersoppa Falls, N. Kanara ; ad. ♂	105	81	83	64	31	29	75
Gersoppa Falls, N. Kanara ; ad. ♀	102	82	78	63	24	30	77
S. e. æneas.							
Makut, S. Coorg ; just. ad. ♂	109	87	85	69	29	29	80
Wottekolle, S. Coorg ; ad. ♀	108	89	85	68	28	32	81
S. e. elissa.							
Nagarhole, S.E. Coorg ; yg. ad. ♂	103	80	80	63	30	32	76
Nagarhole, S.E. Coorg ; ad. ♀	103	79	78	67	26	33	75
Nagarhole, S.E. Coorg ; ad. ♀	98	76	81	66	24	30	73
S. e. priamellus.							
Cochin ; ad. ♂	105	83	82	67	32	32	79

Genus **TRACHYPITHECUS** Reichenbach.

Trachypithecus, Reichenbach, Vollst. Nat. Affen, p. 88, 1862 (in part); Trouessart, Rev. Mag. Zool. 1879, p. 57 (emend.).
The "*Pyrrhus*-group" of *Pithecus*, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 475, 1928.
Trachypithecus, Pocock, Proc. Zool. Soc. 1934 (1935), p. 928; Hill, Ceyl. J. Sci. (B) xx, pp. 118 *et seq.* 1936.

Type of the genus (selected 1935), *pyrrhus*.

Distribution (as at present understood).—From ASSAM through BURMA into Indo-China, the Malay Peninsula, Sumatra, Java, and Borneo.

Distinguished from *Semnopithecus* by the colour of the newly-born young, which has the coat tolerably uniformly golden-red throughout. In the adult the eyebrows are less well developed, and only in one race is there a distinct



Fig. 37.—Head of *Trachypithecus pileatus* subsp.?, drawn by Blanford's artist from a skin of which no particulars were given.

frontal whorl with radiating hair. The hairs of the back also, according to Hill, are thinner, more silky, and have finer surface imbrications, and are pigmented only in the cortex, not in the medulla as well*. The clitoris of the ♀ is small, and contained within the labia of the vulva, not elongated and pendulous as it is in at least some adult ♀ *Semnopithecus*. In the typical species, *pyrrhus* and some others, the sexes differ, the ♀ having a patch of white hair beneath the callosities; but in other species the sexes are alike in the colouring of the pubic region as in *Semnopithecus*.

* It would be interesting to know what species of *Trachypithecus* were examined for this character. It hardly seems probable that the hair-pigmentation is the same in the black Javan *pyrrhus* as in the grey Assamese *pileatus*.

The skull has the brow-ridges less well developed, at least on the average, than in *Semnopithecus*.

I have seen skins of the newly-born young of several different kinds of *Trachypithecus*, ranging from Assam to Java, all of the colour stated. The only exception to the rule apparently was supplied by an example of *T. pileatus*, recorded by McCann as white. But the young of this species known to me are typically golden.

In the following key to the species here admitted the characters of *obscurus* and *pyrrhus* apply to the races found within British Indian territory, *i. e.*, Tenasserim, not necessarily to all the races found elsewhere.

Key to the British Indian Species of Trachypithecus *.

a. Sexes alike in the colour of the pubic region, the tint of the hind abdomen continued back to the callosities, to a certain extent down the thighs, and sometimes on to the root of the tail; lower side paler, whitish-grey or ochreous.

b. The face black, hair on the crown forming a mat typically differentiated from the hairs of the temples and fore-nape by its greater length and darker hue; size on the average larger . . . . . [p. 121. *pileatus* (Blyth),

b'. Face with a pale patch in front on the lips, and a similar pale ring or half-ring round the eyes; no such mat on the head; size on the average smaller.

c. Hind legs, tail, and crown not sharply distinguished from the back by their much paler tint . . . . . [p. 129. *phayrei* (Blyth),

c'. Hind legs, tail, and crown sharply contrasted with the back by their whitish hue . . . . [p. 138. *obscurus* (Reid),

a'. Sexes differing in colour of pubic region, the ♀ with a pale patch of hair beneath the callosities; darker, browner above and below; no pale patch on mouth [p. 142. *pyrrhus* (Horsf.),

12. **Trachypithecus pileatus** (Blyth).

Semnopithecus pileatus, Blyth, Journ. As. Soc. Beng. xii, p. 174, 1834; and xiii, p. 467, 1844. (For other bibliography, see under the subspecific headings.)

Locality of *type* unrecorded, but no doubt Assam.

Distribution.—ASSAM and the adjoining districts of Chittagong and UPPER BURMA.

Size large, face black, the crown from the brow, where there is no whorl, to the occiput typically covered with a thick

* The species described by Blanford (*op. cit.* p. 38) as *Semnopithecus chrysogaster*, on the evidence of two specimens alleged to have come from Tenasserim, is not represented in the fauna of British India. That name is a synonym of *Trachypithecus potenziani*, which is found, so far as is known, only in the Mentawei Islands, west of Sumatra.

mat of soft, mostly erect hairs, which posteriorly overlap the short hairs of the fore-nape and laterally those above the ear and on the temple ; hairs of lower cheek long, whisker-like, covering the lower part of the ear, and blending with long hairs low down behind the ear. General colour of the upper side, outside of the limbs, and the basal half of the tail grey to blackish-grey with some long glistening hairs ; the incrassate tail blackish in its distal half ; the hands and feet also sometimes darker than the fore-arm and lower leg ; the underside of the body, the inner surface of the limbs, and the cheeks typically paler than the rest and sharply contrasted, often suffused with red.

Key to the Races of T. pileatus.

a. Whiskers long, whitish or reddish, and sharply contrasted with the darker tint of the crown.
  b. A sharp contrast in colour between the upper and undersides of the body and between the outer and inner surfaces of the limbs ; throat and breast not paler than belly.
    c. Breast, throat, and whiskers pale, at most tinged with buff ; abdomen greyish-white, at least in adult . . . . [p. 122. *pileatus* (Blyth),
    c'. Breast, throat, and whiskers bright rusty red.
      d. Upper side paler, head and nape nearly uniformly slaty-grey ; red suffusing underside at least to groins .. .... [p. 125. *durga* (Wrought.),
      d'. Upper side darker, head blackish, a grey patch on nape ; red on underside fading away on abdomen [p. 126. *tenebricus* (Hint.),
  b'. No sharp contrast in colour between upper and undersides of body and between outer and inner surfaces of limbs ; throat and breast whiter than belly . .. [p. 128. *brahma* (Wrought.),
a'. Whiskers shorter, grey, and not noticeably lighter in tint than the crown . [(Wrought.), p. 128. *shortridgei*

12 *a*. **Trachypithecus pileatus pileatus** (Blyth).

Semnipithecus pileatus, Blyth, Journ. As. Soc. Beng. xii, p. 174, 1843.

Semnopithecus argentatus, Horsfield, Cat. Mamm. E.I. Co. p. 7, 1851.

Pithecus pileatus pileatus, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 79, 1923 ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 661, 1928.

Locality of the *type* of *pileatus*, unknown ; of *argentatus*, Sylhet.

Distribution.—The Garo, Khasi, Jaintia, and Naga Hills in ASSAM.

Distinguished by the pale hue of the whiskers, throat,

underside of the body, and inner side of the limbs, which are white or whitish, and at most faintly tinged with buff or pale red and are sharply contrasted with the grey hue of the upper side.

The colour varies a good deal individually. A half-grown ♀ from Mokokchung in the Naga Hills, 5,000 ft. (Wells), is pale slate- or smoky-grey above and on the outside of the limbs and on the tail, with the head and hands a little darker; the underside and the whiskers are white, and there is some white on the hands and feet, but the feet are not darker than the legs. An adult ♂ from the same locality differs in having the whiskers and underside tinged with buff or very pale red, the hands and feet darker, and no white on the fingers or toes. An adult ♂ from Tura in the Garo Hills, 1,400 ft. (Wells), differs from the last in having the arms and legs paler, the outside of the leg below the knee and the top of the foot being much greyer. An immature ♂ from Lait Kynsao in the Khasi Hills, 2,000 ft., is very like the adult ♂ from Tura, and an immature ♂ from Konshong in the Jaintia Hills, 3,000 ft., has the outer side of the leg below the knee greyer than in the older specimen from the Khasi Hills, and the end of the tail buff instead of blackish.

Flesh-measurements (in English inches)* and weights (in lb.):—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Tura, Garo Hills; ad. ♂	28	41	7⅖	—
Changchang Pani, Naga Hills; ad. ♂	26⅘	35⅗	8	—
Changchang Pani, Naga Hills; ad. ♂	25⅗	35⅗	7⅘	—
Konshong, Jaintia Hills; ad. ♀	23	35	7½	21½
Changchang Pani, Naga Hills; ad. ♀	23	30½	6⅘	—

As recorded by Hinton, on information supplied by Mr. Mills, this race in the Naga Hills is only found in the high cool jungle above 4,000 ft., and never mixes with the next race, which occurs at lower levels on the slopes and in the valleys.

Habits.—According to McCann (Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 626, 1933), who observed this monkey at Changchang Pani in the Naga Hills, it inhabits dense forests intersected with streams, but was not seen to come to the ground to drink, the plentiful dew supplying all the water it requires, and it feeds on buds, leaves, and fruits. It is polygamous, and at least during the breeding season in the winter

* The measurements of the specimens from Changchang Pani are taken from McCann, who identified them as *pileatus*, without nominating the subspecies.

months goes about in small parties of eight or ten, consisting of a master male, three or four females and young; but there are also parties of immature, non-breeding individuals. It

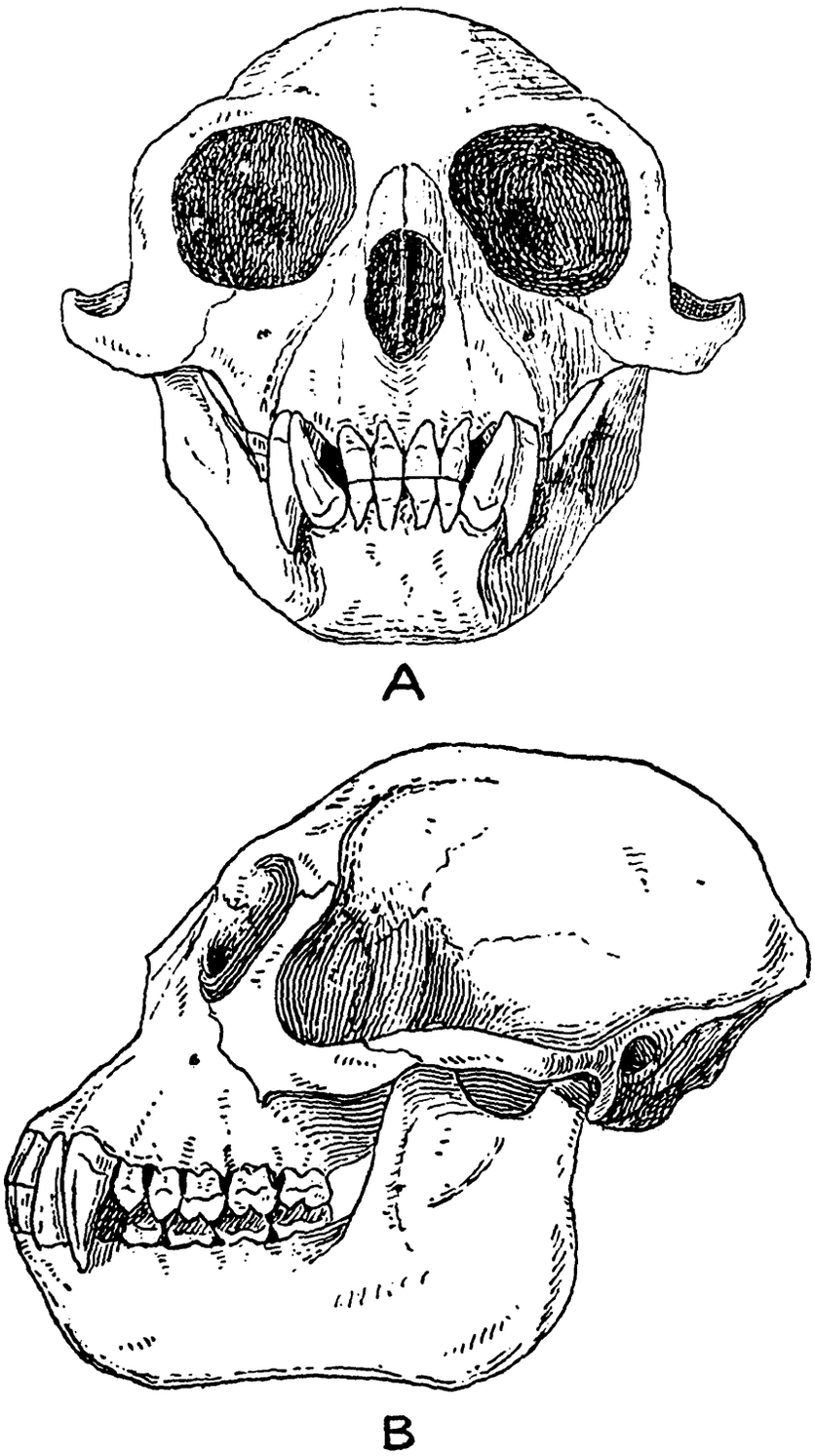


Fig. 38.—Skull of adult ♂ of *Trachypithecus pileatus pileatus* from Tura in the Garo Hills. A. Frontal view. B. Lateral view.

makes a squealing noise at times, but its warning cry is a harsh bark, and, being exceedingly shy, it either, when alarmed, hides and remains quiet in the topmost foliage or takes to

flight, making a tremendous noise by breaking and bending the branches as it traverses the forest. This account refers to typical *pileatus* or *durga*; but no doubt the habits of all the races are similar.

12 *b*. **Trachypithecus pileatus durga** (Wroughton).

Presbytis pileatus, Blyth, Journ. As. Soc. Beng. xvi, p. 735, pl. xxvi, fig. 3, 1847.
Presbytis durga, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 655, 1916.
Pithecus durga, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 79, 1923.
Pithecus pileatus saturatus, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 81, 1923.
Pithecus pileatus durga, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 663, 1928.

Locality of the *type* of *durga*, Cachar ? ; of *saturatus*, Bara Hapjan in Lakhimpur.

Distribution.—From Lakhimpur in UPPER ASSAM southwards to the NAGA HILLS, CACHAR, TIPPERAH, CHITTAGONG, and UPPER CHINDWIN to the west of the river.

Distinguished from the foregoing typical race by the intensity of the redness of the whiskers, throat, underside of the body, and inner surface of the limbs.

When Blyth received examples of this race from Tipperah and Chittagong he regarded them as representing the males of his *pileatus*, based on a pale-bellied female from an unknown locality. But the difference in coloration is not sexual, nor can *durga* be regarded as an erythristic mutant of *pileatus*, because the two forms do not appear to live together, and there is evidence of their occurrence at different altitudes. On the label of an example of *pileatus* shot at Mokokchung, 5,000 ft., in the Naga Hills, Mills, the collector, wrote: " Grey-bellied variety much less common than red-bellied, and found at higher altitudes." He secured *durga* at Lakhuni in the Naga Hills at 2,000 ft., but most of the specimens obtained by the Survey were from much lower levels, 200 ft. at Lakhimpur, 300 and 400 ft. at Golaghat, 400 ft. at Lanka in North Cachar, and 800 ft. at Lamsakhang in the Cachar Hills. Shortridge secured a specimen with " ginger yellow underparts and whiskers " at Nansun Chaung in Upper Chindwin, and believed that this race occurs on the west side of the river and the related form, *shortridgei*, on the east side. A skull picked up by Mackenzie near the Kabaw Valley is probably referable to *durga*.

The locality of the type of *durga*, collected over half a century ago by Dr. Reid, is doubtful. It was first labelled " Cachar " and later " Upper Assam." But the point is of no great moment, since this red-bellied Langur is found in northern

Assam, at Golaghat and Lakhimpur, and also in Cachar. Although Hinton regarded the types of *durga* and *saturatus* as representing distinct species, I consider the differences between them to be due to the age and the "make-up" of the skins. The type of *durga* is darker above and duller below than that of *saturatus*, but the latter is a fresh skin, whereas the former has been many years in the Museum, and is probably soiled and faded. The teeth of *durga* were supposed to be larger than of *saturatus*. This is true of the two types, as the table of skull-measurements shows, but the cheek-teeth of an example of *saturatus* from Golaghat are only 1 mm. shorter than in the type of *durga*.

Flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Barahapjan (*saturatus* type); ad. ♂	27⅖	39	7⅘	—
Golaghat ; ad. ♂.	23⅖	35⅖	7⅘	—
Lanka, N. Cachar ; ad. ♂.	23⅕	40⅘	9⅕	27
Golaghat ; ad. ♀.	20	33⅕	7⅕	—
Lamsakhang, Cachar Hills ad. ♀.	19⅗	33⅗	6⅘	25

12 *c*. **Trachypithecus pileatus tenebricus** (Hinton.)

Pithecus pileatus tenebricus, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 81, 1923 ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 664, 1928.

Locality of the *type*, Matunga River, N. Kamrup.

Distribution.—Assam, north of the Brahmaputra, North Kamrup.

Distinguished from the two preceding races by the darker tint of the upper side, the head, back, outer surface of the arm, the hand, and the base of the tail being ashy black, but the cap is defined behind by a half-collar of grey-tipped hairs and the leg is somewhat greyer than the arm ; the throat, breast, and shoulders, and the base of the whiskers are almost as deep a red as in *durga*, but the whiskers are apically grey as in the next race, *brahma*, and the redness of the underside is much less pronounced on the belly and inguinal area, which in the ♂ are whitish, in the ♀ pale red. A young specimen is darkish grey above and on the outside of the limbs, but whitish below, with a yellow tinge on the chest and cheeks. It is darker than a young ♂ of the typical race of about the same age from Konshong in the Jaintia Hills.

Examples of this race were collected by Wells at Menaka Nadi, 500 ft., Matunga River, 1,200 ft., and at Bogra Nadi, 2,000–3,000 ft.

Skull-measurements (in mm.) of the races of *Trachypithecus pileatus*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular length.
T. p. pileatus.							
Mokokchung, Naga Hills; ad. ♂	119	91	—	75	34	29	83
Tura, Garo Hills; ad. ♂	115	89	89	70	33	28	83
Tura, Garo Hills; yg. ad. ♀	102	76	75	65	27	28	74
T. p. durga.							
Lanka, N. Cachar; ad. ♂	120	95	86	74	33	28	84
? Cachar (type); old ♂	117	94	86	75	35	30	83
Golaghat; old ♂	118	92	85	74	34	29	81
Barahapjan, Lakhimpur (*saturatus* type); ad. ♂	116	92	88	76	34	27	86
Lakhuni, Naga Hills; ad. ♀	111	83	80	69	29	29	79
Lamsakhang, N. Cachar; ad. ♀	103	74	77	67	27	29	72
T. p. tenebricus.							
Matunga River, N. Kamrup (type); yg. ad. ♂	104	81	81	69	28	28	73
Boganadi, N. Kamrup; ad. ♀	97	74	77	65	26	28	69
T. p. brahma.							
Dafila Hills, N. Lakhimpur (type); ad. ♂	110	85	82	70	36	29	79
T. p. shortridgei.							
Tamanthe, Upper Chindwin (no skin); ad. ♂	121	96	90	83	37	30	88
Minsin, Upper Chindwin; ad. ♂	117	91	86	73	34	28	81
H'Kamti, Upper Chindwin (*belliger* type); ad. ♂	115	91	92	75	36	30	83
Homalin, Upper Chindwin (*shortridgei* type); ad ♂	113	91	91	78	36	30	82
Kabaw Valley, Upper Chindwin; ad. ♀	116	91	87	75	31	28	—

The flesh-measurements (in English inches) of two specimens and the weight (in lb.) of one are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Matunga River (type); yg. ad. ♂. .. .	22⅘	36⅘	7⅕	19½
Bogra Nadi; ad. ♀	22½	34	7	—

The evidence of these measurements would hardly in themselves justify the opinion that this race is smaller on the average than the preceding two, but the skulls point to the same conclusion, the adult ♀ having the same condylobasal length as the smallest known adult ♀ of *durga* and being a little less in that dimension, as in the length of the mandible, than the young adult ♀ of *pileatus* from the Garo Hills.

12 *d*. **Trachypithecus pileatus brahma** (Wroughton).

Presbytis brahma, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 654, 1916, and xxv, p. 559, 1918.
Pithecus brahma, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 79, 1923.
Pithecus pileatus brahma, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 604, 1928.

Locality of the *type*, Seajuli in the Dafla Hills, North Lakhimpur.

Distribution.—North Lakhimpur, so far as known.

Distinguished principally from the typical race, *pileatus*, by the absence of sharp contrast in tint between the outer and inner surfaces of the limbs and upper and undersides of the body, and by the slight suffusion of the flanks and abdomen with red, making them brighter and darker than the chest, throat, and whiskers which are white, with only the tips of the whisker-hairs grey.

General colour above and on the outside of the limbs uniformly slate-grey, but the limbs and tail darkening towards their extremities; the inside of the limbs pale grey, blending with the tint of the outside, and there is no pale line invading the hallux on the inner side of the foot; whiskers white, with ashy tips as in *tenebricus*; throat and chest whitish, but the belly tinged with reddish-buff, becoming more intense laterally where it passes into the flanks.

No measurements were recorded of the only known example of this race, a barely adult ♂.

12 *e*. **Trachypithecus pileatus shortridgei** (Wroughton).

Presbytis shortridgei, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 56, 1915.
Presbytis shortridgei belliger, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 57, 1915.

Pithecus shortridgei, Hinton, Journ. Bomb. Nat. Hist. Soc. xxix, p. 79, 1923.
Pithecus pileatus shortridgei, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 665, 1928.

Locality of the *type* of *shortridgei*, Homalin in Upper Chindwin ; of *belliger*, H'Kamti.

Distribution.—The Upper Chindwin district of UPPER BURMA to the east of the river.

Distinguished from all the preceding races by its nearly uniform greyish hue, except on the hands and feet and the greater part of the tail, which are blackish, the whiskers, the underside of the body, the throat, and the inside of the limbs being grey, with no trace of erythrism or whiteness and only slightly paler than the upper side, which is slate or greyish-brown. Also the whiskers are noticeably shorter and the tail is distally short-haired ; but since all the known skins were collected in July and August these may be seasonal characters.

Flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Homalin (*shortridgei* type) ; ad. ♂. ..	28⅕	40⅘	7⅘	30
Minsin ; ad. ♂ .	27⅕	39⅘	7⅘	—
H'Kamti (*belliger* type) ; ad. ♂	26⅕	37⅕	8⅕	28
Homalin ; ad. ♀	26⅕	38⅕	7½	21

This race inhabits the valley of the Upper Chindwin River apparently at comparatively low levels. Shortridge collected it at H'Kamti, 500 ft., and at Homalin, 400 ft., and according to him it is plentiful between those two localities and is found only on the east side of the river. He also secured it at Minsin* ; and H. C. Smith shot specimens in the Pidaung Reserves, Myitkyina.

13. **Trachypithecus phayrei** (Blyth).

Presbytis phayrei, Blyth, Journ. As. Soc. Beng. xvi, p. 733, 1847. (For other references see under the subspecies.)

Locality of the *type*, Arakan.

Distribution.—The whole of BURMA, including Tipperah, from at least as far north as Bhamo to northern Tenasserim, and thence through Siam to Indo-China.

Distinguished from *T. pileatus* by the absence of the " cap "

* As Shortridge pointed out, Wroughton was misled into describing the skins from H'Kamti as representing a distinct race, *belliger*. The character on which he relied was due to discoloration of the skins by smoke during preparation.

on the summit of the head, which in that species is differentiated from the hair of the temple by being longer, fuller, and in all the races except one by its darker and contrasted hue, the hairs in *T. phayrei* on the top and sides of the head being essentially similar in colour, texture, and length; also in *T. phayrei* the dark hue of the face is relieved by a pallid patch on the mouth and more or less round the eyes, the end of the tail is not blacker than the back, there is no tendency to erythrism in the coloration, and the size is, on the average, considerably smaller.

Key to the British Indian races of T. phayrei *here admitted.*

a. No whorl or parting in the hair of the forehead; eyes encircled by pale ring.
  b. Darker on the average above and with sharper contrast between dorsal and ventral surfaces. [p. 130. *phayrei* (Blyth),
  b'. Paler on the average above and with less contrast between dorsal and ventral surfaces . . . . . [(Elliot), p. 134. *crepusculus*
a'. A whorl or parting in the hairs just behind the brow; a pale half-ring on inner side of eye. [(Wrought), p. 136. *shanicus*

13 *a*. **Trachypithecus phayrei phayrei** (Blyth).

Presbytis obscurus, Blyth, Journ. As. Soc. Beng. xiii, p. 466, 1844 (not *obscurus* Reid).

Presbytis phayrei, Blyth, Journ. As. Soc. Beng. xvi, p. 733, 1847, and of Anderson and Blanford under *Semnopithecus*; Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 464, 1915, and xxiv, p. 297, 1916 (in part)

Presbytis barbei, Blyth, Journ. As. Soc. Beng. xvi, p. 734, 1847 (not *barbei* Blyth, 1863 and 1875).

Presbytis melamera, Elliot, Ann. Mag. Nat. Hist. (8) iv, p. 267, 1909.

Pithecus pyrrhus phayrei and *barbei*, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, pp. 668 and 669, 1928.

Vernacular.—*Myauk-Ugenyo*, *Myauk-myet-kwin-byu* (Burmese); *Myauk-Nyo* (Toungoo).

Locality of the *type* of *phayrei*, Arakan; of *barbei*, Tipperah Hills*, of *melamera* Caud Ciaung, near Bhamo.

Distribution.—The whole of BURMA from at least as far north as Bhamo to Pegu.

The explanation of the above-given synonymy, especially the relegation of *barbei*, is as follows:—In his original description Blyth gave the name *barbei* to specimens said to have been collected in the Ye district of Tenasserim, and stated

* Originally recorded by Blyth from the Ye district of Tenasserim; but this was corrected in 1863 to the interior of the Tipperah Hills. Presumably the alteration applied to the original specimen of *barbei* and not to the one cited under that name at the later date (see p. 131.)

most positively that they resembled Malayan specimens of *T. obscurus*, with which he was evidently familiar, in the light markings on the face, *i. e.*, the pale hue round the eyes and on the lips. But in 1863 he not only changed the locality, on information received from Barbe, but contradicted his first description by saying that the faces were black *. Moreover, in 1875 he stated that the skins were received without skulls. Anderson, however (Cat. Mamm. Ind. Mus. i, pp. 48–9, 1881), when referring to specimens in the Calcutta Museum as Blyth's types of *barbei*, described two skulls, citing their catalogue numbers. Further, the Calcutta skins regarded by Anderson as the types of *barbei*, and no doubt the same as those called *barbei* by Blyth in 1863, have black faces. This is shown by the reproduced photograph of the head of one of them sent by Annandale to Wroughton (Journ. Bomb. Nat. Hist. Soc. xxv, p. 47, 1917) and by the account of the two given by Osman Hill (Proc. Zool. Soc. 1936, pp. 105–8), who came to the conclusion that they represent a distinct black-faced species of Leaf-Monkey from Tipperah. But the evidence cited above shows they are not the original specimens of *barbei* described in 1847, and there is no evidence that they came from Tipperah if the alteration in the locality applied, as may be supposed, to the original pale-lipped, pale-eyed skins. There is one more point. Blyth was largely actuated in separating *barbei* from *phayrei* in his description of 1847 by the absence in the former of the crest on the crown, but he subjoined a footnote stating that the taxidermist lad who prepared the skins was positive they had crests when fresh. That, in my opinion, is not unlikely. If so, it is another item of evidence favouring the view of close likeness between the types of *phayrei* and *barbei* †

Another name to be considered is *melamerus*. In 1928 I considered this to be a synonym of *barbei*, which was regarded as a race distinguished from *phayrei* by its generally darker hue. But I had only one skin, the type of *melamerus*, to

* The view that the eyelids and lips changed from pale to black in sixteen years is untenable. Skins 100 years old retain the pallor of those areas.

† The source of the confusion about *barbei* will probably never be traced. But it seems clear that Blyth must have had skins from the Ye district in Tenasserim, whence came the type of the race described below as *atrior*, which is black-faced, like his examples of *barbei* described in 1863. But G. M. Allen (Amer. Mus. Novit. no. 429, p. 4, 1930) has recorded as *barbei* a good series of fresh skins from S.W. Yunnan which have blackish faces and are silvery above and below; and these seem to agree better with Hill's description of the supposed types of *barbei*, allowing for soiling and deterioration of the latter, than do my specimens of *atrior*. It is quite likely that specimens resembling Allen's will turn up in Upper Burma and perhaps prove to be *T. pileatus shortridgei*.

judge from. Since then the examination of fresh material, notably of a skin collected by Garthwaite near Bhamo, whence the type of *melamerus* came, convinced me that the supposed differences are individual, not racial.

The eyes in the living animal are encircled by a white ring which turns livid and reddish in dried skins. The hair on the crown may or may not be raised into a crest, but there is no parting or whorl behind the brow. The general colour of the upper side may be deep, dull lustreless drabby, not reddish, brown or buffy or greyish-brown, the pale area of the hairs being more or less lustrous ; the forehead and cheeks are blacker ; the arm below the elbow gradually darkens to the black hands, and the feet are black ; the tail above is usually paler than the back ; the chin, throat, chest and belly are whitish or grey, and the pale colour extends in both



Fig. 39.—Head of *Trachypithecus phayrei phayrei*, without trace of tuft, from 35 miles north-west of Toungoo.

sexes to the callosities and down the inner side of the thigh, fading away inferiorly below the knee, but sharply defined against the dark hue of the outer side of the thigh behind ; frequently too it spreads on to the base of the tail below*.

One or two cases may be cited to illustrate individual variation in colour in the same district. The type of *melamerus* from near Bhamo is mostly deep brown above and darkish grey below. Garthwaite's specimen, also from near Bhamo, 500 ft., January 12, which, like the other, is crestless, differs in being much paler and greyer, both above and below, and closely resembles a skin from Kin in Lower Chindwin, whereas another from Kin is decidedly darker and more like, although

* When the monkeys are in flight, with the tail uplifted, these whitish areas may perhaps act as guide-marks.

not so dark as, the dark Bhamo skin. In a series of eight skins from about thirty miles north-west of Toungoo (Mackenzie), one ♀, January 12, is very dark, lustreless drab-brown above, very like the dark Bhamo skin, whereas in two ♀♀, November and January, the long hairs from the nape backwards have extensively buff-grey, somewhat lustrous ends. The rest of the Toungoo series are intermediate between these extremes. A skin from the southern Zamayi Reserve, 6 miles north of Pegu (Mackenzie), March 10, is even darker above than the dark Bhamo skin, but has the belly dirty white. This skin is like two from 30 miles south-east of Prome, November 24 (Mackenzie), and it seems to resemble the type of *phayrei* from Arakan, except that it has no crest.

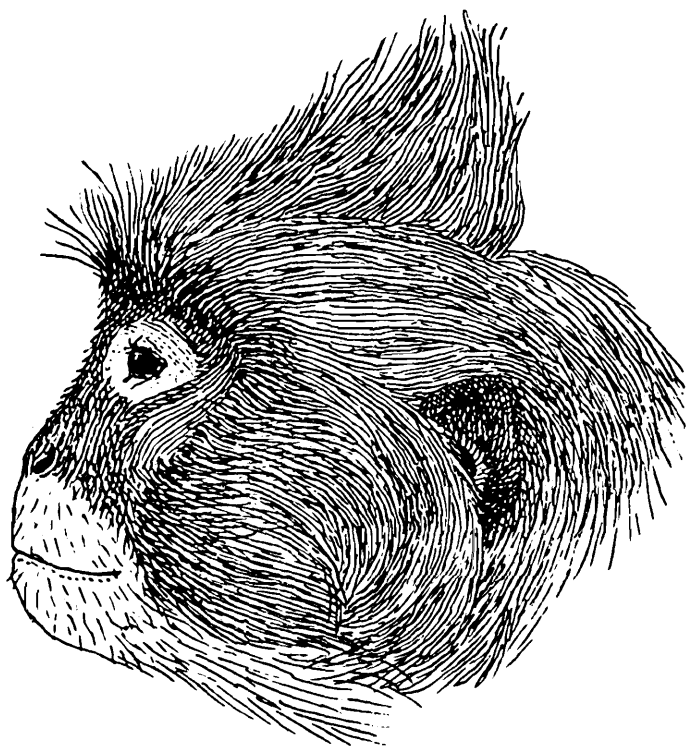


Fig. 40.—Head of *Trachypithecus phayrei phayrei*, with well-developed tuft, from 35 miles north-west of Toungoo.

This crest, to which some importance has been attached, is too unreliable in its incidence, at least in made-up skins, to be used as a systematic character. In the series of Toungoo skins it is present or absent. It is present as a thin upright tuft in one from Kamri Island, Arakan, in the two from Kin in Lower Chindwin, and in two from Mt. Popa (Shortridge); but in two others from Mt. Popa and in those from Prome and the Zamayi Reserve there is no definite crest, although the hair on the crown, as in many of the Toungoo skins, is long and irregularly straggling. In the dark Bhamo skin the hair on the crown is as long as in some of the southern skins, but it is less untidy and has a generally backward direction. In Garthwaite's skin from Bhamo it has the same direction, but is shorter and smoother.

Habits.—The habits of this monkey are probably the same throughout Burma. According to Shortridge it is less noisy and less seldom seen than the Indian Langurs (*Semnopithecus*), being almost exclusively forest dwellers, and rarely frequenting cultivated ground. He found it fairly plentiful on the higher slopes of Mt. Popa, which he considered to be the northern limit of the range of the race to the east of the Irrawaddy, its place farther north and in the Shan States being taken by *shanicus*. Near Toungoo Mackenzie reported that it is usually found in dense high forest in parties numbering about twenty. On being alarmed the females made off at once with their young, but the males sometimes stayed behind, barking at the intruders. More of them were consequently shot then of the other sex. In flight the whole party follows the same route, running along the same branches, jumping from and to the same spots and now and again stopping at the same place for a long look back. Their leaps appear tremendous. Usually they seem to jump into a group of branches or the top of a lower tree, rather than on to a particular branch, "spread-eagling" themselves so as to distribute the weight, the tail apparently being used as a balancer. All the specimens he secured were from the west bank of the Irrawaddy; but he saw a troop on the east side of the river. The Burmans, he added, eat the monkey.

At Kin in Lower Chindwin the monkey was fairly plentiful on the west bank of the river, but it was not seen on the east bank, nor on the Upper Chindwin.

At Letsigan, 3,000 ft., in Lower Chindwin, in a party of about twenty, Mackenzie shot on February 10 two ♀♀, one in milk, the other with a three-quarter-grown naked fœtus. This shows that this monkey may breed early in the year. It is likely enough, however, that young are born at all seasons.

13 *b*. **Trachypithecus phayrei crepusculus** (Elliot).

Presbytis phayrei, Tickell, Journ. As. Soc. Beng. xxviii, p. 428, 1850.

Presbytis crepuscula and *P. crepuscula wroughtoni*, Elliot, Ann. Mag. Nat. Hist. (8) iv, pp. 271, 272, 1909.

Presbytis argenteus, Kloss, Journ. Nat. Hist. Soc. Siam, iii, p. 388, 1919.

Pithecus pyrrhus crepusculus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 672, 1928; Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 202, 1932.

Trachypithecus phayrei crepusculus, Pocock, Proc. Zool. Soc. 1934, p. 949.

Locality of the *type* of *crepusculus*, Mt. Mulai-yit, Tenasserim; of *wroughtoni*, Pachebon, Central Siam; of *argenteus* Lat Bua Kao, west of Korat, S.W Siam.

Distribution.—NORTHERN TENASSERIM, the adjacent areas of Siam, and thence apparently to Laos and Annam.

Closely resembling typical *phayrei*, with similar pale eyelids and lips, but distinguished by being on the average paler and greyer above and not so white below, the ventral surface being grey and sometimes hardly paler than the dorsal. Crest on the crown present or absent.

This race differs considerably in coat and colour according to the season. This is illustrated by two skins from Mt. Mulai-yit, 5,000 ft. (Davison) which Blanford identified as *phayrei*, rightly considering them to be the same as the Langur from near Moulmein referred by Tickell to *phayrei*. One is tolerably uniformly brown above, with some rusty-brown hairs on the arms, hands, and feet, so that the hands and feet have lost their typical black hue. The other in fresh coat is greyer, with black hands and feet, and scarcely differs from examples of typical *phayrei* from Mt. Popa, except that the belly is greyer and the base of the tail the same tint as the loins. Very similar to the last is a skin from Lampha, Tenasserim, 1,000 ft. (A. S. Vernay). An instructive series showing considerable individual variation in tint, in the same locality and the same month, was secured by A. S. Vernay east of Um Pang on the Mewong River, Siam, between February 3 and 27, probably at the time of coat-change. Some are paler grey, some darker and browner than the pale skin from Mt. Mulai-yit, but they are obviously the same monkey. An unusually brilliantly-tinted skin, with a golden sheen, was collected by Vernay south-west of Kempenpet, 600 ft., on the Klong Klung River on February 27 A topotype of *argenteus* Kloss (September) is paler than the average of Siamese and Tenasserim skins, but very like the palest Um Pang skin.

Tickell's MS. account of *phayrei*, and his figure of a specimen shot on the ground while drinking at a stream in the hills between Kawkareik and Midiawaddee in Tenasserim, refer no doubt to *crepusculus*. In the living animal the face is livid purple with white rings round the eyes and white lips; the general colour is smoke- or ash-grey all over except the brow and hands and feet, which are black, and the hind abdomen and inner side of the thighs, which are white.

Habits.—It was not at all common near Amherst, keeping to the depths of the forest and frequenting in small parties only the hugest trees. It was seldom seen owing to its fear of man, but might be heard crashing through the trees in full flight. When by chance observed in flight, the party was seen to keep in line, headed by the biggest, galloping along the large boughs of the trees and occasionally flinging themselves, with prodigious leaps, from one to another. The main body

continues its flight for some time, but an old male will sometimes stop behind, uttering, with the mouth wide open, a short deep bark, not unlike that of the Indian Entellus. At other times they are usually silent. In flight they were never seen to carry the tail upright, like the Entellus in India.

13 *c*. **Trachypithecus phayrei shanicus** (Wroughton).

Presbytis barbei, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 465, 1915 (not of Blyth).
Presbytis shanicus, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxv, p. 47, 1917.
Pithecus melamerus, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 552, 1921 (not of Elliot).
Pithecus pyrrhus shanicus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 670, 1928.

Vernacular.—Lingmun, *Ling Kang*? (Shan); *Myauk-Ugengo*, *Myauk-myet-kwin-byu* (Burm.).

Locality of the *type*, Séen in the Hsipaw State.

Distribution.—The North Shan States and their neighbourhood to the east of the Irrawaddy, in the dry zone of Upper Burma.

Distinguished from the specimens assigned to typical *phayrei* by the presence of a whorl, rarely represented by



Fig. 41.—Head of *Trachypishecus phayrei shanicus*, from Hsipaw State in the N. Shan States, showing the whorl on the brow.

a short longitudinal parting, in the hairs of the forehead just behind the brow; and, according to Shortridge, the pale area round the eyes is limited to the inner portion of the orbit.

Shortridge collected this monkey on the east bank of the Irrawaddy, 560 ft., opposite Kyaukmyaung; at Se-en, 1,411 ft., in the Hsipaw State; at Gokteik, 2,133 ft.; at Mansam Falls and at Pyaungyaung in the North Shan State. H. C. Smith

Skull-measurements (in mm.) of the three races of *Trachypithecus phayrei*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular length.
T. ph. phayrei.							
Toungoo ; ad. ♂	106	87	80	62	31	27	80
Mt. Popa ; ad. ♂	103	85	79	66	30	29	76
S. Zamayi Reserve ; ad. ♂	108	83	81	61	31	29	76
Kin, Lower Chindwin ; ad. ♂	101	81	81	63	33	25	75
Chin Hills ; ad. ♀	95	77	74	61	26	27	70
T. ph. crepusculus.							
Mt. Mulai-yit, Tenasserim (type) ; ad. ♂	107	—	82	69	32	28	—
Mt. Mulai-yit, Tenasserim ; ad. ♂	(105±)	—	80	66	32	27	74
Seeswad, Siam ; ad. ♀	95	76	72	57	27	27½	70
T. ph. shanicus.							
Gokteik, N. Shan States ; ad. ♂..	102	81	80	65	31	28	75
Se-on, N. Shan States (type) ; ad. ♂	100	82	79	65	31	28	72
Gokteik, N. Shan States ; ad. ♀. ..	94	75	71	59	24	27	70

subsequently got it at Nattaung, 700 ft., in Maymyo, Mandalay District. In this specimen and in one from Gokteik the parting on the brow is a short streak with the hairs diverging right and left. In the others it is a whorl with radiating hair, and this whorl is well defined in the immature specimen from Pyaungyaung, which is just changing its baby coat.

Shortridge found this monkey plentiful in the Hsipaw District and fairly abundant at Ngapyimin opposite Kyoukmyoung, where it probably occurs as a wanderer from the Shan Plateau, which at this point is not very far from the river; but he surmised that probably it is not found on the Irrawaddy below Mandalay, the country being too open. It lives in troops, is not apparently very noisy, but is shy of man. It was on living specimens that he noticed the difference between this race, then identified by Wroughton as *barbei*, and typical *phayrei* from Mt. Popa in the coloration of the orbits, adding that the difference is not observable on dried skins. That is true. In most of his skins of *shanicus* the orbits appear to be coloured as in *phayrei*.

Flesh-measurements (in English inches) and weights (in lb.) of the three races *phayrei*, *crepusculus*, and *shanicus*:—

Name, locality and sex.	Head and body.	Tail.	Foot.	Weight.
phayrei.				
Mt. Popa; ad. ♂	24	32	7	17½
Kin, Lower Chindwin; ad. ♂.	22⅗	26⅗	6⅘	17½
Toungoo; ad. ♂	22½	31	7	—
Toungoo; ad. ♂	21½	34	7	—
Mt. Popa; ad. ♀ . .	21½	31	6	15½
W. of Kindat; ad. ♀	18½	25½	6	10½
W. of Kindat; ad. ♀	17½	28⅘	6⅘	15
crepusculus.				
Lampha, Tenasserim; ad. ♀	22	31½	6	16½
shanicus.				
Gokteik, N. Shan St.; ad. ♂	24	30	6½	19
Gokteik, N. Shan St.; ad. ♀	23	31	6½	15

14. **Trachypithecus obscurus** (Reid).

Semnopithecus obscurus, Reid, Proc. Zool. Soc. 1837, p. 14; Martin, Mag. of Nat. Hist. vi, p. 440, 1838; and of many subsequent authors under the same or other generic names.
Trachypithecus obscurus, Pocock, Proc. Zool. Soc. 1935, p. 940.

Locality of the *type*, unknown *.

Distribution.—The Malay Peninsula from Johore northwards into TENASSERIM and S.W Siam.

Resembling the typical race of *T. phayrei* in the pale hue on the mouth and round the eye, but the eye not entirely

* Martin's good description of Reid's type, a specimen exhibited in the Zoological Gardens, London, shows tolerably conclusively that it came from some place in the southern part of the Malay Peninsula. It was probably shipped from Singapore.

encircled, the pale area being restricted to a semicircle above and on its outer side. Further distinguished by the presence of a cap of pale hair on the crown usually sharply contrasted with the dark hue of the rest of the head and of the body, which is brown or blackish, without silvery sheen, but has the dorsal area usually paler than the flanks, often bronze-brown, and this tint spreads over the shoulders in front; the legs and tail are usually paler than the loins, sometimes a little, sometimes very conspicuously, and the underside is dark brownish or greyish-brown to nearly black.

There is no doubt about the close kinship between this species and *phayrei*, and in my paper on the Langurs of British India in 1928 I regarded them as subspecies of the same species on the supposition that intermediate forms would be found; and it is true that skins of typical *obscurus* from

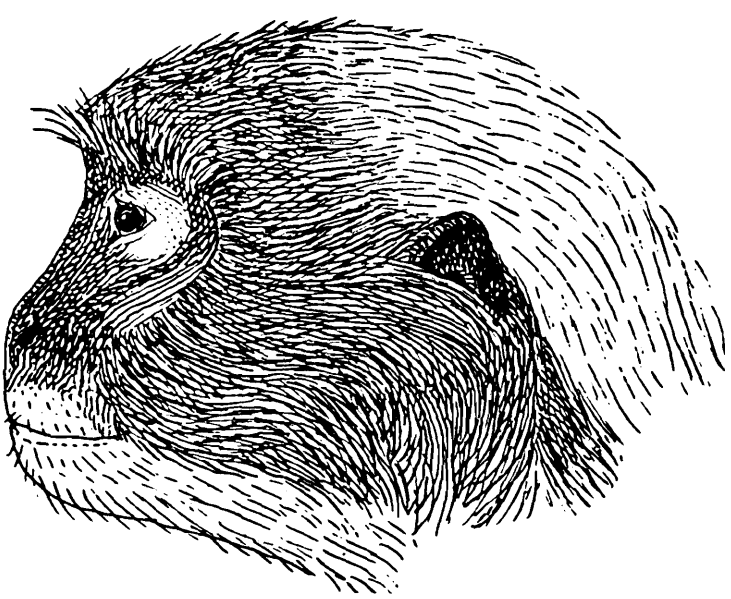


Fig. 42.—Head of *Trachypithecus obscurus flavicauda* from the mouth of the Tavoy River, showing the pale crown and nape.

the Malay Peninsula are often very like examples of *phayrei* from Upper Burma; but in Tenasserim the characteristic colouring of *obscurus*, i. e., the white cap and the pale contrasted tint of the hind legs and tail, become emphasized, and there is no indication whatever that in this district *obscurus* blends with the southern form of *phayrei*, i. e., *crepusculus*, which also occurs there.

The two races here admitted as members of the British Indian fauna may be provisionally * diagnosed as follows :—

a. Tail much paler than the legs, which are only a little paler than the loins . *sanctorum* (Elliot), [p. 140.

a'. Tail approximately the same tint as the legs, both being much paler than the loins *flavicauda* (Elliot), [p. 140.

* Provisionally because Elliot did not describe the colour of the legs in *sanctorum*. He merely compared the type-specimen with a more southern, darkish-legged form, without mentioning any difference in the hue of these limbs.

14 *a*. **Trachypithecus obscurus sanctorum** (Elliot).

Presbytis sanctorum, Elliot, Proc. U.S. Nat. Mus. xxxviii, p. 351, 1910.

Pithecus pyrrhus sanctorum, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 673, 1928.

Trachypithecus obscurus sanctorum, Pocock, Proc. Zool. Soc. 1934, p. 944.

Locality of the *type*, St. Matthew Island, Mergui Archipelago.

Distribution.—St. Matthew Island, so far as known.

Distinguished apparently from the other British Indian races by the comparatively slight contrast between the tint of the hind legs and of the loins, a feature in which it comes nearer to the typical race of *obscurus* from Selangor, Johore, etc., but differing from the latter in having the tail much paler than the legs.

The characters of this race are merely inferred from Elliot's untrustworthy description of it. He compared it to a race named *carbo* by Thomas in 1909, which inhabits Terutau Island, off the western coast of the Malay Peninsula, and is a blackish form with the legs and tail approximately matching and not very sharply contrasted with the loins. From this he distinguished the type of *sanctorum* by its creamy-white cap and buff-grey tail. If his description is correct, *sanctorum* is distinguished from the next race by the sharp contrast in colour between the tail and the hind legs. The uncertainty about *sanctorum* is particularly unfortunate because the name has page priority over the name of the next race, which is well known.

14 *b*. **Trachypithecus obscurus flavicauda** (Elliot).

Presbytis flavicauda, Elliot, Proc. U.S. Nat. Mus. xxxviii, p. 352, 1910.

Presbytis obscura smithi, Kloss, Journ. Nat. Hist. Soc. Siam, ii, p. 5, 1916.

Trachypithecus pyrrhus flavicauda, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 672, 1928.

Trachypithecus obscurus flavicauda, Pocock, Proc. Zool. Soc. 1934 (1935), p. 942.

Trachypithecus obscurus corax, Pocock, Proc. Zool. Soc. 1934 (1935), p. 944*.

* I have seen the type of *smithi*, not the type of *flavicauda* ; but the examination of a large number of skins from the northern portion of the Malay Peninsula convinces me that the alleged differences between them are merely individual, not racial. The supposed race *corax* was based on several specimens darker in hue both above and below than typical *flavicauda*, and regarded as representing the most northern race of *T. obscurus*. But since describing it I have received from Mr. H. C. Smith a skin from the mouth of the Tavoy River, a locality to the north of the type-locality of *corax*, and this skin is of the *flavicauda* type. Since a distinct subspecies is not likely to cut into the area of *flavicauda*, I abandon, for the present at all events, the idea that *corax* is a distinguishable form.

Vernacular.—Lutong, Lutong-laboo (Malay at Bankachon).

Locality of the *type* of *flavicauda*, Trang, Peninsular Siam; of *smithi*, Patiuyu in Peninsular Siam; of *corax*, Tenasserim Town.

Distribution.—From the northern part of the Malay Peninsula northward through TENASSERIM to Tavoy and to the Pechburi district of S.W Siam.

Distinguished from typical *obscurus* from the southern portion of the Malay Peninsula and from others found in the islands off the coast by the strong contrast between the pale whitish or greyish tail and hind legs from the hips to the ankles and the dark brownish or blackish hue of the rest of the dorsal surface up to the head, which has the typical pale, often silvery, conspicuous cap. From Elliot's description of *sanctorum* it differs from that form by the legs being pale, like the tail, not brownish, and contrasted with it.

This Leaf-Monkey is represented in the British Museum by skins from the following British Indian localities: Bankachon near Victoria Point, Tenasserim Town, Banlaw on the Great Tenasserim River (Shortridge), King Island, Mergui Archipelago (Pilgrim), and Tavoy (H. C. Smith).

A series of nine skins from Bankachon, December and January, shows considerable individual variations in details. The cap is usually silvery and conspicuous, sometimes soiled yellowish, sometimes quite inconspicuous; the back is mostly black or blackish, with a varying amount of bronze-brown or grey-brown on the shoulders; the arms vary from decidedly brown, only a little lighter than the shoulders, to pale, glistening, buffy-whitish or grey almost to the wrist, and nearly as pale as the legs; the legs, mostly clear whitish, may be ashy or pale smoke-grey; the tail may match or be contrasted with the legs, and is whitish or ash-grey or decidedly yellowish throughout, or ashy-grey in its proximal, smoke-grey in its distal half. Individual skins of this series closely match skins from localities in the northern part of the Malay Peninsula.

The proximity of St. Matthew Island, Mergui, to Victoria Point suggests the likelihood of identity between the Leaf-Monkeys of the two areas; but the description of *sanctorum* does not admit that determination, especially as Elliot referred a specimen from James Island, a few miles to the north, to *flavicauda*. This skin Kloss assigned to *smithi*, as also a skin from Kissaraing Island. The skin in the British Museum from King Island (September), as well as those from Tenasserim Town (March) and Banlaw (April), have the hairs of the belly darker, blackish when massed, than in the skins from Bankachon, in which they are paler, palish brown when massed; but the skin from Tavoy is like the Bankachon set.

A flat native imperfect skin from near Pechburi, S.W Siam (K. G. Gairdner), seems to agree best with Tenasserim Town and Banlaw skins.

Flesh-measurements (in English inches) and weights (in lb.) of *T. obscurus flavicauda*:—

Locality and sex.	Head and Body.	Tail.	Foot.	Weight.
Tenasserim Town (*corax* type); ad. ♂.	23½	28	6½	16½
Banlaw, Tenasserim; ad. ♂	22⅘	29½	6⅘	15½
King Island, Mergui; ad. ♂	25½	30½	6½	—
Bankachon; ad. ♀	25½	31	6½	—
Bankachon; ad. ♀	23	31½	6½	19
Bankachon; ad. ♀	21½	31½	6⅘	18½

According to Shortridge this Leaf-Monkey is almost as plentiful in the localities where he collected it as the White-handed Gibbon (*Hylobates lar*), but is much less noisy. The alarm-note is almost like that of a Macaque, and quite unlike the curious "hoot" of the Indian Langurs. It keeps to the thickest jungles and is rather shy of man.

15. **Trachypithecus pyrrhus** (Horsfield).

Semnopithecus pyrrhus, Horsfield, Zool. Res. Java (unpaged), 1820.
Presbytis pyrrha, Thomas & Wroughton, Proc. Zool. Soc. 1909, p. 372.
Trachypithecus pyrrhus, Pocock, Proc. Zool. Soc. 1934, p. 929.

Locality of the *type*, Java.

Distribution.—From Borneo through the Sunda Islands to the Malay Peninsula, Indo-China, Siam, and TENASSERIM.

Distinguished from *T. obscurus* and *T. phayrei* by the absence of the pale patch on the mouth, although the eyelids may be pallid, and by a sexual difference in the colour about the callosities. In the ♂ the hairs round the callosities are of the same tint approximately as those of the underside, but in the ♀ there is a patch of pale, usually white, hair beneath the callosities.

The general colour of this widely ranging species is very variable both individually and racially, ranging on the upper side from black, deep brown or dark grey, with the tips of the hairs of certain areas, occasionally restricted to the head and hind legs, but generally of other parts as well, pale buffish or grey, giving the pelage a spangled or frosted appearance; the hands, feet, and forehead are black, and typically at least the end of the tail as well, but there is never an isolated pallid cap on the occiput and crown as in *obscurus*.

15 *a*. Trachypithecus pyrrhus atrior (Pocock).

? *Presbytis barbei*, Blyth, 1863, and of Anderson, Blanford & Hill under other generic names (for references see above, p. 131) (not *P. barbei* Blyth, 1847).

Pithecus pyrrhus atrior, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 673, 1928.

Trachypithecus phayrei atrior, Pocock, Proc. Zool. Soc. 1934 (1935), p. 952.

Locality of the *type*, Ye Forest, 500 ft., inland of Moulmein in the Ataran district of Tenasserim *.

Distribution.—The northern part of TENASSERIM and adjoining areas of Siam.

Distinguished from *T phayrei* and *T. obscurus*, the other British Indian Langurs of this genus found in Tenasserim, by the characters mentioned in the diagnosis of *pyrrhus* and also by the generally darker hue of the upper and undersides. From *cristatus*, the Malayan race of *pyrrhus*, and *germani*, the Indo-Chinese and Siamese race, it differs by having the tail dark greyish, slightly paler than the back, instead of black distally, and darker than the back.

In the type, from the Ye Forest (Thurling), the coat is short, rather coarse and lustreless, with a few silvery spangles on the nape, the whiskers black, and the tail dark olive-grey. A second specimen ♀ from the foot of Mt. Nwalabo in Tavoy (Davison), April, has the long hairs over the ears, on the nape, upper arm, and on the leg to a less extent, with silvery sheen at the tip ; there is also some silvery spangling on the shoulders and back and a good deal of ashy-grey on the chest. In this ♀ there is only the merest trace of yellow hair detectable about the callosities in the badly made up skin ; but in a ♀ from Menam Hoi, S.W Siam (K. G. Gairdner), there is a visible patch of scanty hair below the callosities. In the type the eyelids are cut away, but in the skins from Nawlaboo, Menam Hoi, and two from Sai Yoke, S.W Siam (K. G. Gairdner), the eyelids have a livid, yellowish hue.

No flesh-measurements are available.

I suspect Blyth may have had in his hands a specimen or specimens of this monkey from the Ye District when, in 1863, he redescribed *barbei* and said it came from Tipperah. Also I think there is little doubt that the specimen from Mt. Mulai-yit assigned by Anderson to *barbei* represented it. Its affinities always have been a puzzle. I now think it is more nearly related to *T. pyrrhus cristatus*, which extends into the Malay Peninsula, than to the more northern species *T. phayrei* ; that it is, in fact, the most northern representative.

* This locality is the same as that originally assigned to *barbei* by Blyth, and the monkey agrees tolerably well with the one he described as *barbei* in 1863, when he corrected the locality to the Tipperah Hills, but it does not agree with the one described in 1847.

Skull-measurements (in mm.) of *Trachypithecus obscurus flavicauda* and *T. pyrrhus atrior*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular length.
T. o. flavicauda.							
Tenasserim Town (*corax* type); ad. ♂	106	84	78	60	32	27	76
King Island, Mergui; subad. ♂	101	82	78	61	27	27	74
Bankachon, Tenasserim; ad. ♂	102	83	79	64	27	26	75
Bankachon, Tenasserim; ad. ♀	95	78	71	57	23	27	70
Bankachon, Tenasserim; ad. ♀	93	76	71	55	24	26	69
T. p. atrior.							
Ye Forest, Tenasserim (type); ad. ♂	102	83	78	65	29	28	74
Nwalabo Mt., Tenasserim; ad. ♀	—	—	76	61	25	27	70

apart perhaps from *T. pyrrhus germani* of Siam and Cochin China, of *T. pyrrhus* rather than one of the most southern representatives of *T. phayrei*. But although it is an isolated form, not, so far as is yet known, intergrading either with

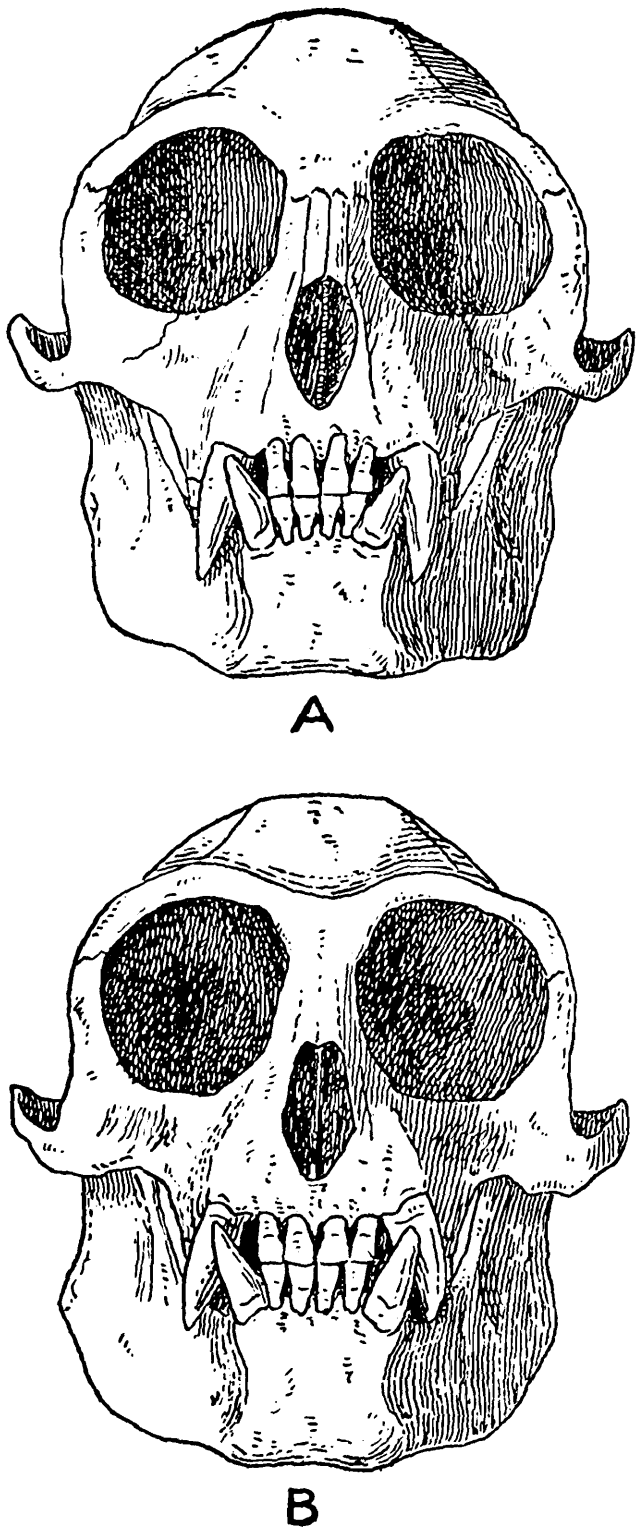


Fig. 43.—A. Facial view of skull of adult ♂ of *Trachypithecus phayrei shanicus* from Gokteik, N. Shan States. B. The same of adult ♂ of *T. pyrrhus atrior* from the Yɔ Forest, Tenasserim, differing in its larger orbits and complete brow-ridge. Both × ⅔.

cristatus or *germani*, I provisionally regard it as a distinct race of *pyrrhus*. One circumstance connected with it stands out quite clearly. Living almost alongside each other in Tenasserim and keeping absolutely apart, and entirely distinct from each other in colour, are the three Leaf-Monkeys *T. phayrei crepusculus*, *T. obscurus flavicauda*, and *T. pyrrhus atrior*. A fourth species coming into the same area is *Presbytis femoralis keatii* (see p. 161), which, according to the present conception of *atrior*, is, like it, a migrant from the south.

Genus **KASI** Reichenbach.

Kasi, Reichenbach, Vollst. Nat. Affen, p. 101, 1862; Hill, Ceyl. Journ. Sci. (B), xx, pp. 118 *et seq.* 1936.

Type of the genus, *johnii* (Fischer).

Distribution.—S. INDIA and CEYLON.

Distinguished from *Trachypithecus* by the newly-born young being black or very light silvery-grey with white cheeks,

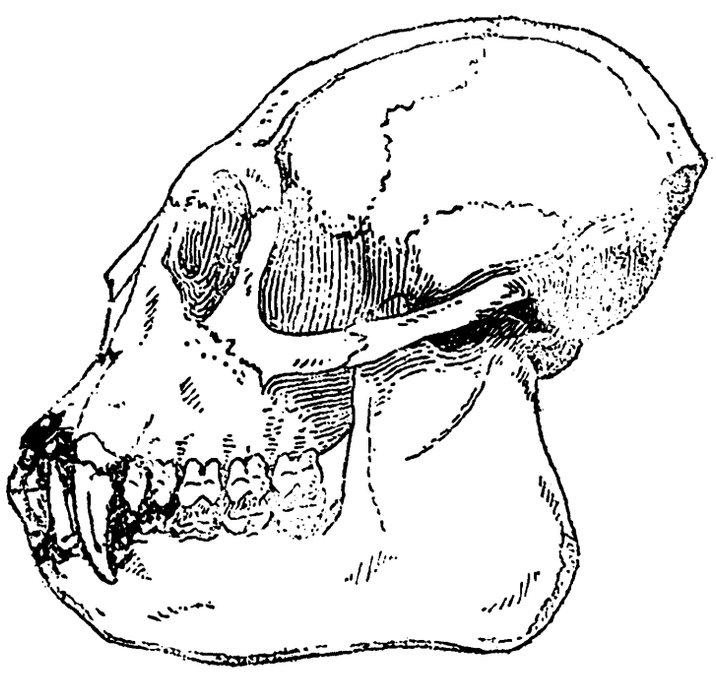


Fig. 44.—Skull of adult ♂ of *Kasi senex nestor* from Panadura, showing the sloped brow and more prominent angular portion of the mandible, by which the skull of this species may be distinguished usually from that of *Semnopithecus entellus thersites*. × ⅔.

and by the hairs of the sacral area (croup) being shorter than those of the fore-back. As in the type of *Trachypithecus*, namely, *pyrrhus*, the sexes differ a little in colour, the ♀ having a distinct patch of white hair below the callosities and sometimes spreading to a varying extent on to the base of the thigh.

The principal differences between the two species here admitted may be summarized as follows :—

a. Hairs of the cheeks typically tolerably uniformly brown and nearly matching those of the crown, never white at the base on each side of the face ; throat and chin darker than the crown ; end of the tail black. .. .. [p. 147. *johnii* (Fisch.),

a'. Hairs of the cheeks generally whitish throughout and contrasted with the crown, always white at the base close to the face ; throat and chin whitish or white and paler than the crown ; end of the tail lighter than the rest. [p. 150. *senex* (Erxl.),

16. **Kasi johnii** (Fischer).

Cercopithecus johnii, Fischer, Syn. Mamm. p. 25, 1829, and of most later writers on the Indian fauna, including Anderson and Blanford, but quoted as *johni* and cited under *Semnopithecus*, *Pithecus*, etc.

Semnopithecus cucullatus, I. Geoffroy, Zool. Vog. Bélanger, p. 38, p.. 1, 1834, and of Blyth, 1859 (*Presbytis*).

Semnopithecus jubatus, Wagner, Schreb. Säug. Suppl. i, p. 305, 1840, and of Jerdon, Mamm. Ind. p. 7, 1867 (*Presbytis*).

Pithecus senex johnii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 503, 1928.

Pithecus johni, McCann, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 624, 1932.

Pithecus vetulus johni, Hill, Ceyl. J. Sci. (B), xix, p. 79, 1934.

Kasi johni, Hill, Ceyl. J. Sci. (B), xx, p. 124, 1936 ; Proc. Zool. Soc. (Syst.), 1937, p. 206 (*johnii*) *.

Vernacular.—Turuni Kodan, *Pershk* (Toda) ; *Korangu* (Baduga and Kurumba), *Karing Korangu* (Mal.) ; *Kari-Mushya* (Coorg) ; *Mandi* (Tamil).

Locality of the *type* of *johnii*, Tellicherry ; of *cucullatus*, the Ghats (Bombay) ; of *jubatus*, South India.

Distribution.—The hill-tracts of SOUTHERN INDIA, the Western Ghats from Coorg southwards, the Nilgiri, Anamalai, Brahmagiri, Tinnevelly, and Palni Hills, usually not below 3,000 ft.

General colour of the body, limbs, and tail, to the apex, jet black above and below, but the dorsal surface typically shows a faint pale speckle under reflected light and frequently

* In 1928, when I associated this monkey and its Ceylonese allies. in the same group as the *entellus*-like Langurs, although giving them specific rank as *P. senex* and *P. entellus* respectively, the obvious course to follow was to regard the comparatively trivial differences between *johnii* and *senex* as of subspecific value to avoid suggesting their equivalence to the much greater differences between either of these forms and *entellus*. But now that *entellus* and *senex*+*johnii* are regarded as distinct genera, I agree with Hill that specific rank may be given to *johnii*, which, although very obviously closely allied to *senex*, does not actually intergrade with it.

there is a conspicuous grizzled patch on the loins, whence it spreads on to the extreme root of the tail and the upper part of the thighs; this patch varies greatly in distinctness and may be undetectable; head with a black brow-band, but the rest of the crown brown or buffy-brown, this tint spreading on to the nape; the long cheek-hairs also brown, generally a little darker than the crown, but the hairs black close to the face and on the chin; the throat with dark blackish-brown hair, darker than the crown.

Flesh-measurements (in English inches) and weights (in lb.) of some specimens in the British Museum and of others recorded by Kinloch and McCann and entered in Hill's Monograph :—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Nelliampathy Hills (Kinloch); ♂	28⅕	28⅖	7⅘	—
Nelliampathy Hills (Kinloch); ♂	25⅘	30⅗	7⅕	—
Tinnevelly (McCann); ♂	26	36	—	20
Kodaikanal, Palni Hills (McCann); ♂	25	27	—	29
Kodaikanal, Palni Hills (McCann); ♂	23	32	—	24
Brahmagiri Hills, S. Coorg (Shortridge); ad. ♂	25⅘	30⅗	7	—
Anamaad, S. Malabar (O'Brien); just. ad. ♂	22½	37	7¾	—
Kukkal Shola, Palni Hills (McCann); ad. ♀	24	32	7	25
Nelliampathy Hills (Kinloch); ♀	22⅓	28⅘	6	—

McCann recorded several wild-caught specimens in which the end of the tail was broken off, his larger ♂ from Kodaikanal being an instance. No doubt Kinloch's large ♂ had the same defect.

The skulls differ profoundly individually both in the degree of prognathism, which affects the slope of the facial plane, and in the length of the cranial. This is shown by the differences between the two skulls from Kotengady and Anamaad. The latter, an older skull, has a shorter, more vertical face and a very short back behind the auditory orifice. The length and width of the cranial portion of the two is as follows :—Kotengady, 83 × 60; Anamaad, 74 × 60 mm. Others are intermediate. The mandibles also differ. In the Anamaad skull the postdental portion has the hind border strongly convex in its lower half and no inferior emargination, whereas in the Brahmagiri Hills skull the postdental portion has the hind border much less convex and the lower border emarginate below. (For the dimensions of these skulls see p. 157.)

Habits.—In Coorg, according to Shortridge, this monkey is apparently confined to the southern slopes of the Brahmagiri Hills on the Wynaad border, where it occurs in the "sholas" or patches of jungle surrounded by grass country on the mountain sides. In this district, which he thinks is probably its northern limit, Shortridge recorded the species from 2,700 to 5,135 ft. It is eaten by the jungle tribes, who use its skin to make drums.

On the label of a specimen collected on the Colengody Estate, Cochin, 3,500 ft., Ryley O'Brien wrote: "Common, but very wideawake and difficult to get a shot at." At Anamaad in S. Malabar he secured the species at 3,200 ft.

Kinloch in 1923 described this species as formerly extremely common in the evergreen forest on the Nelliampathy Hills, where its noisy cry, "hoo-ha, hoo-ha, hoo," could be heard in every direction all day long; but its numbers are now greatly reduced owing to persecution by the jungle Mulcers and Kadars and coffee-estate coolies, who are inordinately fond of its flesh. He recorded its altitude in these hills as 3,500 ft.

Confirming and extending these observations, McCann (Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 624, 1934) states that the species occurs at the foot of the Tinnevelly Hills, but in the Palnis is not found below 3,000 ft. Here it frequents dense "sholas" and may often be noticed passing from one to another over the intervening open green stretches. Occasionally a solitary male, much scarred from fighting with a probably successful rival, may be seen, but more usually pairs or small companies. In the morning they are fond of sunning themselves in the tallest eucalyptus trees near the "sholas," but the afternoon is spent in sound sleep. When cornered in a tree, the monkey frequently drops to the ground and attempts to escape by running on all fours at a good pace. The natives, who highly prize the flesh, blood, and gall as cures for all diseases, use dogs to locate them, and are attracted to the spot by the barking of the monkey at its pursuers. At Kukkal Shola, in the Palni Hills, McCann secured a ♀ at 6,100 ft.

According to Hill the roar of the ♂ is like that of the Ceylonese Bear-Monkey (*K. senex monticola*). Other sounds are a short, sharp growl and a whining cry, the latter used more by the ♀ and young.

McCann's discovery at Kodaikanal of a ♀ with a full-time fœtus on May 8 and of very young specimens on December 20 and 29 suggests that there is no definite breeding season.

17. **Kasi senex** (Erxleben).

Cercopithecus senex, Erxleben, Regn. Anim. p. 24, 1777 *. (For other references see under the subspecific headings.)

Locality of the *type* and *distribution*, Ceylon.

General colour of the body and limbs varying from black to brown, the crown of the head and nape darker or lighter brown, usually paler than the shoulders and back, but the long whiskers, directed back over the ears, typically white and contrasted with the crown, sometimes pale brown at the ends, but always white at the base close to the black face; the throat and chin white or whitish, like the whiskers, and paler than the crown; the distal end of the tail becoming gradually paler to a varying extent.

Typical specimens of the four intergrading races of this species may be distinguished as follows :—

a. Crown and croup sharply contrasted by their paler hue from the darker shoulders and back; distal portion of tail more extensively pale.
  b. General colour of body and limbs black; crown deeper brown; whiskers sometimes brownish distally; croup-patch often silvery; size rather larger ... . [p. 151. *vetulus* (Erxl.),
  b'. General colour of body and limbs drabby or greyish-brown; crown paler brown; whiskers white; croup-patch not silvery; size smaller . ... [p. 153. *nestor* (Bennett),
a'. Crown and croup less contrasted by their paler hue, sometimes scarcely at all, from the generally brown hue of the shoulders and back; distal end of the tail less extensively pale. [p. 154.
  c. Coat shorter and thinner; tail longer .. *senex* (Erxl.),
  c'. Coat thick, shaggy, and long; tail shorter [(Kelaart), p. 156. *monticola*

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* Reasons for the adoption of this name are given on p. 154 (footnote). Another name that has been used for these Ceylon monkeys, even as lately as 1918 by Wroughton, is *veter* Linn., 1766, based upon a monkey described by Ray in 1793 as "white, with black beard" (? whiskers), and alleged to have come from Ceylon. No doubt Ray was told it was from Ceylon; but from the evidence of the description, by which one must abide, it did not, since no Ceylonese monkey has a black beard or whiskers. That is the reason why Blanford (Proc. Zool. Soc. 1877, p. 622), quite rightly, rejected it, and why it was not considered either by Hinton or myself. But in 1934 Hill said *veter* was the earliest name given to the "Purple-faced Monkey" of Ceylon. If so, it would have to come in for one of the races, as Wroughton, who, like Hill, preferred the alleged locality to the description, perceived. But Hill rejected it, not because of the "black whiskers," but because of the white body of the type, being unable to determine to which of the three races addicted to albinism the name applied. Now *veter*, which is not a *nomen nudum*, as Hill declared, is the type of *Pithecus*; and if assignable to the Purple-faced Monkey, as claimed, Hill should have taken *Pithecus*, not *Kasi*, as the generic name. Another name for this species, cited by Hill, and no doubt copied from Elliot or Forbes, *Macacus silenus* var. *alba*, Fischer (Syn. Mamm. p. 28, 1829). I can

17 *a*. **Kasi senex vetulus** (Erxleben).

Cercopithecus vetulus, Erxleben, Regn. Anim. p. 25, 1777.
Cercopithecus kephalopterus, Zimmermann, Geogr. Ges. ii, p. 185, 1780, and of many subsequent authors mostly as *cephalopterus*.
Pithecus vetulus vetulus, Hinton, Ann. Mag. Nat. Hist. (9) xi, p. 509, 1923 (with full synonymy); Phillips, Ceyl. J. Sci. (B), xiii, p. 273, 1926.
Pithecus senex vetulus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 501, 1928.
Pithecus vetulus vetulus, Hill, Ceyl. J. Sci. (B), xix, p. 58, 1934; Phillips, Man. Mamm. Ceyl. p. 14, 1935.
Kasi vetulus vetulus, Hill, Ceyl. J. Sci. (B), xx, p. 127, 1936.

Vernacular.—*Kala vandhura* or *Vandhura* (Sinhalese); *Mundi* (Tamil).

Locality of *types* of *vetulus* and *kephalopterus*, Ceylon.

Distribution.—The wettest parts of the lowlands of the west and south-west.

Face black, bordered at the sides by the white hairs of the cheeks, which are produced into long whiskers towards the ears, where they are frequently pale brown; chin and throat

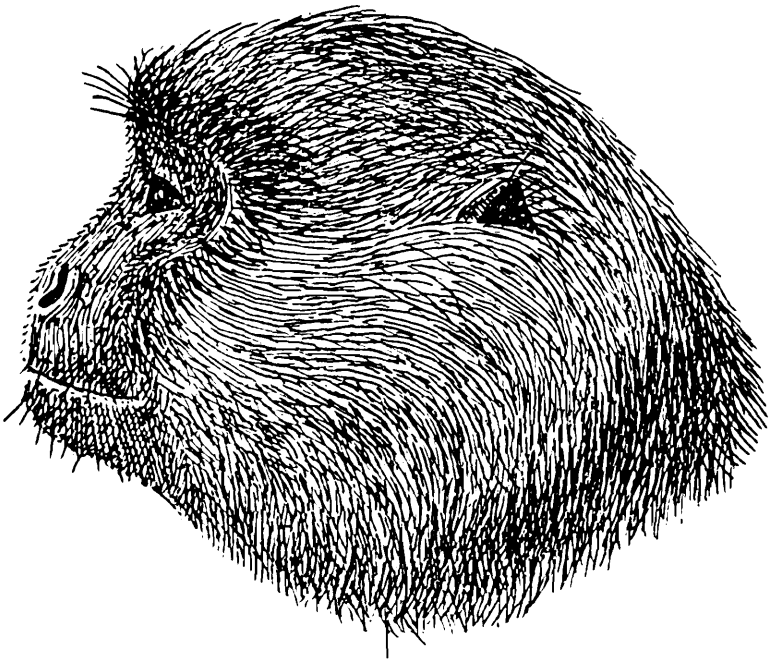


Fig. 45.—Head of John's Leaf-Monkey (*Kasi johnii*) from the Brahmagiri Hills, S. Coorg.

white or whitish. Crown and nape generally dark brown; shoulders, arms, flanks, and greater part of the back black or brownish-black, finely frosted with grey or buff in reflected light; hind-back to the base of the tail covered with a large

find no such entry in this work. There is, however, a paragraph reading "*Simia silenus* y alba; barba nigra," followed by a reference to *Simia veter* Linn. But from the context it is perfectly clear that "alba" is the first word of the description, not a systematic name.

patch of greyish or silvery short hairs, sharply defined against the black in front, and spreading on to the outside and back of the thigh, but dying away at the knee, the rest of the leg, like the whole of the underside, except the throat and chin, black or blackish; tail like rump-patch at base, then darker grey, but with about the terminal third conspicuously paler, dirty white *.

The following are the approximate flesh-measurements (in English inches) and weights (in lb.) of some specimens in the British Museum, and of others recorded by Phillips and Hill :—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Anasigalla (Hill and Phillips's largest); ad. ♂	26	29½	6⅜	17
Kalutara (Brit. Mus.); ad. ♂.	24	28	6½	—
Anasigalla (Brit. Mus.); ad. ♂.	21½	29	6½	12
Matara District, S.P. (Hill's smallest); ad. ♂	17⅜	27⅜	6	—
Phillips's average of 7; ad. ♂	21	28½	6	14½
Kalutara (Brit. Mus.); ad. ♀.	23	27½	6	—
Kalutara (Brit. Mus.); ad. ♀.	22	28	6	11½
Hiyere (Hill's largest); ad. ♀	21⅛	28	6	—
Phillips's largest; ad. ♀	21	30	6	11½
Matara (Hill's smallest); ad. ♀	17⅜	27⅜	6	—
Phillips's average of 9; ad. ♀.	19½	27	6	—

The individual variation in size in both sexes is considerable. I have assumed that the smallest ♂ and ♀ from Matara recorded by Hill are adult. It is curious that their three dimensions are exactly the same! The tail may be from about 4 to 10 in. longer than the head and body.

According to Hill and Phillips this race is restricted to the wettest part of the lowlands on the south-west and south of the island, between the coast and the mountains, where the average rainfall is from 75 to 200 inches per annum owing to the south-west monsoon, thus resembling the Malabar tract of India, where the equally black Leaf-Monkey (*K. johnii*) occurs. In the Udugama Hills it ascends to 3,000 ft.

It is generally found in the forests, wandering about in the tree-tops in troops consisting of 30 or 40 individuals of both sexes and all ages; but in the smaller jungles and near villages the troops are only up to ten or a dozen in number. In broken ground it may be seen clambering about the boulders. In places where it is left unmolested it is comparatively fearless; but where it is shot for food or its skins it becomes timid and goes crashing away with prodigious leaps through the forests or hides in the foliage at the approach of man. It feeds upon leaves, fruits, flowers, fern-fronds, and seeds, possibly, also, to a certain extent on tree-frogs,

* At least in my skins. According to Phillips the tail becomes reddish-brown towards the tip.

since a young one in captivity ate them with avidity. Its characteristic cry is a loud, oft-repeated "hooh! hooh! hooh!" heard in the early mornings, but a shrill shriek or bird-like twittering is also uttered.

No special breeding season is known, but the young are apparenly born mostly in February and March.

17 *b*. **Kasi senex nestor** (Bennett).

Semnopithecus nestor, Bennett, Proc. Zool. Soc. 1833, p. 67.
Pithecus vetulus nestor, Hinton, Ann. Mag. Nat. Hist. (9), xi, p. 510, 1923; Phillips, Ceyl. J. Sci. (B), xiii, p. 274, 1926.
Pithecus vetulus phillipsi, Hinton, Ann. Mag. Nat. Hist. (9) xi, p. 510, 1923.
Pithecus senex nestor, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 502, 1928.
Pithecus vetulus nestor, Hill, Ceyl. J. Sci. (B), xxiv, p. 62, 1934; Phillips, Man. Mamm. Ceyl. p. 18, 1935.
Kasi vetulus nestor, Hill, Ceyl. J. Sci. (B), xx, p. 127, 1936.

Vernacular.—*Vandhura* (Sinhalese); *Mundi* (Tamil).

Locality of *type* of *nestor*, Ceylon, probably Rayigam (Phillips); of *phillipsi*, Panadura.

Distribution.—The low-country wet zone of the Western Province.

Very like *vetulus* in the size and conspicuousness of the rump-patch and the extensive paleness of the tail distally, but distinguished by the general hue of the back being drabby-brown or greyish-brown and not so sharply contrasted with the rump-patch as the black of *vetulus*; the crown and nape, too, are paler, not so deep a brown as in *vetulus*. It is also rather smaller and lighter in weight than *vetulus*.

Approximate measurements (in English inches) of specimens in the British Museum and others recorded by Phillips and Hill:—

Locality and sex.	Head and body.	Tail.	Foot.
Kottawa (Hill's largest); ad. ♂	22	22⅘	6
Phillips's largest; ad. ♂ .. .	20½	30⅕	7¼
Panadura (type of *phillipsi*, Brit. Mus.); ♂	19⅘	28½	6½
Phillips's average of 6; ♂. .	20	26	6½
Gonabendaduwa (Brit. Mus.); ad. ♀	22⅖	30⅘	6⅕
Godigamuwa (Brit. Mus.); ad. ♀	21½	28	6
Godigamuwa (Brit. Mus.); ad. ♀	19½	25½	6½
Phillips's average of 11; ♀.	20½	26½	6

According to these dimensions females are at least as large as males. Hill's largest ♂ from Kottawa has an exceptionally short tail. It died in captivity, and if the tail-measurement is accurately recorded it seems probable that the organ was imperfect, as is often the case in captive monkeys. Phillips recorded the weight of a large captive ♂ as 8½ lb., the average of 2 ♂♂ as 7½ lb., and the weight of a small captive ♀ as just under 7 lb.

The range of this monkey is the low-country wet zone north of the Kaluganga, which separates it from *vetulus*, where the average annual rainfall is typically from 75 to 100 in., but reaches 200 in. in the foothills. On the coast it occurs at least as far as Colombo, but inland it ranges still farther to the north.

So far as is known its habits do not differ from those of *vetulus*.

17 *c*. **Kasi senex senex** (Erxleben) *.

Cercopithecus senex, Erxleben, Regn. Anim. p. 24, 1777 ; and of several subsequent authors under various generic names, including *Semnopithecus senex*, Blanford, Mamm. Brit. India, p. 35, 1888 ; *Pithecus senex senex*, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii p. 498, 1928.

Presbytis albinus, Kelaart, Prodr. Faun. Zeyl. p. 7, 1852.

Pithecus philbricki, Phillips, Ceyl. J. Sci. (B), xiv, p. 57, 1926.

Pithecus senex philbricki, Phillips, Ceyl. J. Sci. (B), xv, p. 122, 1929.

Pithecus vetulus philbricki, Hill, Ceyl. J. Sci. (B), xix, p. 74, 1934 ; Phillips, Man. Mamm. Ceyl. p. 23, 1935.

Kasi vetulus philbricki, Hill, Ceyl. J. Sci. (B), xx, p. 129, 1936.

Vernacular.—Kalu vandhura (Sinhalese) ; *Mundi* (Tamil).

Locality of *type* (not preserved) of *senex*, " hills of southern Ceylon " ; of *albinus*, Matale, C.P. ; of *philbricki*, Kantalai, E.P., near Trincomalee.

Distribution.—The hills east of Matale and Madulkelle up to 5,000 ft. ; also the low-country dry zone of the N.C.P., N.W.P., E.P., and C.P., " right across the Island in its northern lowland portion south of lat. 8° 30′, from Marich-chukkaddi on the west to Nilaveli on the east coast " (Hill).

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* The name *senex*, although admitted as valid by all authors, was discarded by Hill in 1934 as a *nomen nudum*, which it certainly is not, since it was given to monkeys from the hills of Ceylon described by Knox as " milk white." Hill's real reason apparently was its ascription to abnormally coloured individuals ; and for the same reason, with which no systematist will agree, he rejected *albinus* Kelaart, usually, if not always, regarded as a synonym of *senex*. When dealing with *philbricki* in his monograph of these monkeys in 1934, he said that since Kelaart's white monkey (*albinus*) came from Matale it was undoubtedly an albinistic specimen of *philbricki*, and that those seen, and described, by Robert Knox were probably also of this type. I entirely agree, and can see no escape from the dropping of *philbricki* as a synonym of *albinus*, since *philbricki*, and no other race, occurs near Matale and is known from Phillips's records to be liable to albinism, at least at Gammaduwa. Also I see no valid reason for dissenting from the traditional identification of *albinus* with *senex*, which, as the oldest name, has to be assigned, even arbitrarily if necessary, to one of the races of this Ceylonese species. Hill has done a great service by showing to which it belongs. I may add that when Phillips described *philbricki*, which was unknown to me when I published my paper in 1928, he was not aware of its occurrence in the hills by Matale, the type-locality of *albinus*.

Distinguished from *vetulus* and resembling *nestor* in the generally brown hue of the dorsal surface, but differing from the latter, at least typically, by the comparative inconspicuousness of the rump-patch, which is only a little lighter than the area in front of it. It is also larger than *nestor* and than *vetulus*, on the average, in all its flesh-dimensions.

The only skins of this race that I have seen are three from Kantalai, including the type, presented by the Colombo Museum, which have the rump-patch comparatively inconspicuous, and two unmeasured skins from Kala Oya, N.C.P., presented by Sir F Colyer. These have the rump-patch to all intents and purposes as well defined as in *nestor*, and I should have assigned them to that race but for Hill's record of "*philbricki*" from Kala Oya in 1936, based on seven specimens. But his measurements of Kala Oya specimens suggests that they are on the average rather smaller than typical members of this race. No doubt Kala Oya is one of the localities where the two races blend. In 1936 he summarized the characters of the race by saying that it "is distinguished mainly by its large size and very long white-tipped tail. The rest of its characters overlap those of other races." In none of my skins is the tail white-tipped. The extreme end is pale tawny, the pale area being less white and less extensive than in *vetulus* and *nestor*.

Flesh-measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Foot.
Palonnaruwa, N.C.P. (Hill's largest); ad. ♂. .. .	26½	33	7½
Palonnaruwa, N.C.P.; ad. ♂	24⅕	33½	7
Phillips's largest; ad. ♂	24½	33½	7
Kantalai (type of *philbricki*); ad. ♂	24	35	7⅘
Phillips's average of 4; ad. ♂ . ..	23½	33½	7
Phillips's largest, from Sigirya C.P.; ad. ♀.	25½	30⅘	7
Kala Oya (Hill); ad. ♀ ..	20	32⅘	6⅘
Kantalai (topotype); ad. ♀	19½	27	6
Phillips's average of 3; ad. ♀	21½	31	6½

The weight is variable. Phillips recorded a young ♂, from an unstated locality, as 22 lb., and reasonably surmised that an adult ♂ would scale 25 lb. But Hill's heaviest ♂ from Kala Oya was about 16 lb., 2 ♀♀ from the same locality were about 15¾ lb. and 9½ lb. respectively, and 4 adult ♂♂ from Palonnaruwa were about 13¼ lb. each.

This race is the only one of the four that inhabits the same area of Ceylon as the Langur (*S. entellus thersites*). As indicated above, it has a wide and varied range. According to Phillips it spends much of its time sitting high up in the branches of leafless trees or climbing leisurely from bough to bough. In the lowland jungles those he encountered had

little fear of man ; but in the hills and jungles at Gammaduwa and elsewhere, where it has been hunted for its flesh and skin, it is very wary and shy.

17 *d*. **Kasi senex monticola** (Kelaart).

Presbytis cephalopterus var. *monticola*, Kelaart, Journ. As. Soc. Ceyl. ii, p. 321, 1850, and Prodr. Faun. Zeylan. p. 2, 1852.
Presbytis ursinus, Blyth, Journ. As. Soc. Beng. xx, p. 155, 1851 ; and of many later authors, including Blanford.
Pithecus senex monticola, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 502, 1928.
Pithecus vetulus monticola, Hill, Ceyl. J. Sci. (B), xix p. 68, 1934 ; Phillips, Man. Mamm. Ceyl. p. 21, 1935.
Kasi vetulus monticola, Hill, Ceylon J. Sci. (B), xx, p. 128, 1936.

Vernacular.—*Maha vandhura* (Sinhalese) ; *Mundi*, *Periya mundi* (Tamil).

Locality of the *types* of *monticola* and *ursinus*, Nuwara Eliya.

Distribution.—The central hill ranges above 4,000 ft.

Generally resembling normally coloured specimens of *senex*, exemplified by skins described as typical "*philbricki*,"

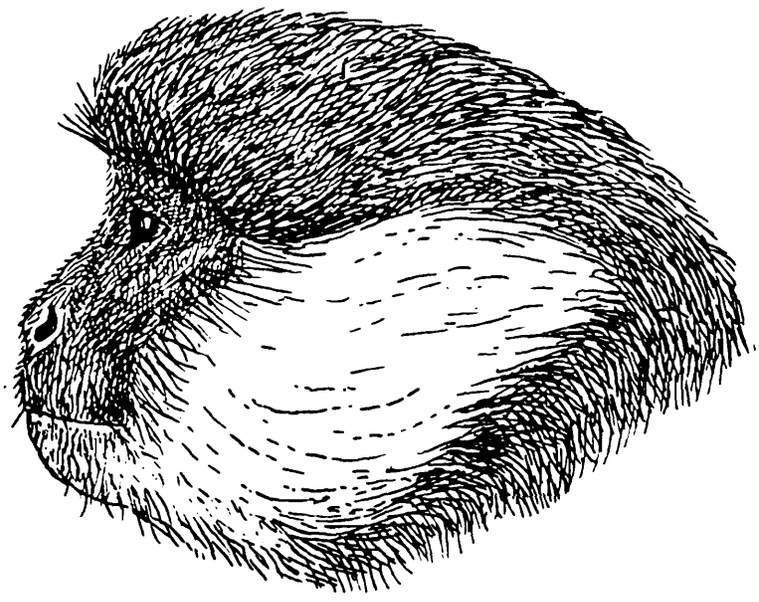


Fig. 46.—Head of the Bear-Monkey (*Kasi senex monticola*) from Hakgalla in Uva, 5,600 ft.

in its tolerably uniform brown hue, with the "cap" and rump-patch at most only a little lighter and contrasted, and with the white whiskers long and conspicuous, but distinguished by its long, shaggy, thick, luxuriant coat, relatively shorter tail, and more massive build.

Of this race, sometimes called the Bear-Monkey, from an example of it being mistaken by Major Forbes for a Sloth-Bear, the British Museum has a skin in poor condition received from Kelaart, one from Hakgalla, 6,210 ft., one from Pattipola, 6,200 ft. (E. W Mayor), and one from Adam's Peak (S. B.

Skull-measurements (in mm.) of the species and races of *Kasi*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Zygo-matic width.	Orbital width.	Maxillary width.	Upper molars.	Mandi-bular. length.
K. johnii.							
Kumblacodia, Cochin ; ad. ♂	111	88	85	69	32	30	83
Kotengady, S. Cochin ; subad. ♂	106	87	79	64	28	30	78
Brahmagiri Hills, S. Coorg ; ad. ♂.	103	85	80	67	33	31	78
Anamaad, S. Malabar ; just ad. ♂	96	79	78	63	29	29	75
Nilgiri Hills ; subad. ♀	94	72	67	60	23	27	63
K. senex senex.							
Kantalai (*philbricki* type) ; ad. ♂	108	87	81	67	31	27	76
Kantalai ad. ♀	93	75	74	58	24	28	68
K. s. monticola.							
Adam's Peak ; ad. ♂	105	86	81	64	30	28	77
Pattipola, C.P. ; ad. ♂	104	84	—	63	29	30	75
K. s. nestor.							
Panadura (*phillipsi* type) ; subad. ♂	98	79	75	60	26	27	70
Panadura ; ad. ♀	94	79	72	59	23	27	70
Panadura ; old ♀	93	73	67	56	23	25	66
K. s. vetulus.							
Matugama ; yg. ad. ♂	91	75	69	55	26	26	67
Matugama ; ad. ♀	85	70	69	55	21	26	61

Bell) without record of altitude. This is blacker than the last two. Kelaart got his type from 6,185 ft. in Nuwara Eliya, and Hill recorded a specimen from the Elk Plains, 6,000 ft.

Flesh-measurements (in English inches) and weights (in lb.):—

Locality and sex.	Head and body.	Tail.	Foot.	Weight.
Pattipola (Brit. Mus.); ad. ♂	23⅘	24⅗	7	20
Bogawantalawa (Hill); ad. ♂.	23⅗	28	6⅗	—
Hakgalla (Hill and Phillips's largest); ad. ♂ .. .	22⅕	28	6⅗	20
Phillips's average of 2; ad. ♂.	21½	27	6½	—
Phillips's largest; ad. ♀..	23⅗	28	6⅗	20½
Bogawantalawa (Hill); ad. ♀.	22½	25½	6⅘	—
Hakgalla (Brit. Mus.); ad. ♀.	21½	26½	6½	16½
Phillips's average of 3; ad. ♀.	22½	26	6⅘	20

It will be noticed that Phillips's largest ♀ has exactly the same dimensions as Hill's ♂ from Bogawantalawa. They were probably taken from the same specimen, differently sexed by the authors.

According to Phillips this monkey is now found only in the jungles of the high mountain ridges and in the forests around Hakgalla, the Bopats and the Horton, Moon and Elk Plains.

Owing to the persecution to which it has been subjected, largely for its luxuriantly coated skin, it is not only extremely timid of man, but is in some danger of extermination. It has already been killed out in certain districts where it was formerly known, and is rare in localities where it still survives. Its habits are the same as those of the other races. It lives in troops among the tree-tops, and on the approach of man either retreats precipitately through the forest or hides in the foliage, concealed by its sombre hue, its white whiskers blending with the clumps of lichens growing on the branches. Soon after dawn, especially in the north-east monsoon, its presence in troops is indicated by its loud cry, "hooh! hooh! hooh!" echoing across the valleys from the high jungles (Phillips).

Genus **PRESBYTIS** Eschscholtz.

Presbytis, Eschscholtz in Kotzeb. Reise, p. 533, 1821; and of many subsequent authors in part.

"The *Aygula*-group of *Pithecus*," Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 675, 1928.

Presbytis, Pocock, Proc. Zool. Soc. 1934, p. 896 (*sensu stricto*); Hill, Ceyl. Journ. Sci. Zool. & Geol. xx, pp. 116–23, 1936.

Type of the genus, *mitrata* Esch. (=*Simia aygula* Linn.; see Thomas, Proc. Zool. Soc. 1911, p. 128).

Distribution.—From TENASSERIM and S.W. Siam, south-eastwards to Borneo.

Distinguished from *Trachypithecus* and *Kasi* by the sum of a number of characters of which one or more may fail when all the species of the genus are considered, but which hold good, so far as is known, in the case of the British Indian species of the two genera.

The newly-born young is of the "cruciger" type, the general whiteness of the colour being relieved by a dark spinal stripe, whence on the shoulders a dark stripe extends on each side to the arms. In the adult the inner side of the thigh is conspicuously white and sharply marked off from the darker hue of the outer surface.

In the adult ♀ the perinæum is comparatively long, as long as the vulva, which is situated lower down between the callosities; the clitoris does not lie between the labia of the vulva, but is external to it, below and sunk in a small pit in the centre of a rounded swelling which projects below the callosities*.

The skulls of both genera are subject to a good deal of individual variation, but on the average the cranium of *Presbytis* is less sharply constricted behind the orbits, has the occipital region more inflated, with a weaker crest, the brow-ridges weaker, with the upper edge of the orbits straighter, less arched, giving a "frowning" aspect to the brow, the nasal bones prominently convex, the anterior nares broader below, less elongated, the muzzle more abbreviated, and there is a well-marked emargination where the zygomatic arches join the maxillæ; the mandible finally is not so robust, especially in its postdental portion. (See also Shortridge's note on the appearance of the face in the only British Indian representative of *Presbytis*, recorded on p. 163.)

18. **Presbytis femoralis** (Martin).

Semnopithecus femoralis, Martin, Charlesw. Mag. Nat. Hist. (new series) ii, p. 436, 1838 (first description of the species named *femoralis*, but not described by Horsfield in Appendix to 'Life of Sir S. Raffles,' p. 642, 1830.)

Semnopithecus or *Presbytis femoralis* of Anderson, Blanford, and other authors, including Miller, Smiths. Misc. Coll. lxi, p. 28, 1913.

Pithecus femoralis, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 675, 1928, and Proc. Zool. Soc. 1935, p. 900 (under *Presbytis*).

Locality of the *type*, Singapore (selected by Miller).

Distribution.—From TENASSERIM and S.W Siam through the Malay Peninsula to Sumatra, the Rhio Archipelago, and Natuna Island.

Hair of the forehead typically parted by a pair of whorls from 20 to 24 mm. behind the brow, rising into an erect

* The characters of the ♀ external genitalia have only been observed in one specimen of *P. melalophus* from Sumatra, and were described and figured in my paper in 1934.

crest between them and projecting forwards as a long fringe over the brow and forming a high, thick tuft or crest on the crown. Colour of the upper side varying from very dark brown to pale sepia-brown; the buttocks may be brown like the back or whitish and sharply contrasted with it; the

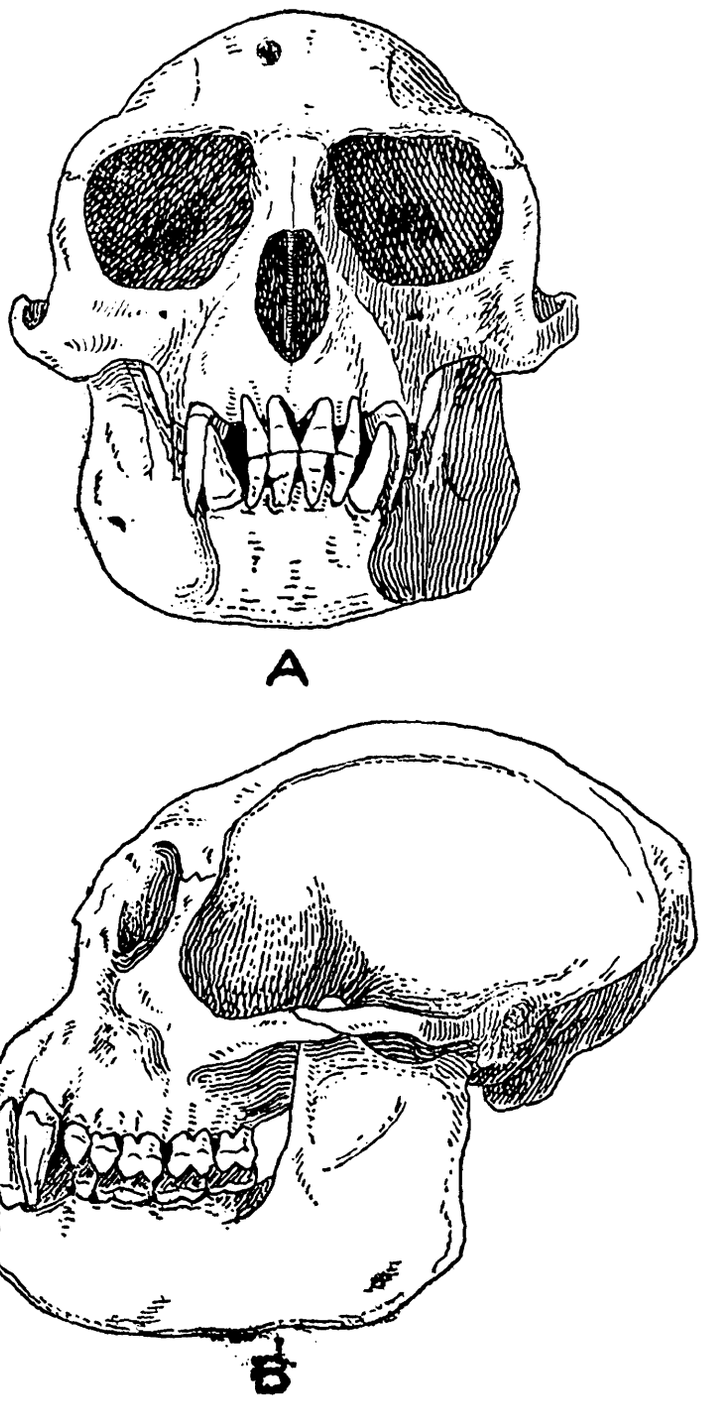


Fig. 47.—A & B. Front and side views of skull of adult ♂ *Presbytis femoralis keatii* from Bankachon, Tenasserim. × ⅔.

underside similarly varies from brown to white, but the underside of the tail is always dark, hardly paler than the upper side, and never strongly contrasted with it; the limbs externally become blackish towards the hands and feet,

but the inner side of the arm may be whitish from the axilla to the elbow, and the inner side of the thigh is always white and sharply defined from the dark outer side, the white frequently extending as a narrow stripe between the knee and heel. The face is black with the lips flesh-coloured and clothed with white hair, and the eyelids are also to a certain extent pale.

18 *a*. **Presbytis femoralis keatii** Robinson & Kloss.

Presbytis neglecta keatii, Robinson & Kloss, Journ. Fed. Mal. St. Mus. iv, p. 174, 1931.
Pithecus femoralis keatii, Wroughton, Journ. Bomb. Nat. Hist. Soc. 1915, p. 702; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxii, p. 676, 1928.
Presbytis femoralis keatii, Pocock, Proc. Zool. Soc. 1935, p. 902.
Presbytis robinsoni, Thomas, Proc. Zool. Soc. 1910, p. 634.

Vernacular.—*Lutong-koka* (Tenasserim).

Locality of the *type*, Trang, in northern Malay Peninsula.

Distribution.—From the northern Malay Peninsula (Trang and Perak) to TENASSERIM and S. Siam, west of Bangkok.

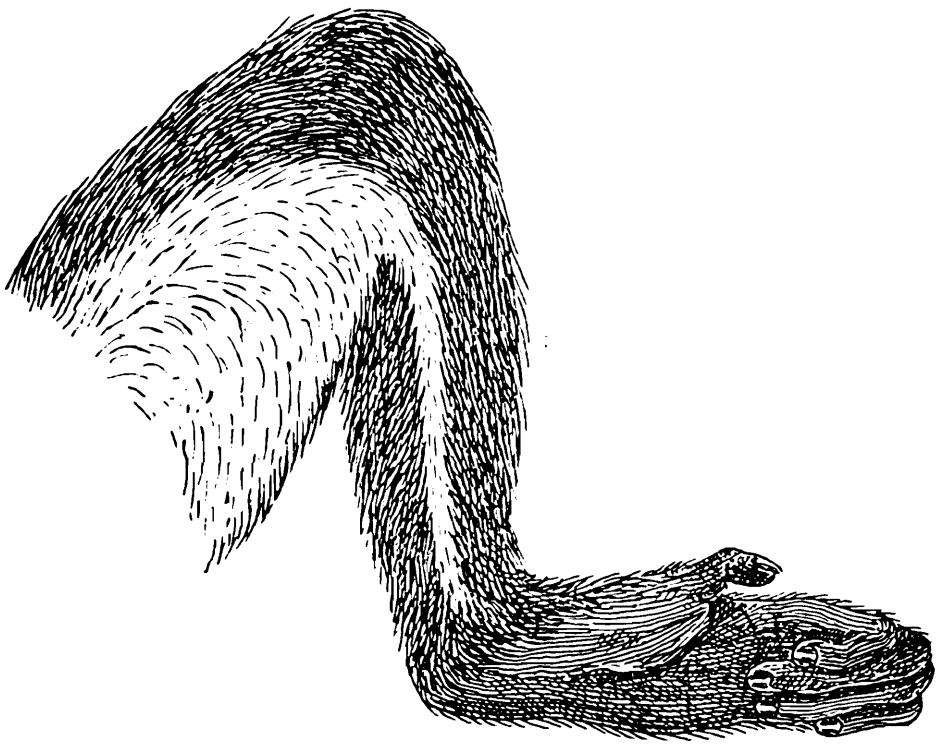


Fig. 48.—Inner surface of leg of *Presbytis femoralis keatii* from Malewoon, Tenasserim.

Resembling typical *femoralis* from Singapore and other districts in the southern portion of the Malay Peninsula in being entirely darker or lighter brown above from the brow backwards and on the outer side of the limbs and on the

buttocks and outer side of the thighs; but distinguished by the whole of the underside from the throat to the inguinal region, being dark brown, without a median white stripe, and with the narrow stripe on the inner side of the leg usually extending to the ankle, whereas in typical *femoralis* the underside is dusky greyish-black, relieved by a narrow white stripe running backwards from the chest, and the white on the inner side of the hind leg passes only a little way below the knee.

As I recorded in 1934, two partially albino examples of this race were collected in the Malay Peninsula. One of them, from Trang, the type-locality of *keatii*, Thomas described as a distinct species, *P. robinsoni*. It is mostly covered with

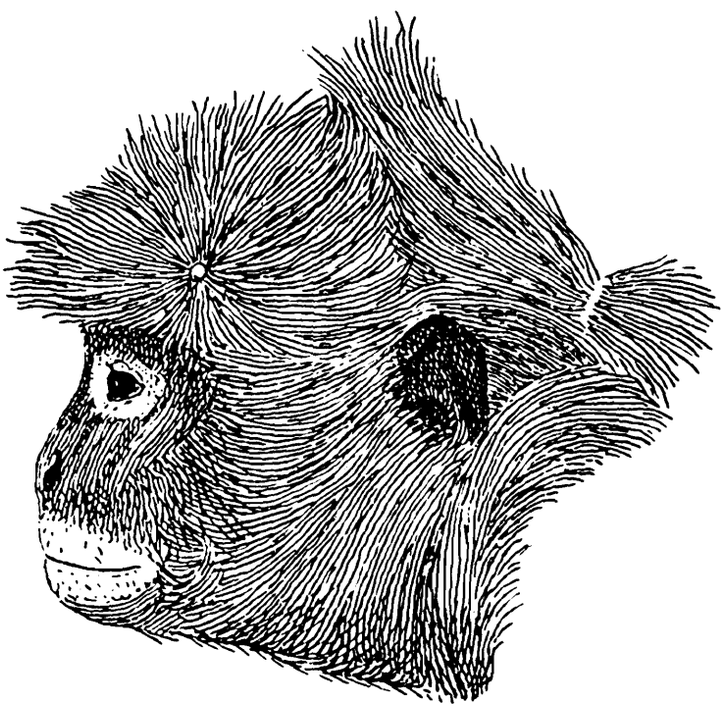


Fig. 49.—Head of *Presbytis femoralis keatii* from Malewoon, Tenasserim.

a mixture of grey and white hairs above, but has the hands and feet dark brown and the end of the tail greyish-brown. The other, taken at Bandon, in association with typical *keatii*, is even paler, being mostly creamy-white, with the hands and feet pale buff-brown, darkening on the fingers and toes. Not improbably similar mutants will be found in Tenasserim.

The flesh-measurements (in English inches) of two typically coloured examples, collected by Shortridge in Tenasserim, are as follows :—

Malewoon, ad. ♂ : head and body 22$\frac{2}{5}$; tail 31$\frac{2}{5}$; hind foot 7$\frac{1}{5}$.
Bankachon, ad. ♀ : head and body 22$\frac{1}{5}$; tail 32$\frac{4}{5}$; hind foot 7$\frac{1}{5}$.

The weight of the ♂ was 15$\frac{1}{2}$ lb., of the ♀ 14$\frac{1}{2}$ lb.

The equality in size of the body-measurements between the sexes is borne out by the skulls, as the following dimensions (in mm.) show :—

Locality and sex.	Total length.	Condylo-basal length.	Zygomatic width.	Orbital width.	Maxillary width.	Upper molars.	Mandibular length.
Malewoon, Victoria Point, Tenasserim; ad. ♂	96	72	72	64	26	25	69
Bankachon, Victoria Point, Tenasserim; ad. ♂	—	—	76	63	29	24	70
Malewoon, Victoria Point, Tenasserim; ad. ♀	93	72	70	62	23	24	69

The largest known skull, that of an adult ♂ from west of Bangkok, in Siam, has a total length of 101 mm. and a condylo-basal length of 82 mm.

Next to nothing of the habits of this Leaf-Monkey has been noted, but they probably differ in no respect from those of other species of the family. The large male from Siam, west of Bangkok, was said by its collector, K. G. Gairdner, to represent a purely mountain form; but the specimens collected by Shortridge came from comparatively low levels in Tenasserim, where it is "apparently not at all plentiful and rather shy." On freshly-killed specimens Shortridge observed that the "facial area is very small and quite unlike that of Burmese and Indian Langurs. The mouth is pinkish-white, but the orbits are dusky flesh-coloured and not a conspicuous feature."

Suborder *LEMUROIDEA*.

Distinguished from the PITHECOIDEA (p. 14) by retaining the *rhinarium*, or moist area of naked skin round the nostrils, with its extension as a narrow strip, or *philtrum*, to the edge of the upper lip, dividing it into a right and left portion, and by the adherence of the lip in the middle to the gum so that it is not protrusible. The hands and feet have the fourth digit never shorter than the third, in almost all cases longer. and the second digit of the foot is armed with a distinct claw, quite different from the flat nail of the rest of the digits. The tongue has a well-developed, underlying lamina, with serrated free end, the *sublingua*.

The skull has the orbit communicating with the temporal fossa, there being no bony partition between the two. The lower canine is reduced in size, incisiform, and projects forwards alongside the similarly projecting incisors, the six teeth

combining to form a comb-like structure, and the two median upper incisors are separated by a distinct space.

The LEMUROIDEA and the suborder CHIROMYOIDEA, containing the aberrant Aye-Aye (*Chiromys* or *Daubentonia*), which has rodent-like dentition and other peculiarities, constitute the Strepsirhine division of the Primates, distinguished from the Haplorhine division, containing the TARSIOIDEA and PITHECOIDEA, by the structure of the nose and the non-protrusible upper lip, by the absence of the postorbital partition in the skull, and by the peculiar arrangement of the lower incisors and canines. These teeth act as a comb for scraping the fur and skin, and the function of the sublingua is the removal of particles from the teeth. The claw on the second digit of the foot also acts as a scratcher and cleaner of the fur.

The Asiatic LEMUROIDEA belong to a single family.

Family LORISIDÆ.

Distinguished from the families Lemuridæ and Indrisidæ, which inhabit Madagascar, by the tympanic bone being large and external to the bulla, of which it forms the outer wall, not small annuliform and enclosed within it. Also by the clitoris being traversed throughout by the urethral canal, which opens at its tip, instead of openly grooved behind, with the orifice of the urethra at its base.

The tail is very short or absent. The hands and feet have the first digit (pollex and hallux) relatively very large and capable of considerable backward extension; the second digit is abbreviated, the remaining three being strong, these features, associated with a short, broad, well-padded palm and sole and short hairy heel, combining to give a tenacity of grip unequalled in other families of Primates.

Mammæ 4, tolerably widely spaced on the hinder part of the chest and the fore part of the abdomen.

The skull has the muzzle moderately elongated, with its upper and lower edges nearly parallel and the anterior nares terminal; the orbits are expanded, with thickened rims, the cranium has a pair of strong temporal ridges, which only occasionally coalesce, and the occiput does not project far beyond the condyles. The dental formula is $i.\frac{2}{2}$, $c.\frac{1}{1}$, $pm.\frac{3}{3}$, $m.\frac{3}{3}$; the first lower premolar is large and canine-like, closing behind the upper canine.

To this family also belong the two genera of African Pottos (*Perodicticus* and *Arctocebus*), distinguished from the Asiatic by, among other characters, almost complete suppression of the second digit of the hand. A closely related family is the Galagidæ, comprising the African Galagos, which have

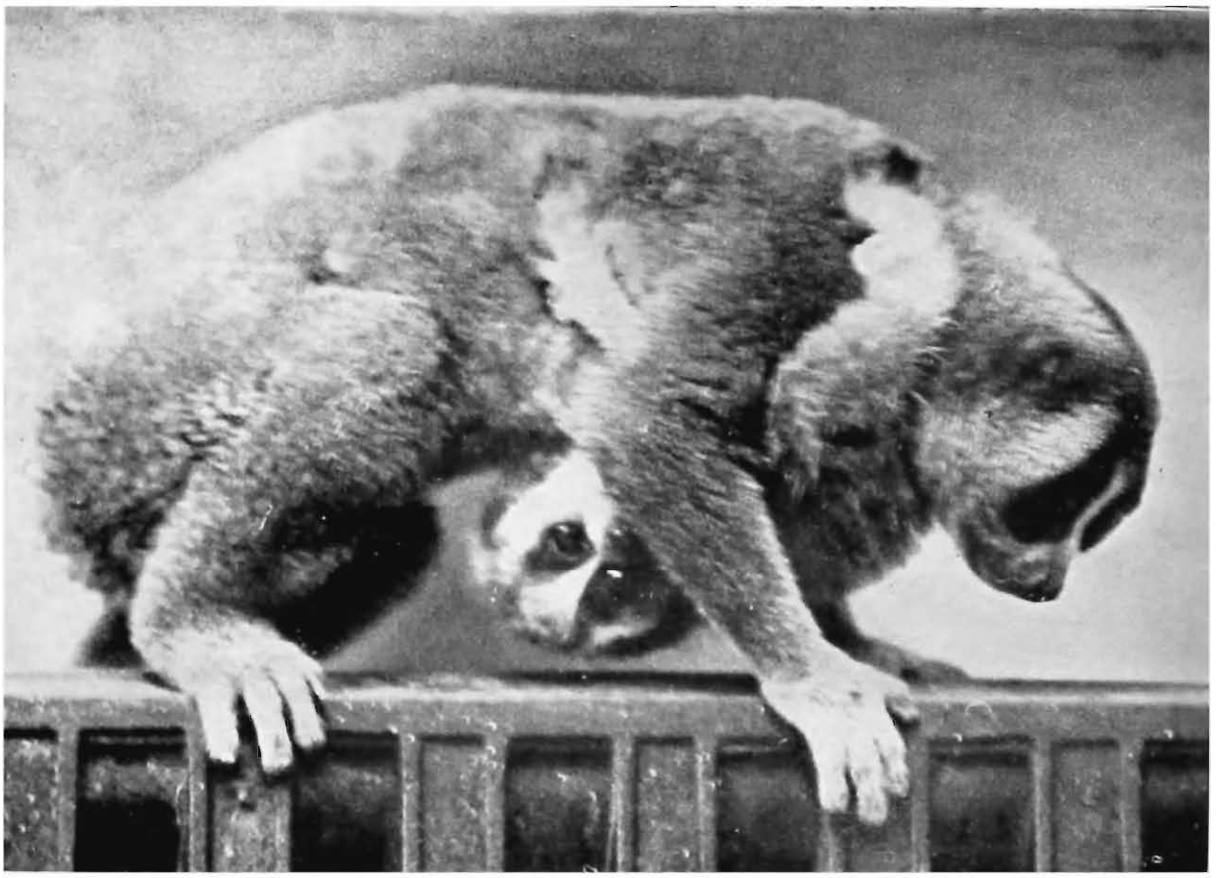


Photo W. S. Berridge

Slow Loris (*Nycticebus coucang*).



Photo F. W. Bond.

Slender Loris (*Loris tardigradus*).

the tail and the heel very long, in conformity with prodigious leaping capacity, in great contrast to the complete inability to leap exhibited by the Lorises and Pottos.

The two Asiatic genera may be briefly diagnosed as follows :—

a. Ears small, limbs stout, tail prominent; skull with shorter snout and palate, narrower orbits, etc.	[E. Geoffr., p. 165. NYCTICEBUS
b. Ears moderately large, limbs very slender, tail typically suppressed externally; skull with elongated snout and palate, broader orbits, etc.	[p. 174. LORIS E. Geoffr.,

Genus **NYCTICEBUS** E. Geoffroy.

Nycticebus, E. Geoffroy, Ann. Mus. Hist. Nat. Paris, xix, p. 162, 1812 ; and of subsequent authors.

Type of the genus, *bengalensis* E. Geoffroy.

Distribution.—S.E. Asia from N.E. BENGAL, ASSAM, UPPER BURMA, and Laos southward to Annam, the Malay Peninsula, and through the Sunda Islands to Borneo.

Body robust ; limbs stout, with powerful hands and feet and thick digits ; head rounded, the muzzle rounded, with the upper jaw and nose not very noticeably projecting beyond the lower jaw ; ears reduced, nearly concealed in the fur, the margin rounded, the supratragus valvular and surmounted by a small supplementary ridge and small pocket-like submarginal depression just above the position of the suppressed antitragus ; tail always present, but conical and short, from ½ to 1 in. long. Skull with interorbital septum moderately broad ; orbits expanded, but not so wide across as the zygomatic arches ; the nasals and premaxillæ only slightly produced beyond the level of the upper incisors ; the palate not prolonged beyond the level of the last molars, and the median upper incisors larger than the laterals, which may be absent.

Until 1902 the Slow Lorises were cited by all writers, except a few of early date, as *Nycticebus tardigradus*. But in that year Stone and Rehn (Proc. Acad. Nat. Sci. Philad. lv, p. 141) pointed out that the name *tardigradus* Linn. belongs to the Slow Loris of Ceylon. They substituted *coucang* Bodd. for the Slow Loris, admitting a considerable number of local races, which, with many others subsequently described, were cited as " species " or " subspecies," according to the fancy of authors. But there is abundant evidence, in my opinion, that many of these so-called " species " or " subspecies " were based on purely individual differences, often due to seasonal changes in the coat and colour, and I here adopt the conclusion that there is but one species of *Nycticebus*, for which the oldest known name is *coucang*.

19. **Nycticebus coucang** (Boddaert).

Tardigradus coucang, Boddaert, Elench. Anim. p. 67, 1785 (*Tardigradus* preocc.). (For other references and synonymies, see under the subspecific headings.)

Coat, in good condition, consisting of copious underwool and abundance of longer, stiffer, but soft contour hairs. General colour very variable, but the back, in good coat, always ornamented with a conspicuous dark spinal stripe extending sometimes from the root of the tail and reaching the crown, where it may be narrow and cease or broad and branched, and extend laterally to the ears and eyes, the areas around those organs being always darkish-tinted; the forehead in the middle line, the interocular area, and the muzzle always white; the cheeks and temples paler than the crown, sometimes white. When these white areas and the dark stripes to the eyes and ears are well defined they constitute a characteristic facial pattern or "mask." But sometimes the extension of the white areas over the crown obliterates the stripes, leaving the whole head pale, except for the tinted areas round the eyes and ears and the median stripe on the crown, and every stage in the development and obliteration of the darker markings may be traced.

The three British Indian races of the Slow Loris here admitted may be briefly distinguished as follows :—

a. Head and neck pale, mostly whitish or grey, the median stripe on the nape and crown narrow, with at most faint stripes to the eyes and ears.	
a'. Stripe ceasing on the middle of the crown, cut off from the coloured areas round the eyes and ears; size larger . . .	[(Fischer), p. 166. *bengalensis*
b'. Stripe typically bifurcating and passing to the eyes, stripes from the ears nearly reaching the point of bifurcation; a little smaller . .	[Elliot, p. 169. *tenasserimensis*
b. Head and neck mostly well coloured, the stripe broad on the nape and crown and extended broadly forwards to the eyes and laterally to the ears; general colour brighter and size still smaller . .	[p. 171. *coucang* (Bodd.),

19 *a*. **Nycticebus coucang bengalensis** (Fischer).

Loris bengalensis, Fischer, Anat. Maki, p. 30, 1804; Tiedemann, Zool. i, p. 334, 1808.

Nycticebus bengalensis, Geoffroy, Ann. Mus. d'Hist. Nat. xix, p. 164, 1912 (in part).

Nycticebus tardigradus, Fischer, Syn. Mamm. p. 71, 1829; and of many later authors, at least in part, including Blyth, Jerdon, Anderson, Blanford, and other writers on Indian Mammals till 1902 (not *Loris tardigradus* Linn.).

Nycticebus cinereus, M.-Edwards, Nouv. Arch. Mus. Bull. iii, p. 9, 1867; and of Anderson (1881), Elliot (1912), Osgood (1932) as a subspecies.

Nycticebus incanus, Thomas, Ann. Mag. Nat. Hist. (9) viii, p. 627, 1921.

Nycticebus bengalensis, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 433, 1922.

Type, "Le paresseux pentadactyle du Bengale," Vosmaer, Descript. Anim. p. 18, pl. 6, 1770.

Locality of the *type* of *bengalensis*, Bengal; of *cinereus*, Bangkok; of *incanus*, Kyeikpadein, Pegu.

Distribution.—ASSAM*, TIPPERAH, CHITTAGONG, UPPER and LOWER BURMA, Siam, Laos, and Annam.

Distinguished by its larger size and pale head, the median stripe ceasing in the centre of the crown and not extended forwards or laterally to join the coloured areas round the eyes and ears; at most faint, abbreviated stripes extending upwards from those areas towards it.

General colour vary variable. Head, nape, and usually at least the fore part of the shoulders white, cream or grey, except for the median brown stripe, which ceases in the middle of the crown, and for faint stripes from the eyes and ears, which never meet the median stripe. Spinal stripe broad or narrow, varying from blackish-brown to ochreous-brown, sometimes traceable to the rump, sometimes not beyond the middle of the back, commonly more or less emphasized anteriorly by grey or silvery hairs continued from those of the shoulder. Flanks and back varying from sepia-brown through all shades to ochreous, buffy or dark grey. Arms to elbow varying with the tint of the shoulder from brownish to whitish, below elbow to hand typically paler, whitish; legs varying from brown to nearly white; hands and feet always quite pale. Lower side varying from whitish to ashy-grey or pale buff. The wool of the dorsal side slaty at base.

In a large series of skins ranging from the Naga Hills to Lower Pegu and thence eastward to Siam, Laos, and Annam no two are exactly alike, even from the same district, the variations in colour being mainly due to the condition of the coat, whether fresh or faded, and especially to the presence or absence of the contour hairs, which when moulted leave the coat entirely woolly and when abundant give a silvery sheen to the back, particularly alongside the dark spinal stripe, which they throw into strong relief.

Vosmaer's figure and description of the type show that the

* Annandale (Proc. Zool. Soc. 1908, pp. 888–9) recorded, on the evidence of La Touche, the existence in the Lushai Hills of a Lemur he considered to be undescribed because it had a bushy tail; and in support of his belief he published a photograph of the animal suspended, Sloth-fashion, from a branch. The photograph clearly represents a typical example of *N. coucang bengalensis*. A bushy tail up to an inch in length, not including the terminal hairs, is a well-known feature in *Nycticebus*.

general colour was "grey or clear ashy-yellowish," a little richer and more ochreous on the flanks and thighs. Two skins from the Naga Hills are better coloured, the whole of the upper side behind the shoulders, apart from some grey hairs alongside the spinal stripe, being pale ochreous-brown. One of them, labelled "Naga Hills," has the abdomen buffy or pale brown in the middle, whereas the other, labelled "Champang," which is a little brighter on the flanks and rump, has the abdomen mainly whitish. A skin from Bassein in Lower Pegu (November 22) closely matches those from the Naga Hills, but has the flanks paler, thus approaching the type of *bengalensis*, and one from Kindat, on the east bank of the Chindwin (December), differs from the skin from the Naga Hills in having the nape and shoulders ashy, the flanks and rump brown. These skins are in good coat, but in one taken 50 miles north of Pegu (June) the coat is all woolly, without contour hairs, the whole of the back being ochreous or buffy, without silvering, the arms and legs paler and the belly pale buff. The type of *incanus*, from Kyeikpadein, Pegu (August) is, on the other hand, mostly grey, with no ochreous or brown except a little on the rump, the arms, legs, and underside being ashy, but there is some silvery-grey on the head and alongside the spinal stripe.

The type of *cinereus*, from Bangkok, was described as clear ashy-grey mixed with golden-brown on the back and rump; but a co-type in the British Museum is in moult, and is mostly covered with soiled grey wool, but some ochreous-brown new hair erupting in patches on the flanks suggests that the skin would have resembled those from the Naga Hills when the coat was fresh. A skin from Taungyi in Thaton closely matches this co-type of *cinereus*. Anderson identified as *N. tardigradus* var. *cinerea* skins from Goalpara in Assam, from Tipperah, and from the Kakhyen Hills east of Bhamo. A skin from Xien Quang Koo, Laos, named *bengalensis* by Thomas, was determined by Osgood as *bengalensis cinereus*; and a much more extensively grey skin from Lao Ba in Annam was referred by both these authors to *cinereus*. I am unable to find any reliable character by which *cinereus* can be distinguished from *bengalensis*.

The skull is the largest of the genus, with the condylobase exceeding 60 mm. In the co-type of *cinereus*, ? adult ♂, from Bangkok, it is 61 mm., only 1 mm. shorter than in the skull from Toungoo, and the cranial ridges meet to form a low sagittal crest as in the ♂ from the Naga Hills. But in another adult, probably ♂, skull from Raheng the condylobase is 63 mm., but the total length is 68½ mm., 4½ mm. longer than in the skull from Bangkok, and the cranial ridges form a crest 4 mm. high. This suggests that the occipital and sagittal crests

increase with age after the condylobase has attained its full length. There is no difference in size between ♂ and ♀ skulls, but the cranial ridges seem to be farther apart on the average in the ♀.

19 *b*. **Nycticebus coucang tenasserimensis** Elliot.

Nycticebus tardigradus, Blanford, Mamm. Brit. Ind. p. 45, fig. 12, 1888 (Tenasserim variety).
Nycticebus tenasserimensis, Elliot, Rev. Primates, i, p. 25, 1912.

Locality of the *type*, Amherst, N. Tenasserim.
Distribution.—TENASSERIM and S.W Siam.
Distinguished from *N coucang bengalensis* by the bifurcation of the stripe on the crown to join the dark area round the

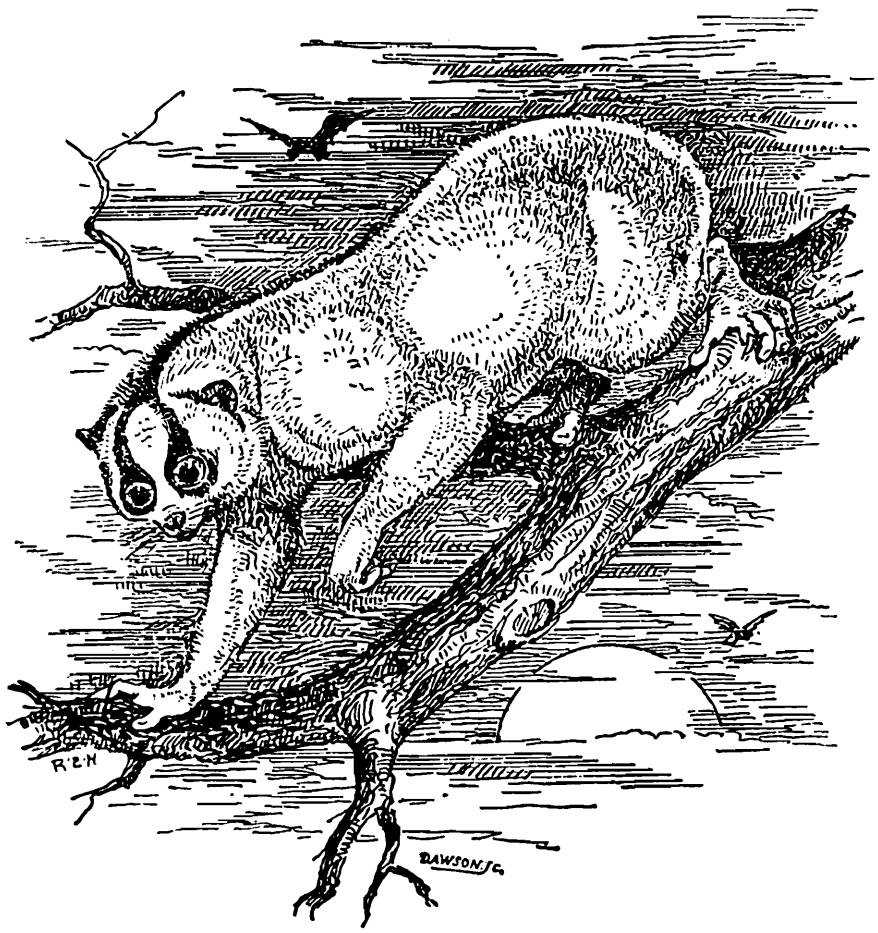


Fig. 50.—Tickell's Slow Loris (*Nycticebus coucang tenasserimensis*) from Amherst. (Adapted from Tickell's figure, but with the frontal stripes too pronounced.)

eyes, by the extension of the stripe above the ear almost to the point of bifurcation, and by the dark hue of the side of the neck, which is the same tint as the upper arm and confluent with the patch over the ear.

The type of this provisionally admitted race is the figure of an adult ♂ Slow Loris from Amherst recorded by Tickell

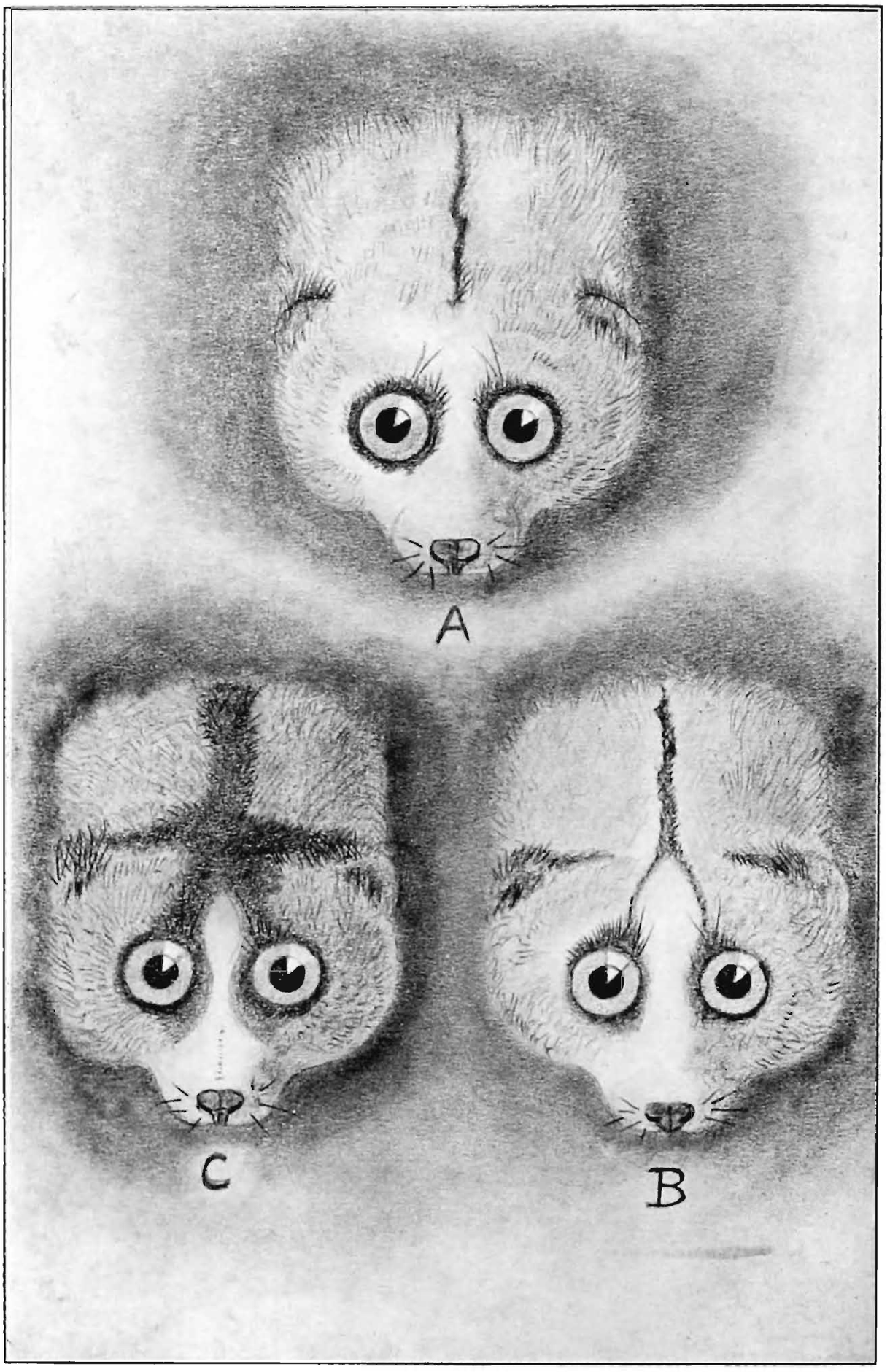
in his MS. A considerably altered copy was published by Blanford as representing the Tenasserim variety of *N tardigradus*, and on this evidence Elliot established his " species." Quoting Blanford, he said the general colour was " pale rufescent." This is incorrect. In Tickell's description it is said to be " pale tawny, a little dulled with greyish-brown, becoming greyish-white on the hands and feet, and almost greyish-white on the occiput and nape, with the middle of the back, the rump, the arm to the elbow, and the thighs orange tawny. ; the dorsal line is continued from the crown as two faint lines to the space round the eyes ; the sides of the neck, like the shoulders, are reddish-tawny, and from the same tint enveloping the ears passes a stripe which nearly reaches the vertex of the crown."

The description and figure of this specimen agree very closely with typical *N coucang bengalensis*, except in the particulars mentioned in the diagnosis. In these the specimen approaches the next race, but the stripes on the head are not so broad and pronounced, the whole crown being whiter. It is a transitional form. Tickell stated that this Loris is found throughout Tenasserim and in Arakan as well, but no doubt he did not distinguish the Amherst specimen he described and figured from the Burmese Lorises I identify as *bengalensis*.

A specimen from Mergui Town (Shortridge) (April) is referred to this race. The coat is all woolly, and the general colour above is drabby-brown from the shoulders to the elbows and rump, with the legs a little greyer ; but the cheeks, temples, and the whole of the neck are deep ashy-grey, as if the hairs had lost their white tips. It differs from the type of *tenasserimensis* in the stripes from the eyes just failing to reach the stripe on the crown.

At Koh Lak in Peninular Siam Kloss (Journ. Nat. Hist. Soc. Siam, ii, p 77, 1916, and p. 289, 1917) collected two Slow Lorises which he identified as *N cinereus*. One of them agrees almost exactly in colour with examples of *N coucang bengalensis* from the Naga Hills, but has a smaller skull, measuring only 60 mm. in total length, the same as in many skulls of the next race from the Malay Peninsula. The other, in the extension of the cranial stripe to join the coloured areas round the eyes and ears, comes close to the type of *N c. tenasserimensis*, and its skull, measuring 62 mm. in total length, is almost the same as in the example assigned to *N c. tenasserimensis* from Mergui Town.

The skull, judging from the scanty records, is a little smaller on the average than in *bengalensis*, and thus approaches skulls from the Malay Peninsula, in five of which the condylo-basal length ranges from 54 to 56 mm. The measurements of the skull of the type are taken from Tickell's figure, drawn natural size.



A. Face of *Nycticebus coucang bengalensis*.
B. ,, *Nycticebus coucang tenasserimensis*.
C. ,, *Nycticebus coucang coucang*.

19 *c.* **Nycticebus coucang coucang** (Boddaert).

The tailless Macauco, Pennant, Quadr. ed. i, p. 212, no. 128, pl. 26, 1781.
Tardigradus coucang, Boddaert, Elench. Anim. p. 67, 1785 *.
Nycticebus coucang, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 433, 1922.

Locality of the *type* not recorded, but, according to Thomas, Java.

Distribution.—The MERGUI ARCHIPELAGO, Malaya, Sumatra, Java.

Distinguished from the preceding two races by having the head, nape, and shoulders better coloured, not so white, with the stripe on the crown broad and dividing into four broad branches extending respectively to the ears and eyes. The size, also, both of the body and of the skull, is a little smaller, and the general colour on the average brighter.

The only British Indian representative of this race known to me is a ♂ from King Island, Mergui Archipelago (Primrose), (December). The general colour is rich, rusty-ochreous above and below, becoming gradually paler distally on the arms and legs, but not white on the hands and feet, and with the chest a little greyer than the belly; the spinal stripe is well defined by patches of very deep brown on the fore back and between the shoulders, but is paler and redder on the nape, which is buffy-grey laterally; the centre of the crown is ochreous, and the stripes are defined by ashy-grey on the forehead and cheeks.

This specimen closely matches an example from Perak in the Malay Peninsula, except that the sides of the neck are greyer and the crown less extensively reddened. This specimen belongs to the form usually quoted as *malaianus* Anderson, which, in my opinion, is indistinguishable from *javanicus* Geoffroy.

According to Blyth (Journ. As. Soc. Beng. xvi, p. 735, 1847) this " darker coloured, more rufous Malayan form," which he cited as his var. B of *N. tardigradus*, was brought to Calcutta for sale by vessels from the ports of Arakan, Burma, Malaya,

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* This species was based by Boddaert upon two distinguishable forms, " The tailless Macauco " of Pennant and " Le paresseux pentadactyle du Bengale " of Vosmaer. When Stone and Rehn revised the genus (Proc. Acad. Nat. Sci. Philad. liv, p. 141, 1902) they took as the type of *coucang* the Bengal Loris described by Vosmaer; and in this they were followed by some later authors, including Elliot, until 1922, when Thomas pointed out that in accordance with the generally accepted custom of selecting the form first quoted under the name of a species as its type, the " tailless Macauco " of Pennant is, *ipso facto*, the type of *coucang*, and this Loris is not the larger, white-headed northern form, *bengalensis*, but the smaller, more southern form with the well-coloured head.

and Singapore. He added that it is rare in Eastern Bengal, but I can find no evidence that he had a specimen from that district. When Anderson described it as *N tardigradus* var. *malaiana*, based on specimens from Malacca and Penang, he said it occurs in Chittagong and Arakan, but he cited no specimens in support of this statement (Cat. Mamm. Calc. Mus. p. 95, 1881). I do not believe it is found so far north.

The only available flesh-measurements (in English inches) and the weights (in lb.) of these British Indian races of the Slow Loris are as follows :—

Locality, name, and sex.	Head and body.	Tail.	Foot.	Weight.
Kindat (*bengalensis*) ; ad. ♂.	14⅗	⅘	3—	2½
50 m. N. of Pegu (*bengalensis*) ; ad. ♂.	14⅘	1	3	—
Laos (*bengalensis*) ; ad. ♂	14	⅘+	2⅘	—
Amherst (*tenasserimensis* type); ad. ♂.	12¾	—	—	—
Mergui Town (*tenasserimensis*); ad. ♂.	13⅕	⅘	2⅘	3¼
Koh Lak, Siam (*tenasserimensis*) ; ad. ♂	11	⅘	2⅘	—

These measurements suggest that *bengalensis* is a little larger than *tenasserimensis*. The specimen assigned to typical *coucang* from King Island was unmeasured, but six adult ♀ examples from various localities in the Malay Peninsula range in length of head and body from 11 to 12⅘ in., almost the same as in the three recorded examples of *tenasserimensis*.

Habits.—Very little is known about the breeding of *Nycticebus*, except that a single young one is, usually at all events, born at a time. In general habits there is probably no difference between the various races ; but accounts have mostly been taken from the behaviour of captive specimens, observation of wild individuals being almost impossible owing to the species being exclusively nocturnal and an inhabitant of dense forests, where it seldom leaves the trees. According to Tickell it is slow in its movements in trees, but climbs readily with a tenacious grip, and on the ground progresses with a wavering kind of trot. By day it sleeps rolled up in a squatting attitude, with its head and hands buried between its thighs. When first caught it is savage and bites quickly and severely, with a grunt or growl. It feeds on plantains and other fruits and greedily devours insects of many kinds. In captivity it may become diurnal. One that Tickell had attempted to catch a cockroach some 10 or 12 inches distant on the floor of a room. The Loris stealthily stalked the insect till within striking distance, then, raising itself on its hind legs, " flung itself " at its prey with a swift grab—but missed it.

Skull-measurements (in mm.) of the races of *Nycticebus coucang*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Orbital width.	Maxillary width.	Mandi-bular length.	Cranial ridges.
N. c. bengalensis.						
Naga Hills ; ad. ♂	67	63½	45	15	42	Meet ; low crest.
Toungoo ; ad. ♂	65	62	41	15	42½	½ mm. apart.
50 miles north of Pegu ; ad. ♀	67	62	42	13½	42	
Lower Pegu (*incanus* type) ; ad. ♀	66	—	41	14	44	4 mm. apart.
Chittagong ; ad. ♀	65½	63	39	14	43½	5 mm. apart.
N. c. tenasserimensis.						
Amherst (type) ; ad. ♂	63	61	—	—	40	Meet in middle line.
Mergui Town ; ad. ♂	63	59	41	14	40½	1 mm. apart.
Koh Lak, Siam (Kloss) ; ad. ♂.	62	—	—	—	—	
Koh Lak, Siam (Kloss) ; ? ♀	60	—	—	—	39½	4 mm. apart.

This account has since been confirmed and extended. Shortridge recorded that the specimen he collected on Mergui Island, where the animal is apparently fairly well known, was very savage, growling like a cat when approached, and always ready to attack anything placed near it. According to Mackenzie the animal moves along a branch in a most peculiar way, very slowly and deliberately, putting the hind foot of one side right up to the hand, then moves the hand, then the hind foot of the opposite side, then the hand, and so on, bending the back the while in a most extraordinary way. A specimen from Thaundaung, kept in captivity, never voluntarily came to the floor of its cage, but would hang from a branch by its hind legs to pick up anything and sometimes to drink. It stalked prey in the way described by Tickell, then seized it with a sudden pounce, usually grabbing it between the fingers and palm, sometimes stretching to its fullest extent to reach it, but always retaining the hold of its hind feet. It ate rice, fruit, insects of many kinds, its favourites being Longicorn beetles, cockroaches, crickets, and grasshoppers, and it was seen to catch moths on the wing. The stomach of a specimen captured near Kindat contained leaves and shoots, a beetle, and a piece of bone, apparently of a bird. The Chins, Mackenzie tells us, use the fur to stop bleeding, and say it is very efficacious.

Genus **LORIS** E. Geoffroy.

Loris, E. Geoffroy, Mag. Encycl. i, p. 48, 1796 ; and of all recent authors, including Osman Hill, Ceyl. J. Sci. (B), xviii, pp. 89–132, 1933.

Type of the genus, *gracilis*, E. Geoffroy (=*tardigradus* Linn.).

Distribution.—S. India and Ceylon.

Distinguished from *Nycticebus* by its more slender build and relatively much longer and thinner limbs, smaller hands and feet and less powerful digits, the hands smaller as compared with the feet ; nose projecting prominently beyond the lower jaw ; ears similar in structure, but less reduced, not so concealed by the fur, with the supratragus and flap above it larger, more completely valvular, the flap which bears the deeper pocket-like depression larger, the margin of the pinna not so rounded, more or less angled anteriorly*, tail only very occasionally a few mm. long. Skull with interorbital septum very narrow, orbits more expanded,

* Osman Hill was the first to dscribe the ear of *Loris*, but I cannot agree with his estimate of its peculiarities ; and the figures he published of the ears of *Nycticebus*, *Loris*, and *Tarsius* are quite unlike the ears of the examples of those genera I have seen.

exceeding the width across the zygomatic arches; nasals and premaxillæ produced in subtubular form beyond the level of the upper incisors; the palate produced beyond the level of the last upper molars, and the upper incisors subequal in size.

Like *Nycticebus*, *Loris* contains a single species.

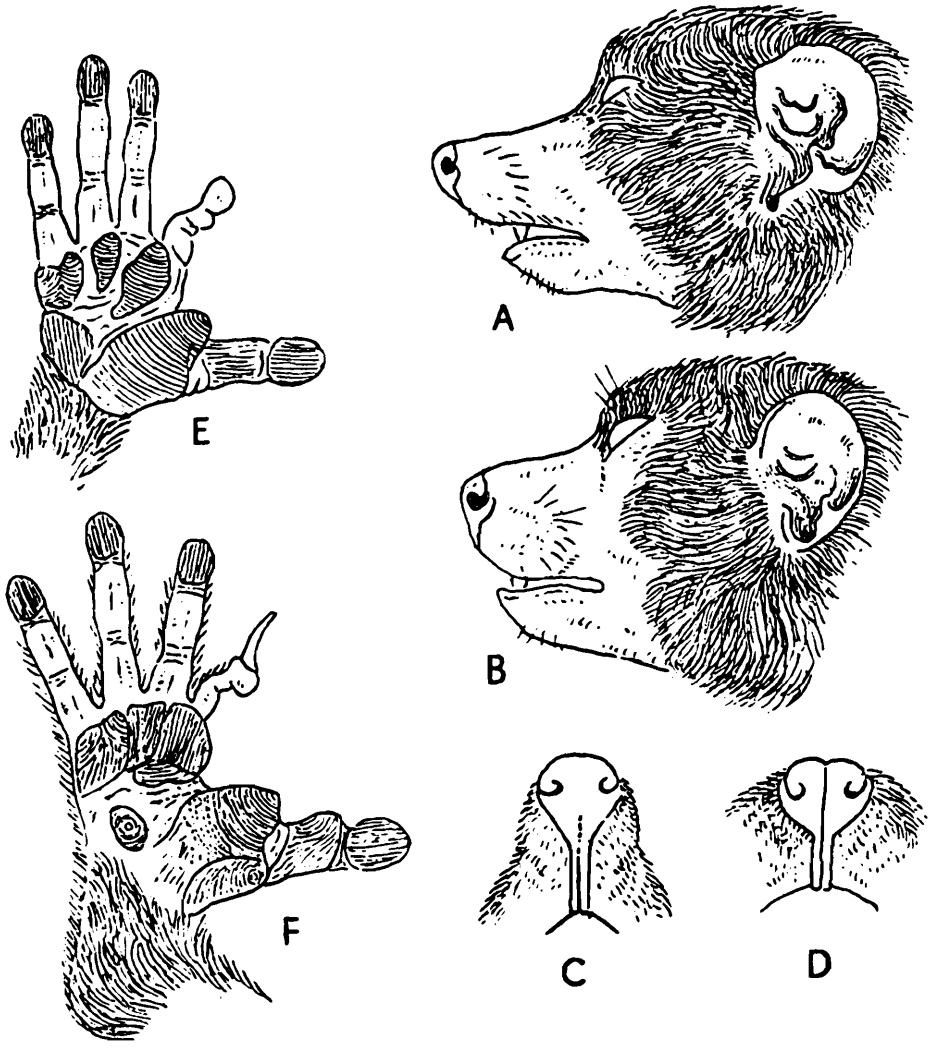


Fig. 51.

A. Side view of head, with ear exposed, of a Slender Loris (*Loris tardigradus*) from Ceylon.
B. The same of a Slow Loris (*Nycticebus coucang*).
C. Rhinarium, from the front, of Slender Loris.
D. The same of Slow Loris.
E. Palmar surface of right hand of Slender Loris.
F. Sole of the foot of the same.

20. **Loris tardigradus** (Linnæus).

Lemur tardigradus, Linn. Syst. Nat. ed. 10, p. 29, 1758. (For synonymy and bibliographical references, see under the subspecies.)

Colour more uniform than in *Nycticebus*, the dorsal side, in good coat, varying from dark grey with silvery contour hairs to earthy-brown, the ventral side from white to buffy, the

dark spinal stripe never strongly pronounced, very frequently traceable, at least on the back, behind the shoulders, but often undeveloped; the head with the crown coloured like the back, but, as in *Nycticebus*, the muzzle and the area between

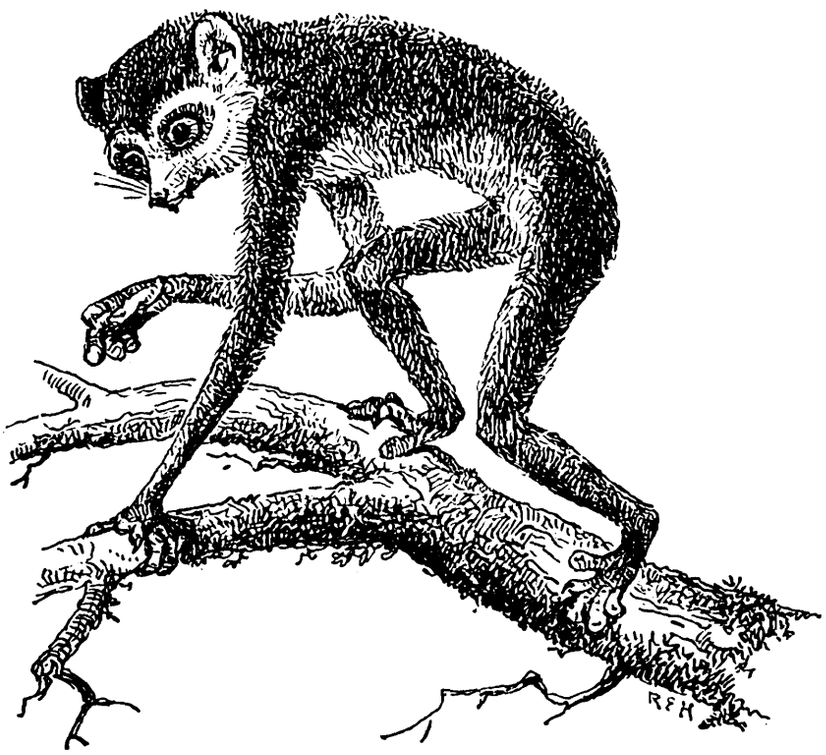


Fig. 52.—The Slender Loris (*Loris tardigradus*).

the eyes are white and the area round the eyes dark, blackish or brown; but the colour may vary considerably when the coat is in moult.

Key to the Races of L. tardigradus.

a. General colour above, in good coat, dark grey, considerably silvered, below typically white, at least the tips of the hairs on the cheeks white like the interorbital stripe and emphasizing the ocular patch.
  a.' Hairs of abdomen and cheek white throughout, or of abdomen faintly grey at base.
    c. Size largest; in a large percentage of specimens the hairs of the abdomen white to the base .. ... [Cabrera, p. 177. *lydekkerianus*
    c'. Perhaps on the average smaller, with a larger percentage of specimens with hair on abdomen faintly grey at the base . . . . *nordicus* Hill, p. 182.
  b'. Hairs of cheeks and abdomen sooty in basal half .. .. [lips, p. 184. *grandis* Hill & Phil-
b. General colour above browner, more ochreous in the pelage and less silvering on the average; cheeks darker than interocular stripe, the ocular patch less emphasized. [Wroughton, p. 180.
  d. Larger, a little paler brown . .. .. . *malabaricus*
  d'. Smaller, a little darker, more rufous-brown. *tardigradus* (Linn.), [p. 181.

A point of interest connected with these races is the occurrence both in India and Ceylon of dry- and wet-zone forms, the wet-zone form in each case being more richly tinted, more rufous or ochreous than the dry-zone form, and also a little smaller.

20 *a*. **Loris tardigradus lydekkerianus** Cabrera.

Loris tardigradus typicus, Lydekker, Proc. Zool. Soc. 1904, p. 345.
Loris lydekkerianus, Cabrera, Bol. Soc. Esp. Hist. Nat. 1908, p. 135; Thomas, Ann. Mag. Nat. Hist. (8) i, p. 469, 1908; Wroughton, Journ. Bomb. Nat. Hist. Soc. xxv, p. 45, 1917, and p. 563, 1918.
Loris tardigradus lydekkerianus, Hill, Ceyl. J. Sci. (B), xviii, p. 124, pl. 7, fig. 2, 1933.

Vernacular (Shortridge).—*Kada-Papa*, *Adavi-Papa* (Kanarese); *Wanur-Manushya* (Marathi); *Arawe-Papa* (Telegu); *Kattu-Papa* and *Kattu-Pullaye* (Tamil); *Sherminda* (Dekhani and Hindustani).

Locality of the *type*, "Madras."

Distribution.—The Eastern Ghats, westwards to Mangalore and Mysore. Precise range to the north unknown.

Size, on the average, larger than in other races of *tardigradus*. Colour of the upper side, in good coat, typically greyish-brown, silvered to a varying extent, especially on the fore back and shoulders, and with indications of a darker median line on the fore back, the fur at the base being deep slate-grey; the flanks paler and passing into the usually clean white abdomen, the hairs of which are, with rare exceptions, white throughout; the cheeks entirely white, like the throat and chin; the limbs proximally about the same hue as the upper side, but becoming paler distally, especially the arms, which are whitish below the elbow; hands and feet white above.

The type of this race, labelled "Madras," and presented by Edgar Thurston of the Christian College, was probably brought as a live specimen from the Eastern Ghats.

A good series of skins of this Loris collected by G. C. Shortridge in the Kolar district of E. Mysore, 2,700–3,000 ft. (October 12–20), shows some variations from the normal in colour. One skin is paler, more drabby, with no silvery tint above, and the belly has a yellowish tinge, with the hairs pale grey at the base. Another, in bad moulting coat, has also lost its silver-tipped hairs, and the general hue above is dark grey and buffy in patches. Two of them have the hind back, loins, and legs covered with pale dull ochreous or buffy wool, and sharply contrasted with the dark grey hue of the fore back and shoulders. Of three specimens collected by Baptista

in the Chettiri Range, Salem, 2,000 ft. (June 8th), one has a decided buffy tinge in the dorsal pelage, thus approaching the Malabar race.

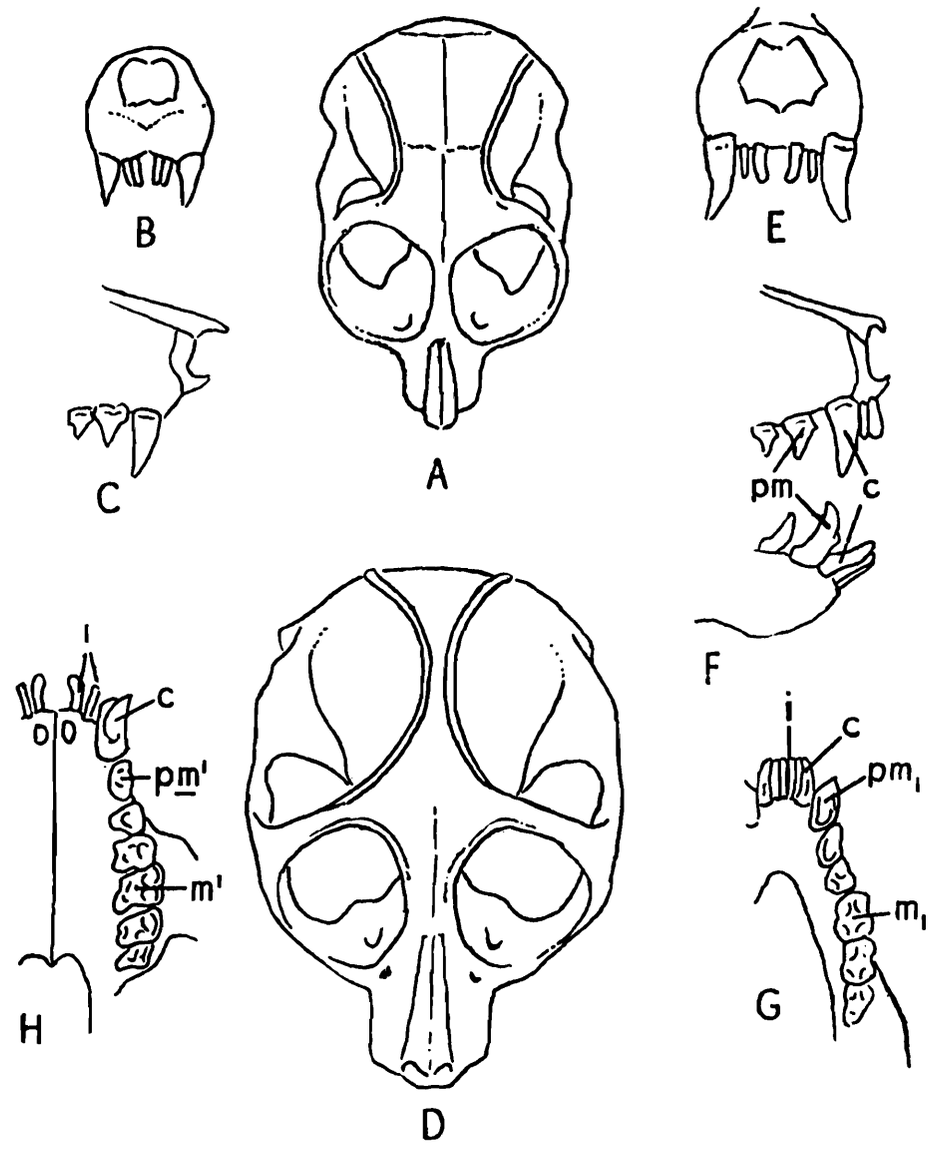


Fig. 53.

A. Dorsal view of skull of adult ♂ *Loris tardigradus lydekkerianus* from Mysore. × ⅜.
B. Front view of muzzle of same, showing the subequal incisor teeth.
C. Side view of end of muzzle of same, showing its projection beyond the upper canine.
D. Dorsal view of skull of adult ♂ *Nycticebus coucang bengalensis* from the Chin Hills.
E. Front view of muzzle of same, showing the unequal incisor teeth.
F. Side view of the end of the upper and lower jaws of the same. *c*, upper and lower canine teeth; *pm*, upper and lower first premolar.
G. Lower teeth of the right side of the same. *i*, incisors, forming with *c*, the canine, the forwardly directed comb; pm_1, canine-like first premolar; m_1, first molar.
H. Upper teeth of the left side of the same. *i*, incisors; *c*, canine; pm^1, first premolar; m^1, first molar.

There is very little difference in size between the sexes, the available evidence pointing to slight superiority of the ♂.

The flesh-measurements (in English inches) and weights (in oz.), according to Shortridge and Baptista, are as follows:—

Locality and sex.	Head and body.	Hind foot.	Weight.
E. Mysore; ad. ♂.	10⅖	2⅕	11¾
E. Mysore; ad. ♂.	9⅘	2⅕	9⅛
E. Mysore; ad. ♂.	10	2⅕	11
E. Mysore; ad. ♀.	9⅘	2+	9½
Salem; ad. ♂	9+	2⅕	8
Salem; ad. ♂	9	2⅕	8
Salem; ad. ♀	8⅘	2	8

One ♂ weighed by Shortridge was 12¼ oz.

Habits.—Shortridge made som einteresting observations on wild and captive specimens of this Loris in Mysore. The iris of the eye is chestnut, the pupil contracts to a nearly vertical slit, and when expanded shines with a golden-coppery light. Wild specimens in foliage are strikingly like the little Spotted Owl (*Athene brama*), have the same habit of swaying the head and, when fighting, utter a similar screech. They also make a faint chattering noise and a low growl when irritated. Their quarrelsomeness when kept together in a cage shows that they are not naturally gregarious. They would occasionally drop to the floor of the cage from a branch 3 or 4 ft. up, but are quite incapable of jumping even the shortest distance from branch to branch. Their movements along a branch are usually slow and deliberate, but much less so than in *Nycticebus*. On the ground the movement is usually exactly like that of a monkey walking slowly, but they can run on the ground at quite a respectable pace, and Shortridge thinks that in Mysore they probably travel some distance from tree to tree. They are unable to swim, and when put into water merely move their limbs backwards and forwards without making any progress. They ate cooked rice and bananas and were particularly fond of grasshoppers, which they would hold in one hand and munch. In the wild they are said to feed largely on insects and small lizards. A captive specimen kept by Kinnear killed and ate the heads of a jerboa and a gerbille, which were in the same cage. Females with two young were found on several occasions, and Shortridge thinks that twins are probably a common occurrence. On one occasion he captured a female with a three-quarter-grown young one clinging to her.

20 *b*. **Loris tardigradus malabaricus** Wroughton.

Loris tardigradus, Ryley, Journ. Bomb. Nat. Hist. Soc. xxii, pp. 284 and 494, 1913.
Loris malabaricus, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxv, p. 45, 1917, and xxv, p. 563, 1918.
Loris tardigradus malabaricus, Hill, Ceyl. J. Sci. (B), xviii, p. 127, 1933.

Vernacular names in Coorg (Shortridge).—*Hunimunna, Singalika, Kard-munishya.*

Locality of the *type*, Huvinakadu Estate, Kutta, S. Coorg, 2,843 ft.

Distribution.—The MALABAR district of S. INDIA, the WYNAAD, S. COORG, and TRAVANCORE.

Distinguished from *lydekkerianus* on the average by its smaller size, tawnier or more ochreous tinge of the upper side, slightly darker underside and cheeks, the latter a little darker than the throat and chin, and the area round the eyes more rufous-brown.

The general colour is subject to a good deal of individual variation. The type from Kutta, S. Coorg, has the dorsal fur tawny-brown superficially, deep slate-grey at the base, with some silver-tipped hairs on the back, especially on the shoulders, and also on the hind legs ; the lower side is buffy-white, the hairs pale grey close to the skin, the throat white, and the cheeks grey and contrasted. Another from Virajpet S. Coorg, is more richly tinted than the last, the dorsal pelage being decidedly ochreous-brown with hardly any silvering. This specimen is very like some specimens of typical *tardigradus*. A third, from Trivandrum, is darker, not so tawny as the type, more silvery on the fore back, with the cheeks paler, less contrasted with the throat, and the hairs of the belly whitish at the base. This approaches *lydekkerianus* and the northern Ceylonese form *nordicus*.

The flesh-measurements (in English inches) of three specimens, according to Shortridge, are :—

Locality and sex.	Head and body.	Hind foot.
S. Coorg ; ad. ♂ .	8⅘	1⅘+
S. Coorg ; ad. ♀ .	8⅘	1⅘
S. Coorg (type) ; ♀.	8⅗	1⅘

The weight of the adult ♂ was 6 oz.

Although the flesh-measurements and weight indicate a smaller race than *lydekkerianus*, there is very little difference in the size of the skulls as shown in the table of measurements (p. 183).

According to a note accompanying Shortridge's specimens, this race, although apparently rare on the western side of India as far north as North Kanara, is probably fairly plentiful in Coorg ; but it is not easy to find in the thick jungle owing

to its nocturnal habits and concealment by day in the thick foliage of high trees. In some specimens, he observed, a slender tail, up to 7 mm. long, may be present.

20 c. **Loris tardigradus tardigradus** (Linn.).

Lemur tardigradus, Linn. Syst. Nat. ed. x, p. 29, 1758.
Loris gracilis, Geoffroy, Mag. Encycl. (Ann. 4), i, p. 48, 1796; and of most subsequent writers to 1908, including Blyth, Jerdon, Anderson, and Blanford.
Lemur ceylonicus, Fischer, Anat. Maki, xii, p. 28, 1804.
Loris gracilis zeylanicus, Lydekker, Proc. Zool. Soc. 1904, p. 345*.
Loris tardigradus, Thomas, Ann. Mag. Nat. Hist. (8) i, p. 469, 1908.
Loris tardigradus tardigradus, Hill & Phillips, Ceyl. J. Sci. (B), xvii, p. 109, 1932; Hill, Ceyl. J. Sci. (B), xviii, p. 113, 1932; Phillips, Man. Mamm. Ceylon, p. 31, 1935.

Vernacular.—Ceylon Sloth; *Unahapuluva* (Sinhalese); *Thevangu* (Tamil).

Locality of the *type*, "Ceylon"; of *ceylonicus*, Ceylon; of *zeylanicus* (here selected), Peradeniya.

Distribution.—Low-country wet zone of CEYLON.

Resembling *malabaricus*, but smaller and apparently rather more rufous-brown above, without silvering, and brighter below, with the hairs extensively sooty at the base, brighter or duller yellowish distally, the throat whitish or yellow, the cheeks dusky and the area round the eyes brown.

This description, taken from two unmeasured specimens in the British Museum, one being the selected type of *zeylanicus* Lydd. from Peradeniya, agrees in essentials with the long description published by Hill, who states that the lumbar and sacral regions are sometimes frosted, but less in the ♀ than in the ♂, the ♀ being further distinguished by being larger than the ♂ on the average and less rufous in general colour above.

The approximate dimension (in English inches) of his largest and smallest ♂ and ♀ specimens and the averages of several are as follows:—

Locality and sex.	Head and body.	Foot.	Ear.
Colombo; ad. ♂	8	1⅘	1—
Henaratgoda; ad. ♂	7⅓	1⅖	¾
Average of 7 ad. ♂♂	7⅗	1⅗	⅘
Loc. ?; ad. ♀	8⅙	1⅘	⅘
Colombo; ad. ♀	7⅘	1⅗	1—
Average of 3 ad. ♀	8+	1⅗	⅘

* In his description of *zeylanicus* the only specimen Lydekker mentioned individually was a mounted one recently received from Ceylon. This was marked "type" by Thomas. It is a representative of *nordicus*, resembling those collected by Mayor at Anuradhapura. But it is not the type of *zeylanicus*, because Lydekker's description was clearly taken from one of the two or perhaps both the "reddish" examples of typical *tardigradus* then in the British Museum, and does not apply in any way to the mounted specimen, of which the general tint is brownish-grey with a white belly. Since one of the two specimens Lydekker described came from Peradeniya, I select it as the type.

The weights, according to Hill, are : ♂, 3 to 4½ oz. ; ♀, 3 to 4 oz. ; the average being 3½ oz.

There are no skulls in the British Museum certainly assignable to this race, but, according to Hill, ♂ skulls range from 47 to 50 mm. and ♀ skulls from 48 to 50 mm. in total length, the average of seven adult skulls being 48½ mm.

20 *d*. **Loris tardigradus nordicus** Hill.

Loris tardigradus nordicus, Hill, Ceyl. J. Sci. (B), xvii, p. 117, 1933 ; Phillips, Man. Mamm. Ceylon, p. 36, 1935.

Vernacular.—The same as for the preceding Ceylonese race.

Locality of the *type*, Talawa (50 ft.), N.C.P., Ceylon.

Distribution.—The dry zone of the N.P., N.C.P., and C.P. of CEYLON from just above sea-level up to 650 ft.

Possibly distinguishable from *lydekkerianus* by being slightly smaller and by having the fur in the middle of the ventral surface on the average greyer at the base, but otherwise the coloration is apparently the same.

In his key to the races of *L. tardigradus* Hill distinguished *nordicus*, the largest of the Ceylonese forms, from *lydekkerianus*, the largest of the Indian forms, by the greyness of the basal third of the ventral hairs, which he alleged to be white throughout in the Indian race ; but these hairs are occasionally grey basally in the latter, *e. g.* in the type, and may be pale throughout in Ceylonese specimens.

Approximate flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Foot.	Ear.
Wilachchyia (Willichia) ; ad. ♂	9½	2⅕	1⅕
Sigiriya ; ad. ♂	9⅓	1⅔	1
Talawa ; ad. ♂ .. .	8⅔	2—	1+
Tammanewa ; ad. ♀	9	2—	1⅕
Talawa ; ad. ♀	8⅘	1⅘	1⅕
Talawa (type) ; yg. ad. ♀	8⅕	1⅘	1

The average weight of 4 adult ♂ specimens, according to Hill, is 8⅓ oz. Both in measurements and weights these specimens agree very closely with those of *lydekkerianus* collected by Baptista on the Chettiri Range, Salem, which from their locality may be considered almost as topotypes of *lydekkerianus* recorded from " Madras."

Between the skulls of *nordicus* and *lydekkerianus*, as entered in the table, there is practically no difference. But in a long series of skulls, lent to me by Sir F Colyer, from Monaragala, in the dry zone of Uva, the average total and condylobasal lengths of 6 adult ♂♂ is 51 and 41⅘, and of 8 adult ♀♀ 49½ and 41 mm. Unfortunately there are no skins ; but Hill, who knew by report of the occurrence of *Loris* at this locality, thought

Skull-measurements (in mm.) of the races of *Loris tardigradus*.

Name, locality, and sex.	Total length.	Condylo-basal length.	Orbital width.	Maxillary width.	Mandibular length.
L. t. lydekkerianus.					
Kolar Distr., E. Mysore ; ad. ♂	55	47	35	10	31
Kolar Distr., E. Mysore ; ad. ♀	55	47	34	9½	30
Kolar Distr., E. Mysore ; ad. ♂	54	46	34	10	30
Kolar Distr., E. Mysore ; ad. ♀	54	47	34½	11—	30
Kolar Distr., E. Mysore ; ad. ♀	52	45	33	10	28
Chettiri Range, Salem ; ad. ♂	53	47	34	10	30
Chettiri Range, Salem ; ad. ♂	52½	44	32½	10	29
"Madras" (type) ; ad. o	53	45	33	10	30
L. t. malabaricus.					
Virajpet, S. Coorg ; ad. ♂	54	47	33½	10	—
Wynaad ; yg. ad. o .	52	44	31½	9	28
Trivandrum ; yg. ad. o . ..	49	42	31	8	—
Kutta, S. Coorg (type) ; ad. ♀	47	41	—	8	27
L. t. nordicus.					
Anuradhapura, N.P. ; ad. ♀	54	46	34	9½	—
Anuradhapura, N.P. ; ad. ♂	53	44	34	8	29
Willichia, N.C.P. ; ad. ♂ .	54	46	35	9	30
Talawa (type) ; yg. ad. ♀	50	44	34	8	29
L. t. grandis.					
Gammaduwa (type) ; yg. ad. ♀	51	44	32	9	—
L. t. tardigradus.					
"Ceylon" (Dr. Willey) ; just ad. ♀.	50	42	31	7	26

they would prove to be *nordicus*. If this guess was correct, the series of skulls from Monaragalla would make the average size of the skulls of *nordicus* less than of *lydekkerianus*. The skulls in question are intermediate in size between those of typical *tardigradus* and of *nordicus*.

20 *e*. **Loris tardigradus grandis** Hill & Phillips.

Loris tardigradus grandis, Hill & Phillips, Ceyl. J. Sci. (B), xvii, p. 110, 1932; Hill, Ceyl. J. Sci. (B), xviii, p. 117, pl. 7, fig. 1 & pl. 8, fig. 2, 1933; Phillips, Man. Mamm. Ceyl. p. 34, pls. 4 & 5, 1935.

Vernacular.—The same as for the typical race, with the addition of *Kalu unahapuluva* (Sinhalese) and *Kadu-papa* (Tamil).

Locality of the *type*, Mousakanda in Gammaduwa, 2,200 ft., C.P., Ceylon.

Distribution.—"Probably throughout the lower foot-hills of the mountain cluster of the Central and Uva Provinces" (Phillips), up to about 3,500 ft.

A little smaller on the average and with a fuller coat than *nordicus*, resembling it in dorsal coloration, but with the basal half of the hairs of the ventral surface and of the cheeks deep sooty-grey, and white-tipped hairs extend over the eye to the median frontal stripe.

This description is taken from the type, a young adult ♀, the only example known to me. It bears out Hill's description of the race except in the dark tint of the hairs of the cheek, which from his account appear to be white to the base in the examples he recorded in 1933.

The approximate dimensions (in English inches) according to Hill are :—

Average of 4 ♂♂ from Gammaduwa : head and body $8\frac{2}{5}$; foot $1\frac{4}{5}$.

Average of 4 ♀♀ from Gammaduwa : head and body 9— ; foot $1\frac{4}{5}$.

The weights are from $5\frac{1}{2}$ to just over 7 oz.

Habits.—No doubt the Lorises of Ceylon resemble the south Indian form in habits; but the account given of the latter may be supplemented by the observation of Hill and Phillips on the Ceylonese races. The period of gestation is unknown, but, as Hill has pointed out, there is evidence that it is over three months. Lactation lasts for about one year, and the young, usually one, but occasionally two, are for a long time, wholly at first, partly later, dependent on the mother, even availing themselves of her nursing when as much as half-grown and able to feed independently. Females have been observed suckling newly-born young and at the same time nursing the one to which they had previously given birth.

In captivity, according to Phillips, they show a special liking for plantains and eat papaws and other fruits, but seem to prefer insects or animal food of some kind. In the wild state he thinks they are mainly carnivorous, feeding on insects, small birds, lizards, and tree-frogs; but captive specimens would not touch small mammals, such as mice, shrews, and bats.

Like *Nycticebus* they capture prey, after a stealthy approach, with a lightning grab of both hands, and hold it in a tenacious grip while devouring it. Everything is consumed—feathers, scales, and bones of the vertebrates, and wings, legs, and the horny exoskeleton of insects.

Order CARNIVORA.

In their general organization the CARNIVORA, containing such familiar mammals as Cats, Dogs, Bears, Weasels, etc., stand nearest to the INSECTIVORA (*q.v.*, p. 11), of which they are a highly specialized offshoot. They are distinguished from them by the sum of a number of characters of which the most important perhaps are supplied by the teeth, especially those in the fore part of the jaws, which, on the whole, are very stable in arrangement and structure*. The incisors, almost always six in number above and below, are small, never prominent or widely separated, with the outer larger than the inner, more noticeably in the upper than the lower jaw, and form a regular straight or curved compact series between the piercing tusk-like canines, and there is always a space between the upper outer incisor and the upper canine, into which the lower canine fits when the mouth is closed. The premolars and molars, always cuspidate or tubercular and rooted, are very variable in number and structure; but there is evidence that at an early stage in the evolution of the order the fourth upper premolar (pm^4) and the first lower molar (m_1) †, which are opposed to one another, were enlarged and especially modified for cutting flesh—hence they are called the "carnassials"—and constituted a "point of the greatest mechanical efficiency" in the jaws. The dominance of these teeth in species which have retained primitive predatory habits rendered the others of the series, especially those behind them, of less importance, in the same way as the large size of the canines deprived the premolars behind them of their use. Hence the reduction in the number or simplification of the postcanine teeth takes place at the anterior and posterior ends of the series ‡ (see figs. 3 & 4, pp. 4 & 6).

Apart from the teeth, the CARNIVORA are more highly organized on the whole than the INSECTIVORA, and have, in

* Excluding the aberrant group PINNIPEDIA (Seals and Walruses), which by their puzzling exclusion from the northern shores of the Indian Ocean do not fall within the limits of the British Indian fauna. The PINNIPEDIA are a section of the Arctoid CARNIVORA (see below, p. 190) adaptively specialized for marine feeding, although breeding on land.

† The position of the number added to the letter symbolising the tooth indicates its belonging to the upper or lower jaw.

‡ The type of dentition above described has been lost in some mainly herbivorous forms, very noticeably in the Bears.

particular, a better developed brain, with convoluted cerebral hemispheres.

Some special characters, both external and cranial, used in their classification must be referred to. In the head the muzzle nearly always has a typical rhinarium and philtrum and an adherent upper lip. In the predatory species the facial vibrissæ are well developed, and there are two tufts of genal vibrissæ, an upper and a lower. These tactile organs may, however, be quite inconspicuous in some species that are mostly vegetable feeders. The ear varies considerably in size, and may be reduced to little more than a rim of thickened skin round the orifice. When well developed its posterior rim is generally provided with a supplementary flap of skin giving rise to a pocket-like structure, the *bursa*. (For these characters see fig. 1, p. 2.)

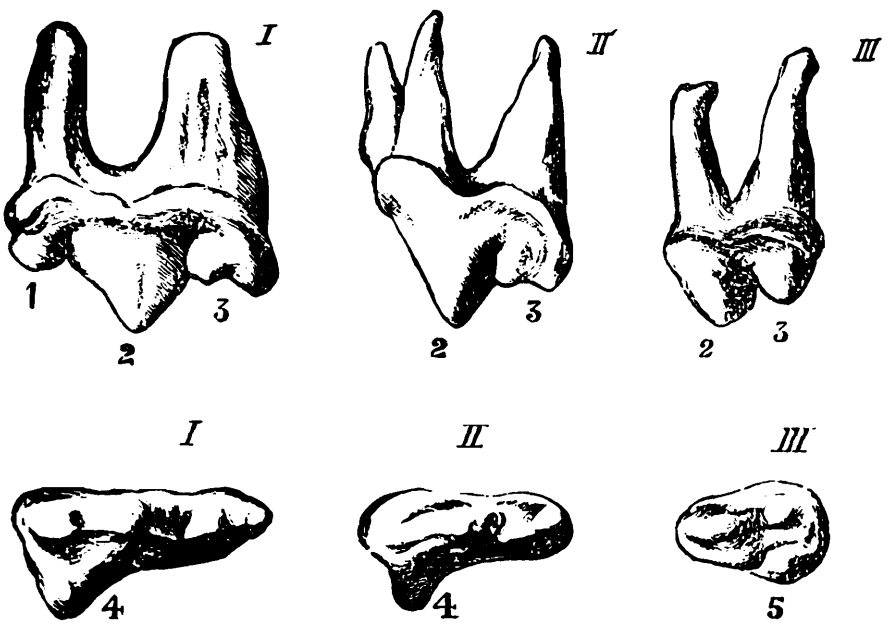


Fig. 54.—The left upper carnassial (pm^4) of a Tiger (I), Wolf (II), and Bear (III). Upper row from the outer side, lower row from below. 1, anterior cusp (*parastyle*); 2, median cusp (*paracone*); 3, posterior cusp (*metacone*); 4, the inner lobe (*protocone*), its root not shown in upper fig. 1; 5, the inner, posterior, unrooted cusp of Bear's tooth (after Flower).

The feet are typically pentadactyl, but by the loss of the first digit, almost always the smallest of the series, the number of digits may be reduced to four. They are provided with claws which vary in shape and size, in accordance with the use of the foot for running, climbing or digging. Sometimes the hind feet are modified for swimming. When the entire limbs are adapted for running or leaping the hind foot is lengthened, has its heel or hock raised off the ground, and the sole down to the plantar pad usually clothed with hair, with at most traces of the metatarsal pads remaining. The

fore foot is also usually hairy between the wrist and the plantar pad, with the outer carpal pad alone retained, and the first digit, when present, is raised off the ground. In these cases the plantar and digital pads alone rest on the ground and the gait is digitigrade. The Cats, Hyænas, and Dogs show the extreme of this specialization of the feet. At the opposite extreme are the Bears, in which the hind feet are short and broad and mostly naked from the heel; the five toes form a continuous lightly curved line, and all are in contact with the ground. They are called plantigrade because, when walking, the entire sole of the foot appears to be planted on the ground, although in reality both the heel and wrist are raised to a certain extent. There is every gradation between these types, intermediate kinds of feet being called subplantigrade.

The tail is usually long in species which run, jump or climb, but it may be quite short, and act merely as a covering to the underlying naked skin, as in bears. In otters it is very thick, and acts as a swimming propeller.

The anal and genital regions also supply useful systematic characters in the position of the prepuce, the length of the perinæum, and the presence or absence of scent-glands on it. There is also, except in the Bears, a pair of well-developed glands within the anal orifice, and in connection with these a pouch or glandular area may be present round or above the anus.

In the skull, apart from the teeth, three sets of bones or areas are important, namely, the turbinals in the nasal passages, the auditory bulla, and the area in front of the latter low down in the temporal fossa. The bulla may be composed of a single bone, the tympanic, which primarily forms the floor of the auditory orifice, but may be developed into a tube or expanded into a thin-walled cavity; or it may be composed of two bones, the tympanic, which forms its antero-external portion, and the entotympanic, forming its postero-internal portion; where these two bones meet a partition is developed dividing the cavity of the bulla into an outer and an inner chamber.

In the temporal fossa outside the foramen rotundum there is frequently a bony channel, the *alisphenoid canal*, through which a branch of the carotid artery runs. Its incidence is remarkable, and it has been much used in classification. It is probably a primitive character in the order which has been retained in some families, lost in others (see figs. 3 & 4, pp. 4 & 6).

In his classification of the Indian CARNIVORA, Blanford followed Flower in assigning them to the suborder FISSIPEDIA, which have normal feet, as opposed to the PINNIPEDIA, in

which the feet are converted into swimming paddles. The FISSIPEDIA, which alone are represented in the Indian fauna, were divided into three main groups, the ÆLUROIDEA, comprising the Cats, Civets, Mongooses, and Hyænas, the CYNOIDEA, the Wolves, Jackals, and Foxes, and the ARCTOIDEA, the Bears, Raccoons, Weasels, Otters, etc. But quite obviously from his key this classification is unsatisfactory; and it has been abandoned with the discovery that the Dog-family is closely akin to those classified under the ARCTOIDEA, that

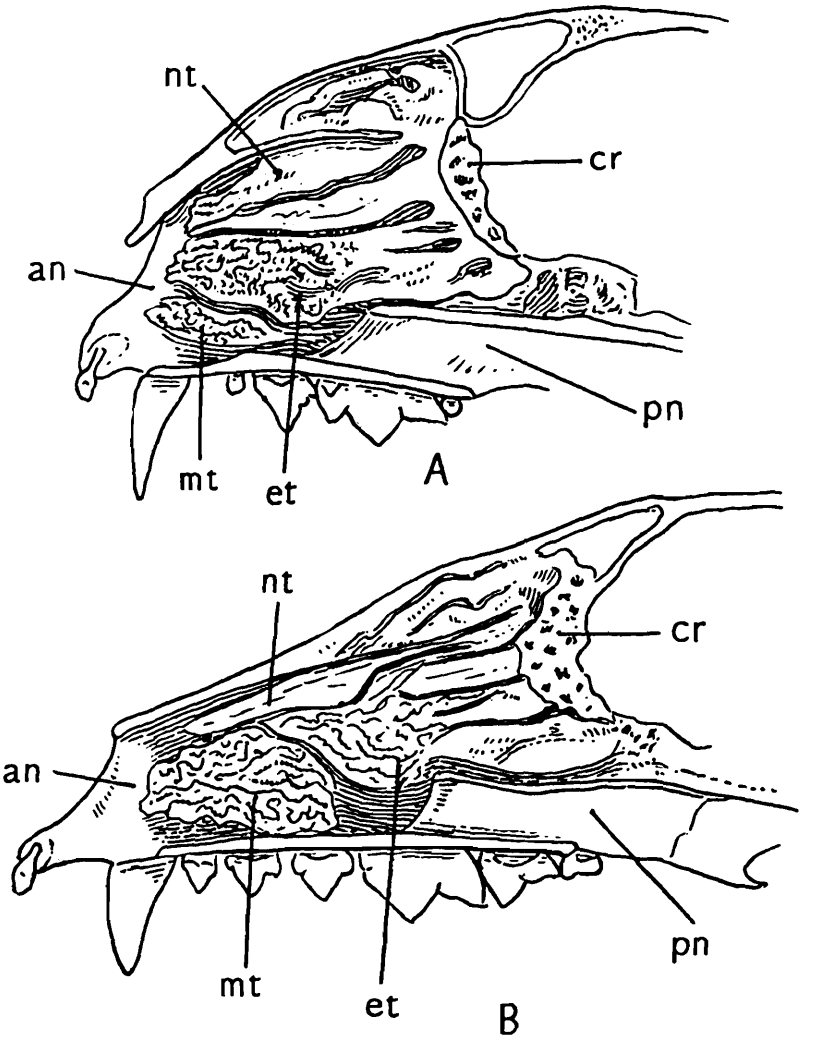


Fig. 55.

A. Partly diagrammatic longitudinal section of the nasal chambers of a Cat (*Felis*).

B. The same of an Indian Jackal (*Canis*), illustrating the difference between the Æluroid and Arctoid Carnivora in the arrangement of the turbinal bones. *cr*, cribriform plate through which the olfactory nerves enter the nasal chambers; *an*, anterior nares; *pn*, posterior nares; *nt*, the naso-turbinal, which is a branch of *et*, the ethmo-turbinal; *mt*, the maxillo-turbinal.

the Hyænas do not differ from the rest of the ÆLUROIDEA, as was supposed, in the structure of the bulla, and that the turbinal bones, which had not then been studied in this con-

nection, supply a character by which the CARNIVORA may be divided into the two groups, ÆLUROIDEA* and ARCTOIDEA.

The two suborders may be briefly diagnosed and contrasted as follows :—

a. Ethmo-turbinals very large, occupying the greater part of the nasal chambers and extending forwards over and between the smaller maxillo-turbinals, almost to the anterior orifice of the chambers. The auditory bulla composed of two bones and divided by a partition into two chambers. Cowper's glands absent; at most a small penis bone — [p. 190. **Æluroidea,**

a'. Ethmo-turbinals excluded from the anterior orifice of the nasal chambers by the enlarged maxillo-turbinals. The auditory bulla composed of a single bone, the tympanic; its cavity typically undivided; when divided the partition is not homologous to that of the Æluroid bulla. Cowper's glands, associated with the generative organs of the male, present; a large penis bone in all Asiatic species. — **Arctoidea.**

Suborder *ÆLUROIDEA.*

Key to the Indian Families.

a. Post-palatine foramina (see p. 5) set far back on the maxillo-palatine suture; teeth reduced in number and highly sectorial, the dental formula being $i.\ \frac{3}{3}$, $c.\ \frac{1}{1}$, $pm.\ \frac{3\text{ or }2}{2}$, $m.\ \frac{1}{1}$; interramal tuft of vibrissæ absent .. .. . . — [p. 191. **Felidæ,**

a'. Post-palatine foramina in front of the suture; teeth not so specialized or reduced in number, the $pm.\ \frac{4}{3}$ or $\frac{4}{4}$, the $m.\ \frac{2}{2}$ or $\frac{1}{1}$; the interramal tuft of vibrissæ present.

b. Feet with four toes in front and behind, dog-like in structure; auditory bulla without oblique groove; jaws and teeth very massive .... **Hyænidæ.**

b'. Feet with five toes, not dog-like; auditory bulla with distinct groove; jaws and teeth less massive.

c. Ears tolerably large, with well-developed bursa and simple supratragus with no valvular flap above it; feet compact, with short claws; anus not enclosed in a glandular sac; no bony tube to the auditory orifice .. .. — [p. 330. **Viverridæ,**

c'. Ears small and rounded, with vestigial bursa, a valvular supratragus, and a valvular flap above it; feet with freer digits and fossorial claws; anus in centre of glandular pouch; a well-developed bony tube to the auditory orifice — **Herpestidæ.**

* This name, meaning cat-like, has been objected to, and HERPESTOIDEA, Mongoose-like, substituted on the grounds that the generic name *Ælurus* or *Ailurus* is the admitted name for the Cat-Bear or Panda, one of the ARCTOIDEA. But for the sake of convenience I here retain the long-established name ÆLUROIDEA, which according to its meaning is appropriate.

Family FELIDÆ.

In their external characters the Felidæ (Cats) come nearest to the Viverridæ, especially to the Linsangs, which have the retractile claws and claw-sheaths typical of most cats, the penis short and close to the scrotum, and no perineal glands. But in the Felidæ the plantar pads of the front and

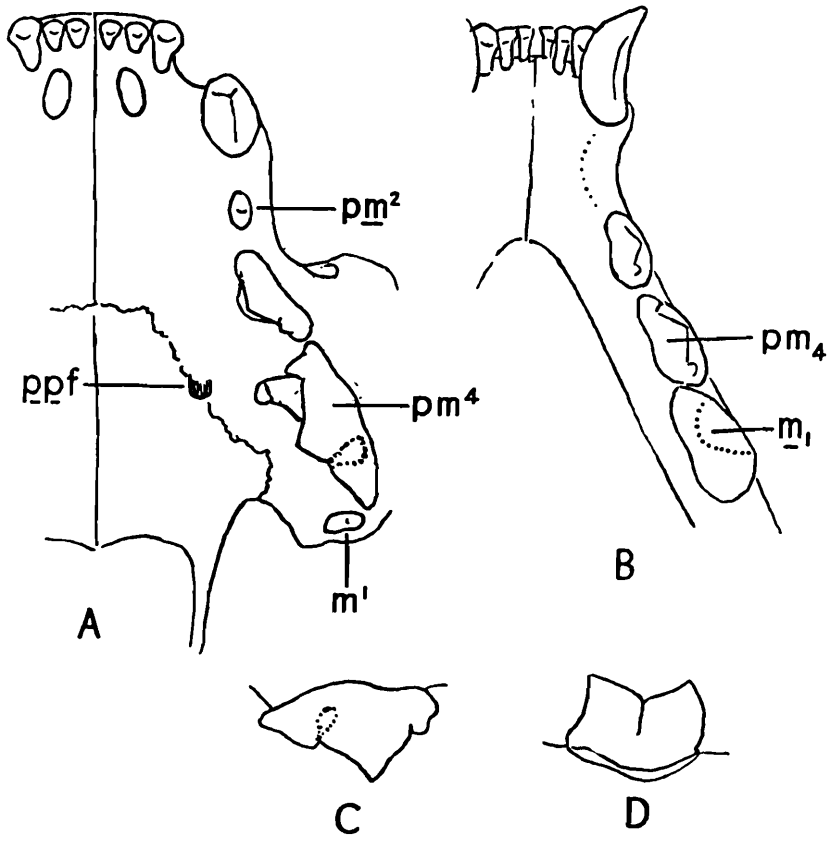


Fig. 56.

A. Left half of the palate and teeth of a Cat (*Felis constantina ornata*) from Sehore, C.I. *ppf*, posterior palatine foramen on the maxillo-palatine suture; pm^2, second premolar; pm^4, fourth premolar (carnassial); m^1, first and only molar.
B. Right half of dental portion of mandible. pm_4, fourth premolar; m_1, first molar (carnassial).
C. Outer side of right upper carnassial.
D. The same of right lower carnassial.

hind feet form compact three-lobed cushions, there is a single carpal pad on the fore foot, and the hind foot has only four toes and no trace of metatarsal pads. The typical facial vibrissæ are well developed, with the exception of the inter-ramal tuft, which is absent. The ear is tolerably large, has

a simple supratragal ridge, and a well-developed marginal bursa. There are two or three pairs of mammæ.

The skull has no alisphenoid canal, the jaws are shortish and massive, and the auditory bulla is typically high and rounded. In the mouth there is almost always a large space, the postcanine space, due to the loss of the true first premolar and the very small size or absence of the second in the upper jaw, to the loss of the true first and second premolars in the lower jaw, and to the uplift of the anterior portion of the mandible carrying the canines and incisors. This space is to give penetrating depth to the tusk-like canines. The single upper larger premolar, morphologically the third, which precedes the "carnassial" and the two below, morphologically the third and fourth, have triangular compressed crowns, with a single large pointed cusp and smaller cusps behind and in front at its base. The crown of the upper carnassial (pm^4) is also compressed, its outer cutting portion consisting of three cusps set in a line, the first low, the second (paracone) high and pointed, the third or posterior (metacone) lower and more blade-like; the inner lobe (protocone) of the tooth is set far forwards, small, and has at most a single cusp, but in some cases it is reduced to vanishing point. The single upper molar is a small, nearly functionless tooth with its long axis set transversely. The lower carnassial, the single lower molar, is very highly specialized. Its crown carries two compressed blade-like pointed cusps, the paraconid and protoconid, but there is no trace of the metaconid on the inner side of the latter, and the "heel" of the tooth found in most other Carnivores is at most represented by a small tubercle. This tooth is always smaller than the upper carnassial.

In the classification of the Felidæ a part of the skeleton is used which, although primarily independent of the skull, has become secondarily attached to it in the Mammalia. This is the hyoidean apparatus (see fig. 57), of which the main portion is a U-shaped bone, the hyoid, embracing the top of the windpipe. The larynx, containing the vocal chords, opens between the two arms, which are directed backwards. In most mammals this bone is attached to the side of the back of the skull close to the mastoid process on each side by a series of three bones closely jointed together and arising from the forepart of the U-shaped bone. This is the suspender, or *suspensorium*, of the hyoid. Normally the suspensorium holds the larynx and the back of the tongue close under the base of the skull, admitting only comparatively slight movement of those parts in a vertical plane. But in some cases the bones of the suspensorium are wholly or partly replaced by an elastic tendon or ligament which allows the larynx to be depressed or elevated to a greater or less extent.

In a paper, "The Classification of existing Felidæ" (Ann. Mag. Nat. Hist. (8) xx, p. 332, 1917), I made use of the modifications of this structure in subdividing the family. Other characters employed were supplied by the skull and feet.

Many of the zoologists of olden times could perceive that the existing Felidæ fall into a number of natural groups, to which generic names were attached, sometimes with no attempt to diagnose them. But the conception of the affinities of the species was mostly hopelessly vague, and far too many names were proposed either in a generic or subgeneric sense.

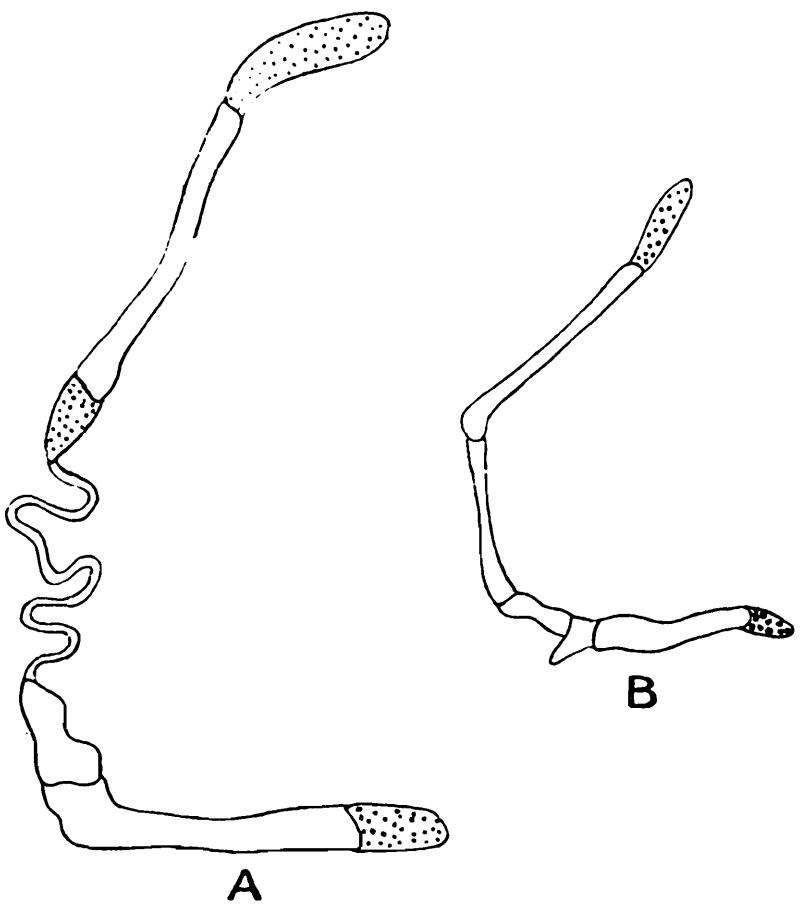


Fig. 57.

A. Left half of the hyoidean apparatus of a Tiger, showing the ligament between the upper and lower bones, the ligament in this case very much shortened, thickened, and twisted by methylated spirit.

B. The same of the common House-Cat, showing the complete chain of bones found in all the Felidæ except the Pantherinæ.

Admittedly the classification is difficult, and later authors followed the easier course of assigning all the species but one to the genus *Felis*, the only species to which separate generic rank was given being the Hunting Leopard or Cheetah. This was the classification adopted by all mammalogists,

including Blanford, until about twenty years ago. But, in my opinion it embodies an erroneous conception of the affiliation of the species, since the Cheetah appears to be more nearly akin to the ordinary Cats than the latter are to Lions, Tigers, and their allies, which have a highly modified hyoidean apparatus, the Cheetah resembling the ordinary Cats in the normal structure of this system of bones.

The Cheetah, called by Blanford *Cynælurus*, but now known as *Acinonyx*, was, apart from its general build, distinguished by its so-called non-retractile claws. The main distinctive character of its foot lies in the complete loss of all trace of the lobes of skin at the tips of the toes, which in other Cats to a varying degree constitute sheaths for the claws, protecting their tips when retracted. In the most perfectly developed foot in the family there is a pair of these skin-lobes to the claws of the four main digits, and as a rule in this case the skin or "web" between the digits is continued up to the digital pads. But in several of the ordinary cats some of the lobes may be undeveloped, the others reduced in size and the webs much less extensive, so that the foot structurally approaches that of the Cheetah.

The Cats, which are the most highly organized of all the CARNIVORA, are found almost all over the world up to the limit of tree-growth, except in the Australian Region and Madagascar. They are essentially predatory, feeding mostly on freshly-killed mammals and birds; but many of them will eat carrion and kill and eat reptiles, frogs, and fishes, and occasionally insects.

Many are essentially forest species; others inhabit open grassland or semi-desert rocky districts, wherever, indeed, prey is available.

I divide the Felidæ into the following subfamilies :—

a. Hyoidean apparatus modified by the conversion of the median part of the suspender into a long elastic tendon; paws with complete claw-sheaths . . . . . [p. 195. **Pantherinæ,**

a'. Hyoidean apparatus of the normal mammalian type, the suspender consisting of a chain of bones jointed end to end.

b. Paws with more or less well-developed cutaneous lobes constituting sheaths for the claws when retracted . . . . . **Felinæ,** p. 243.

b'. Paws without trace of cutaneous lobes constituting sheaths for the claws. [p. 322. **Acinonychinæ,**

Subfamily PANTHERINÆ.

The suspender (suspensorium) of the hyoid modified from the normal mammalian type by the replacement of the median bone of the chain by a long, elastic tendon conferring great mobility upon the larynx and permitting the back of the mouth to be greatly distended. The tips of the digits of both fore and hind feet have a cutaneous lobe on the outer and inner side of the claws so that the claws, when retracted, are

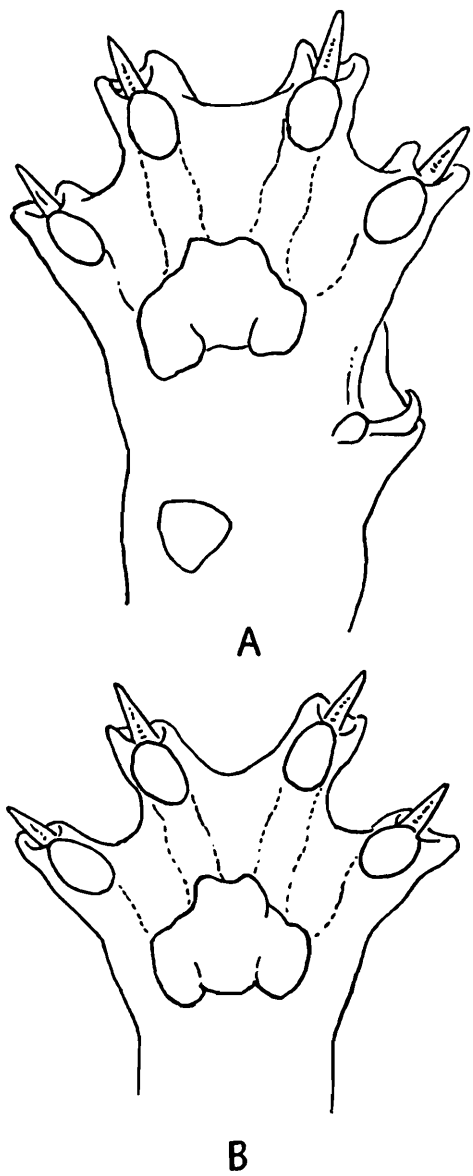


Fig. 58.

A. Lower side of right fore paw of a Leopard with the toes spread, the claws extruded, and the hair clipped close to show the pads, the interdigital webs, and the lobes of skin which act as sheaths to the claws when retracted.

B. Lower side of right hind paw of the same.

completely sheathed and the interdigital web extends to the digital pads.

The structure of the hyoid in this subfamily is associated with the voice. The sexual call, where known, *i. e.*, in the Lion, Tiger, Leopard, and Jaguar, is a definite roar—it is not recorded in the Snow-Leopard—and pleasure or content is not expressed by " purring " as in the rest of the family.

Key to the Genera of Pantherinæ based on Cranial Characters.

a. The dorsal profile of the muzzle between the anterior nares and the interorbital area tolerably straight, not noticeably concave; the frontal interorbital area not abruptly elevated; outer chamber of the bulla small, the partition close to the orifice . . . . . [Oken, p. 196. PANTHERA

a'. The dorsal profile of the muzzle decidedly concave where it passes into the frontal interorbital area, which is noticeably elevated; outer chamber of the bulla larger, the partition remote from the orifice [p. 239. UNCIA Gray,

Genus **PANTHERA** Oken.

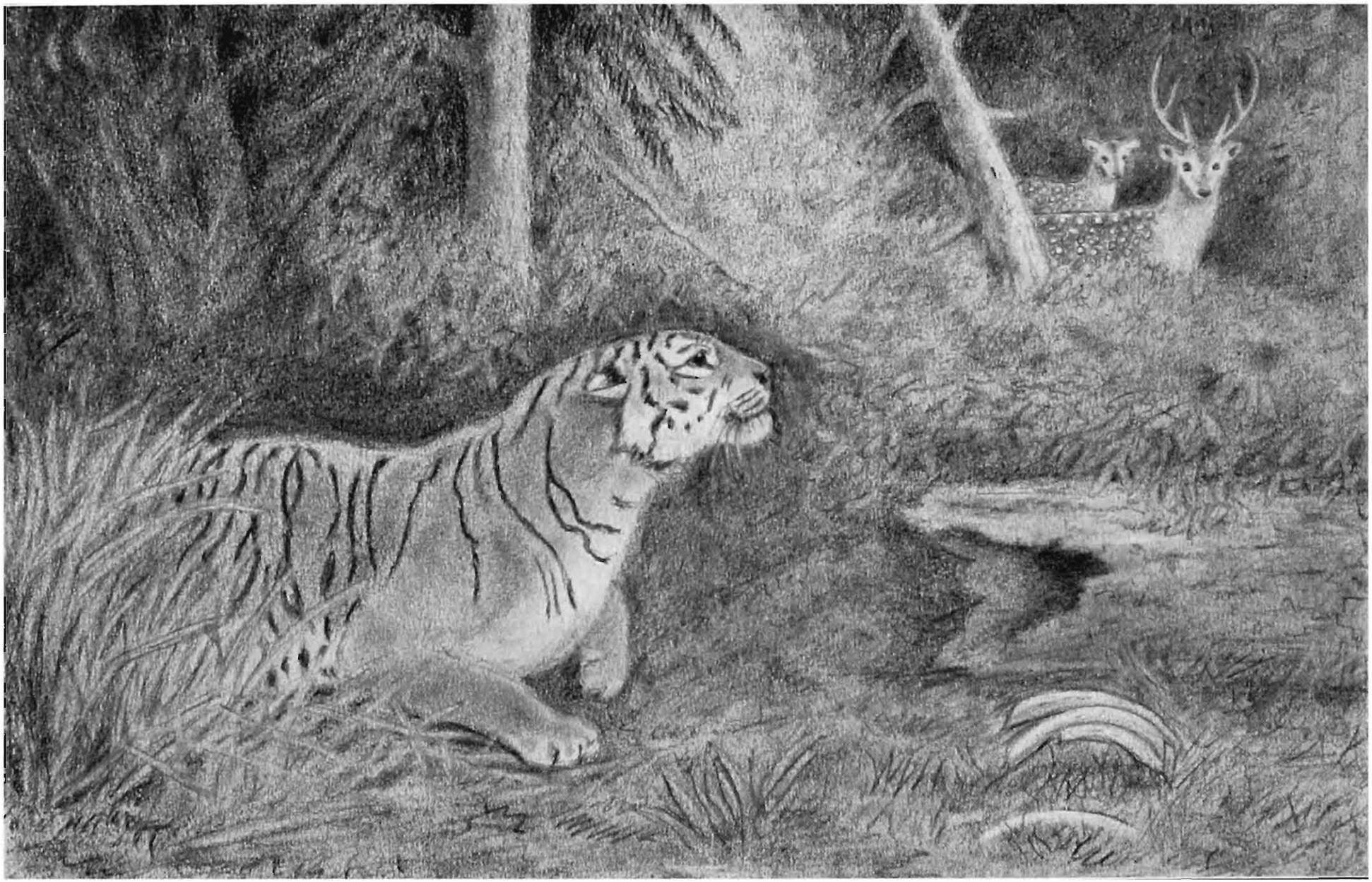
Panthera, Oken, Lehrb. Zool. 2nd Abth. p. 1052, 1816.
Tigris, id., tom. cit. p. 1066.
Leo, id., tom. cit. p. 1070.
Panthera, Pocock, Ann. Mag. Nat. Hist. (8) xviii, p. 306, 1916.

Type of *Panthera*, *pardus* Linn.; of *Tigris*, *tigris* Linn.; of *Leo*, *leo* Linn.*.

Distribution.—The greater part of temperate and tropical Asia from the Caucasus and Mongolia to Java and Bali, and most of Africa except the Sahara; tropical America.

Dorsal profile of the skull flattish or tolerably evenly convex, not concave where the muzzle passes into the frontal interorbital area, which is not noticeably elevated, and the area behind the elevation less steeply sloped: the basicranial axis nearly horizontal; a wide notch between the glenoid process and the bulla; bulla with the inner chamber large,

* By some modern authors the three well-known species here assigned to *Panthera* are regarded as representing distinct genera under the names cited. But in the three papers, quoted below, on Tigers and on the Panthers and Lions of Asia, and published in the Journ. Bomb. Nat. Hist. Soc. 1929–30, I have shown that the cranial and dental characters relied on to distinguish them generically completely break down when a large series of skulls is examined. It is needless to repeat the facts. The prevalent external differences between the three species, when adult, are well known, but are, in my opinion, only of specific value. Their citation under different generic names completely obscures their kinship, which is undeniably close.



Tiger stalking Spotted Deer. (From a painting by C. E. Swan.)

the outer small, the partition between them close to the external auditory meatus ; mandible with a sloping, convexly rounded chin.

Key to the British Indian Species of Panthera *based on External Characters.*

a. Pattern of stripes or spots or both combined, usually present in the cubs, lost or very nearly so in the adult, in which the general colour varies from tawny-brown to greyish ; a black tuft on the tip of the tail ; male usually with mane. *leo* (Linn.), [p. 210.

a'. Pattern of stripes or spots retained throughout life ; no black tuft on tail-tip ; sexes alike except in size.

b. Pattern consisting of vertical black stripes, with at most a few faint spots ; a ruff on the cheeks as in *leo* ; size larger . . . *tigris* (Linn.), [p. 197.

b'. Pattern consisting mainly of irregularly arranged rosettes composed of from three to five spots in a ring ; no ruff on cheeks ; size smaller *pardus* (Linn.), [p. 222.

Key to the Species based on Normal Differences in the Skulls.

a. Skull large, in adult ♂♂ up to about 13 or 15 in. long.

b. Nasals projecting beyond maxillæ, frontal area elevated, facial portion shorter as compared with cranial and less massive, inferior edge of lower jaw not convex in the middle . *tigris* (Linn.), [p. 199.

b' Nasals not projecting beyond maxillæ, frontal area flattish, facial portion longer as compared with cranial and more massive, inferior edge of lower jaw lightly convex in the middle . *leo* (Linn.), [p. 212.

a' Skull smaller, in adult ♂♂ up to about 9 in., typically in shape and proportions more like that of *tigris*, but nasals not projecting so far beyond maxillæ. *pardus* (Linn.), [p. 225.

In addition to the three species above mentioned, *Panthera* includes the Jaguar (*Panthera onca*) of America, which is most nearly related to the Leopard (*P. pardus*), resembling it in the nature of its pattern and sexual call, but differing in its larger size, on the average, relatively bigger head, and considerably shorter tail.

21. **Panthera tigris** (Linnæus). The Tiger.

Felis tigris, Linn., Syst. Nat. ed. 10, p. 41, 1758 ; and of most subsequent writers.

Panthera tigris, Pocock, Ann. Mag. Nat. Hist. (8) xviii, p. 306, 1916 ; id., Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 505, 1929.

Typical locality (traditionally fixed), Bengal.

Distribution.—Practically the whole of Asia, in suitable localities, eastward of a line from the Caucasian area and Afghanistan to Manchuria and Korea, but omitting the

Tibetan Plateau, most of INDIA, and extending from BURMA and the Malay Peninsula through the Sunda Islands to Bali, east of Java, but not found in Ceylon.

The largest of the existing species of Felidæ, apart from the Lion, which it rivals in size, and distinguished from the other species of Pantherinæ by the sum of a number of characters, more particularly by the highly specialized pattern of numerous, nearly vertical dark stripes extending from the spine over the flanks to the belly, generally broken up into smaller, simple or looped stripes, and always, in normal skins, conspicuous against the bright typically reddish or yellowish tan colour of the upper side and the pale, typically white hue of the underside. A conspicuous pale, typically white patch over the eye is also distinctive, and a peculiarity of the reddish hair of the interspaces is their tolerably uniform hue, without trace of black speckling, all the black in the pelage being concentrated in the stripes.

The head is marked with short transverse stripes on the crown, with longitudinal vibrissal stripes on the white upper lip, and an irregular pattern—some longitudinal, some vertical—on the cheeks, which are white in their lower half like the chin and throat, a long vertical stripe descending in front of the ear; the ears are black at the back, with a white patch in the upper half; on the nape the stripes are few, thin, and obliquely longitudinal. On the spine the stripes of the two sides typically meet and form forwardly jutting angles. The fore leg externally is generally without stripes, and a considerable area of the shoulder above it is not infrequently unstriped. On the hind quarters the stripes are narrower and closer set, and low down on the thigh they pass into irregular transverse stripes extending to the hock. The inside of the fore and hind limbs is white, with a few stripes. The tail is heavily but irregularly banded, typically loses its bright colour in the distal half above, and has a black tip, but no tuft.

From sportsmen's records it seems that the tail is, on the average, less than half the length of the head and body; in some cases it is considerably less. On the other hand it is sometimes considerably more, nearly as long in proportion as in typical leopards (see Sterndale's records, p. 205).

In both sexes there is always a fringe of hair, varying in length, which starts just above the ear in front and descends to the throat, as in the lion; but, unlike the latter, the hair on the top of the neck over a wide area grows backwards in the same direction as that of the head and the spine, only on the sides of the neck does it usually grow forwards from a whorl in front of the shoulder and, passing beneath the ear, meets the backwardly-directed hairs of the cheek at the fringe; but the direction here is variable, and may be affected

by additional whorls. On the nape the hair is always apparently longer than on the body, and may be long enough to constitute a small mane.

The *skull* (see fig. 59) is distinguished by its large size, only rivalled in the Felidæ by that of the lion, from which it is not always easy to distinguish when a large series of both is examined. The tiger's skull, however, is, on the average, at least shorter in its facial and longer in its cranial portions, measured from the postorbital process ; it is usually more arched, owing to the brow being higher and the sagittal crest lower ; its nasals are longer, overlap the maxillæ behind to a greater extent, and the anterior nares are narrower ; the lower edge of the mandible is not convex in the middle, but is concave in front of the angular process, so that the skull rests steadily on a flat surface and does not " rock " backwards and forwards ; finally, the inner lobe of the upper carnassial (pm^4) is a little larger.

21 *a*. **Panthera tigris tigris** (Linnæus). The Indian Tiger.

Felis tigris, Linn., Syst. Nat. ed. 10, p. 41, 1758 ; and of all authors on Zoology and sport in India and Burma.
Panthera tigris tigris, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 505, 1929.

Vernacular.—*Bágh*, *Sher* (female *Bághni Shernii*) (H.) ; *Náhar*, *Sela-vágh* (H. of Central India) ; *Babr* (P.) ; *Mazar* (Baluchi) ; *Shinh* (Sindhi) ; *Padar-suh* (Kashmiri) ; *Patayat-bágh*, *Wahág* (Mahr.) ; *Go-vágh* (Beng.) ; *Tut*, *Sad* (Hill tribes of Rájmehál) ; *Garúmkúla* (Kol.) ; *Lákhra* (Uraon) ; *Krodi* (Kondh) ; *Kula* (Sonthal, Ho, and Korku) ; *Púli* (Tam., Tel., Mal., and Gond) ; *Púli-redda-púli*, *Peram-pilli* (Tam.) ; *Pedda-púli* (Tel.) ; *Perain-púli*, *Kúdua* (Mal.) ; *Kuli* (Can.) ; *Nári* (Kurg) ; *Pirri*, *Bürsh* (Toda) ; *Tág* (Tibetan) ; *Túkt* or *Tük* (Bhot.) ; *Sathong* (Lepcha) ; *Keh-va* (Limbú) ; *Schi* (Aka) ; *Matsá* (Garo) ; *Kla* (Khasi) ; *Sa*, *Ragdi*, *Tekhu*, *Khudi* (Naga) ; *Humpi* (Kúki) ; *Sumyo* (Abor.) ; *Sü*, Khamti) ; *Sirong* (Singpho) ; *Kei* (Manipuri) ; *Misi* (Kachari) ; *Kya* (Burmese) ; *Kla* (Talain) ; *Khi*, *Botha-o*, *Tupuli* (Karen) ; *Htso* (Shan) ; *Rimau*, *Harimau* (Malay).

Locality of the *type*, Bengal.

Distribution.—Practically throughout INDIA from the Himalayas, where it may ascend to 6,000 or 7,000 ft., southwards, but not in the deserts of Rajputana, the Punjab, Cutch, and Sind, and exterminated or very scarce in certain districts where it was formerly plentiful. Also throughout BURMA in suitable localities *.

* The Burmese tiger is provisionally identified as *P. t. tigris*. There is some evidence that it may prove to be a distinguishable race ; but I have not seen sufficient skins and skulls to establish this point.

One of the largest of the races, only a little, if at all, smaller on the average than the Mongolian and Manchurian race (*P. t. longipilis*), but distinguished from it and from the Chinese race (*styani*) and the Persian or Caucasian race (*P. t. septentrionalis*) by its shorter and thinner winter coat, and from the last also by its fewer, more widely spaced stripes. Considerably larger than the three races from the Sunda Islands, Sumatra (*P. t. sumatræ*), Java (*P. t. sondaica*), and Bali (*P. t. balica*), and also less fully and closely striped.

A good many of the skins of British Indian tigers presented to the British Museum are more or less faded from being exhibited or exposed as rugs, but several are unfaded and exhibit the characteristic bright orange-red hue, and are practically indistinguishable in colour, although coming from the following widely separated localities :—United



Fig. 59.—Skull of Tiger from the Central Provinces, showing the shape characteristic of the Indian race.

Provinces (Major G. Burrard), Bengal (Col. Sanderson), Pennghot, Mirzapur (S. Wyndham), Chanda, C.P. (C. E. Hewetson), Kadra, N. Kanara (N. B. Kinnear), Travancore (the Conservator of Forests), and the Thaungyin Valley, Amherst, Tenasserim (E. H. Peacock). The last does not bear out the supposition that Burmese tigers are richer in colour than Indian tigers. No two skins are alike in pattern, the stripes varying individually in thickness, looping, and the extent to which they are broken up.

Although only two of the skins are dated, many of the others exhibit interesting differences in the coat. Of the dated skins a ♀ from Mirzapore (November) has the coat roughish, but with hardly any wool and about 18 mm. long on the back, 25 mm. on the nape, and from 45 to 50 mm. on the cheek. The other, a ♂ from Central India (H.H. The Maharaj Holkar) (February), has a little wool, a roughish, slightly longer

coat, about 21 mm. on the back, 31 mm. on the nape, and from 50 to 70 mm. on the cheek. These skins, of different sexes, are very much alike, allowing for the increase in the coat from November to February. Neither has what can be called a mane on the nape. But in two, undated, from the Nepal Tarai, a ♂ (Col. R. L. Kennion), with the coat on the body without wool and only about 12 mm. long, has a distinct mane, 66 mm. (2½ in.) on the nape, shortening to 33 mm. towards the shoulders, and the cheek-fringe up to 85 mm. or more (3½ in.). A ♀ (Sir R. Dane), with a similar short, clearly summer coat, has the nape-hairs only 25 mm. (1 in.) and the cheek-fringe 50 (2 in.). Since both these skins are in summer coat the difference between them in the length of the hair on the nape and cheek might reasonably be regarded as sexual, and comparable in a small way to the usual sexual difference in lions. But this is not borne out by three undated skins from the Central Provinces (Sir R. Dane). A ♂ from Raipur has the coat smooth, without wool, and quite short, about 8 mm. only on the back, 17 mm., not constituting a mane, on the nape, and about 50 mm. on the cheek. A ♀ from Balaghat, on the contrary, has the coat about 18 mm., with a little wool, on the back, a mane of 56 mm. on the nape and the cheek-fringe about 62 mm. In this case the differences are apparently seasonal. The third skin, a ♂ from Baslar, has the coat about 12 mm., without wool, the nape-hairs about 25 mm., and the cheek fringe 50 mm. Unless, as is possible, there was a mistake in the labelling when the skins were dressed, it is the ♀ that has the mane in this case. The skulls show the sexes.

Other undated skins from scattered localities show similar variations indicating seasonal change. A ♂ from Bengal (Col. Sanderson) has a sleek coat, with no wool, only about 8 mm. long on the back and 14 mm. on the nape; whereas another from Danta Mahi Kanta, Gujerat (Major G. H. O'Donnell) has a rougher coat, with a little wool, about 25 mm. long, and on the nape about 40 mm. The hair on the belly also varies greatly, being typically, but not always, longer than on the body. According to Dunbar Brander tigers in the Central Provinces rapidly moult the winter coat in March, there being a great difference between skins at the end of January and the end of March.

Colour Varieties of Indian Tigers.

Apart from comparatively slight individual differences in depth of hue, Indian tigers sometimes exhibit partial or complete albinism. In most of the cases of so-called " white " tigers the stripes are dark brown or reddish-black, and stand

out boldly against the white ground-colour. This type has been recorded from Orissa, Bilaspur, Sohagpur, and Rewa. One from Mirzapur (Mrs. Craigie Halkett) is similar, but has the stripes tan. A wholly white tiger, with the pattern only visible under reflected light, like the pattern of a white tabby cat, was exhibited in the Exeter Change Menagerie in the early part of the nineteenth century and described by Hamilton-Smith. It was probably an Indian specimen. Probably similar to this, although the stripes were not mentioned, were a couple of young tigers with pink eyes and apparently "pure albinos," recorded from Cooch Behar in 1922 by V. N. Narayan*.

Black tigers also have been reported, but no skins have come to hand, and some of them have turned out to be "black panthers." One that was sighted near Bhamo, but not secured, is said to have left "pug-marks" too big for a leopard's! This was recorded by Mr. Hauxwell (Journ. Bomb. Nat. Hist. Soc. xxii, p. 788). The story of another that was shot near Chittagong in 1846, and seen in a state of putrefaction in the jungle by Mr. C. T. Buckland, is told in 'The Field,' 1889, p. 73, and a dead one in a similar condition, was said to have been found in the Lushai Hills ('The Field,' 1928, p. 656). The evidence, however, is clearly incomplete. There is no known reason why tigers should not be black, like leopards and jaguars; but at present their existence can be neither asserted nor denied.

Skulls of British Indian Tigers.

The skulls of British Indian tigers differ from those of the races occurring in the Sunda Islands in their larger size and in some other features which need not be particularized; but there is not sufficient material available of the Chinese, Mongolian, and Persian races to establish distinctive characters between the four. In the following table, containing the measurements of a selection of the specimens in the British Museum to show the variations in the size, the Indian and Burmese skulls are treated separately. Although the ♂ skulls from the two countries overlap in size, the Burmese are, on the average, smaller, but there are too few of them to warrant the conclusion that they represent another race, especially as the differences between the ♀ skulls is less marked. There is no structural difference between the skulls from the two countries.

* A variety of a different kind, with the ground-colour normal above and below, but the pattern brown, and consequently little defined, is represented by the skin of the south-western Asiatic race which was procured on the northern slopes of Mt. Elburz by Col. R. L. Kennion. This was described and illustrated in colour in my paper, 1929.

Skull-measurements (in mm.) of Indian and Burmese Tigers*.

Locality, collector, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
INDIA.									
Darjeeling (E. Davys); ad. ♂	375	330	260	68	80	104	250	37	30
Gauripur, Assam (The Maharajah); ad. ♂	365	322	250	60	75	101	240	37	28
Central Provinces (B. B. Osmaston); ad. ♂	357	313	271	70	75	100	243	37	26
Hyderabad (Col. H. W. Murray); ad. ♂	355	311	240	62	70	97	232	35	26
Nepal Tarai (Col. R. L. Kennion); ad. ♂	342	307	240	62	74	100	227	37	27
Jubbulpore, C.P. (Col. J. H. Carlisle); ad. ♂	340	303	254	64	75	101	235	35	28
Central Provinces (Dunbar Brander); ad. ♂	338	305	236	61	67	99	230	35	27
Bastar St., C.P. (Sir R. Dane); ad. ♂	333	293	256	64	75	94	225	35	27
Rajputana (Maharaj Kumar, Bikanir), ad. ♂	332	286	225	66	71	93	216	36	27
Nepal (Hodgson); ad. ♀	309	272	202	59	57	84	197	32	24
Nepal Tarai (Col. R. L. Kennion); ad. ♀	302	265	197	62	60	84	194	34	25
Rajputana (Maharaj Kumar, Bikanir) ad. ♀	300	268	198	57	60	83	202	33	25
Jubbulpore, C.P. (Col. J. H. Carlisle); ad. ♀	290	256	187	59	57	81	189	32	23
Bhandara, C.P. (G. E. Hewetson), barely ad. ♀	271	250	185	56	56	79	185	32	25
BURMA.									
Upper Chindwin (Mrs. Manby); ad. ♂	336	302	236	63	74	101	226	34	26
Nr. Bhamo (V. Fields Clarke); ad. ♂	324	282	225	59	67	90	210	34	25
Upper Chindwin (E. H. Peacock); ad. ♂?	317	274	210	60	64	85	205	35	27
Lower Burma (J. M. D. Mackenzie); ad. ♀	294	265	194	64	62	82	192	32	25
Mergui (G. E. R. Cooper); ad. ♀ ..	293	262	191	54	54	79	195	30	23
Nr. Bhamo (V. Fields Clarke); ad. ♀	284	252	200	59	56	81	189	32	24
Amherst (E. H. Peacock); ad. ♀	282	251	203	61	61	86	189	34	25

* In this table and in similar tables of the measurements of CARNIVORA in this volume the skulls are measured as follows :—Total length is the length from the tip of the occipital crest to the front edge of the premaxillæ ; the condylobasal length is to the same point from the hind border of the occipital condyle ; the zygomatic width is the greatest width across the cheek-bones ; the postorbital and interorbital widths are respectively the least widths behind and between the eyes ; the maxillary width is the width of the muzzle just above the upper canine teeth ; the mandibular length is the length of the lower jaw from the condyle to the anterior edge ; pm^4 is the greatest length of the upper carnassial along its outer side ; m_1 is the greatest length of the lower carnassial.

For the benefit of sportsmen who record big skulls, like tigers', in English inches, it may be added that 25 mm., as nearly as may be, go to the inch. Hence the tiger's skull from Darjeeling is approximately 15 in. in total length.

The Indian tiger skulls vary considerably in length and zygomatic width, and there is some evidence that the longest are mainly northern skulls. For instance, in addition to those enlisted above, one from Bengal (Sanderson) has the condylo-basal 332 mm., in those from Assam (Marcus Maxwell and the Maharajah of Gauripur) it varies from 322 to 309 mm., the average being 317½ mm.; in one from the Bhutan Tarai it is 321 mm.; and in five Nepal skulls it varies from 317 to 305 mm., the average being 309 mm. Even this last average exceeds by 5 mm. the average of six skulls from the Central Provinces, but the intergradation is complete. On the other hand, the zygomatic width in three of the skulls from the Central Provinces, namely, Osmaston's and those from Jubbulpore (Carlisle) and the Bastar State, is actually or relatively greater than in the more northern skulls. The conclusion above suggested regarding the superiority in length of northern skulls seems to be borne out by the measurements in Rowland Ward's ' Records,' 1928, where the first ten skulls entered in order of total length came from Kumaun, Nepal, Cooch Behar, the Duars, Assam, and Bengal, five of them slightly exceeding my skull from Darjeeling, which is 15 in., the largest measuring 16 in. and coming from Naini Tal (B. B. Osmaston). Apart from size, the most noticeable variation is in the development of the sagittal crest, which profoundly affects the shape of the dorsal profile of the cranial portion. Usually it is a thick, three-fold ridge and quite low, from about 5 to 10 mm. high in the middle of the crown, but raised and deep posteriorly, where it runs into the uptilted occipital crest. In this case the dorsal profile is markedly concave in front of the occipital crest; but sometimes the sagittal crest, *e. g.*, in one of the ♂ skulls from Gauripur, is as much as 22 mm. in the centre of the crown, and the dorsal profile behind the orbits is straight from front to back as in a lion's skull.

Size of British Indian Tigers.

There has been some difference of opinion about the size of tigers. Large numbers of both sexes have been measured by sportsmen; but in most cases only the total length from "tip to tip" has been recorded. There are two methods, called respectively "over the curves and "between pegs," and these naturally yield discrepant results. Col. C. S. Stockley, for example, showed that his "large tiger" from Kheri, entered in the table below, according to its dimensions "between pegs," was 6 in. longer when the tape was run over the curves of the head and body. Since the methods are not always stated the results are unsatisfactory. The skin

from Mergui is the only one in the British Museum in the series quoted below in which the tail was measured as well as the head and body. The first seven on the table were taken between pegs, and probably those cited from Sterndale were similarly measured, but the evidence that all were full-sized is inconclusive. That is only certain in the Mergui specimen, of which I have the skull.

Locality, authority, and sex.	Head and body.		Tail.		Total.	
	ft.	in.	ft.	in.	ft.	in.
Centr. Prov. (Dunbar Brander); ♂.	7	3	2	8	9	11
Kheri (Col. C. S. Stockley); ♂	6	7	2	11	9	6
"India" (Col. Stewart Capper); ♂	6	4	2	6	8	10
"India" (Col. Stewart Capper); ♂	5	10	3	0	8	10
"India" (Col. Stewart Capper); ♂	5	8	3	0	8	8
Bankachon (G. C. Shortridge); ♂	6	0	3	1	9	1
Mergui (G. E. R. Cooper); ad. ♀	5	9	2	7	8	4
"India" (Sterndale); ♀	5	3½	2	11	8	2½
"India" (Sterndale); ♀	5	2	3	2	8	4

This table brings out very clearly the great variation in the proportion of the tail to the head and body.

As regards total lengths "between pegs," Dunbar Brander's longest ♂ was 10 ft. 3 in., his shortest 8 ft. 9 in., the average of many being 9 ft. 3 in. His longest and shortest ♀ specimens were 9 ft. 1 in. and 7 ft. 10 in. respectively, and the average of thirty-nine 8 ft. 4 in. But out of a large number measured "between pegs" by Gen. R. G. Burton the longest tiger was 9 ft. 8 in. and the longest tigress 8 ft. 6 in. and these were the only two that reached these dimensions.

Tigers from Burma have been alleged to be smaller on the average than those from India; but Peacock gives reasons for doubting this. I have records of the total length "between pegs" of two tigers and two tigresses from that country. The tiger from Bankachon, Tenasserim (Shortridge), recorded as 9 ft. 1 in., and said to be considered large for the district, bears out H. C. Smith's statement that 9 ft. is a good length for a Burmese tiger. But there is no skull to show that the animal was full-sized. The second tiger, from Pinnwe, Katha District, near Bhamo (V H. T. Fields Clarke), known to be full-sized from its skull, was 8 ft. 4 in., a short beast, but the skull is nearly 1 in. shorter than an adult ♂ skull from the Upper Chindwin (Mrs. Manby). Of the tigresses, both fully grown by their skulls, one from Mingun, near Bhamo (Fields Clarke), was 7 ft. 8 in., the other, from Mergui (Cooper), being 8 ft. 4 in. The average of these two, 8 ft., is a good length for a Burmese tigress according to H. C. Smith ('Wild Animals of Burma,' p. 2, 1935); but Peacock quotes many instances of tigers ranging from 9¼ to over 10 ft. ('A Game Book for Burma,' p. 160, 1933).

Compared with the specimens of Indian tigers entered in Rowland Ward s ' Records ' for 1928, all the above-quoted specimens are small. Fifty-six Indian tigers in the flesh ranged from 9 ft. 10 in. to 10 ft. 7 in., and twelve tigresses from 9 ft. to 9 ft. 10 in. The excess is probably due in a measure to the animals being especially selected for measurement on account of their size ; but probably most of them were measured " over the curves."

The standing height at the withers of a living tiger seldom exceeds 3 ft. I measured many standing against or walking past graduated scales in the Zoological Gardens, and the biggest, a ♂ of the northern Asiatic race, shipped from Vladivostock and admitted by all Indian sportsmen who saw him to be a huge beast, stood 3 ft. 2 in.*

Weights.—Dunbar Brander's heaviest tiger was 512 lb., the lightest 353 lb., the average of many being 420 lb. His average for tigresses was 290 lb., the heaviest being 343 lb. Sir J. Hewett's heaviest tiger and tigress were respectively 570 and 347 lb. But there are three tigers in Ward's ' Records ' scaling 600 lb. from Cooch Behar, 608 lb. from Gwalior, and 645 lb. from Kumaun. Shortridge's Bankachon tiger was 382 lb.

The Original Country of the Tigers.

From the discovery of fossil remains of tigers in the extreme north of Siberia in the Pleistocene and the survival of the species in Manchuria and Amurland, it is inferred that the species is of northern origin and migrated southwards to south-western Asia on one side of the Tibetan Plateau and through China on the other, and thence to Burma and ultimately to the Sunda Islands. The evidence that it made its way into India from Burma round the eastern end of the Himalayas, and not through Afghanistan and Persia, is supported by one or two facts. There is complete continuity in distribution and racial characters between the tigers of India and China and discontinuity in both respects between those of western India and Afghanistan. In the Himalayas they are rarer west of the Bhagirathi River than to the east of it (Burrard), and are not found at all events in Upper Kashmir, nor are they plentiful in Upper Sind or the

* A dimension interesting to sportsmen is what Rowland Ward calls " The estimated height at the shoulder." This is taken " between pegs " when the dead animal is lying on its side on the ground. In the 1928 edition of the ' Records ' this dimension ranges in tigers from 3 ft. 3 in. to 4 ft. ; but it is not the standing height of the living animal. One living tiger, however, is said to have stood 3 ft. 10½ in. at the shoulder. If this be accepted, the animal must have exceeded in all its dimensions the big N. Asiatic specimen above referred to by nearly as much as an ordinary tiger exceeds a leopard.

Punjab. That the species was a comparatively late comer into India is attested by its failure to reach Ceylon. (See also under the account of the Lion, p. 221).

Habits of Tigers.

Tigers live in forests, jungles, and even in scrub or grass-land, wherever the three essentials for their well-being are supplied—plenty of game, water, and shelter from the sun. Being intolerant of heat, they mostly lie-up during the day, start hunting about sunset, and may be so occupied until sunrise, often covering great distances in their quest, which is conducted at a slow, stealthy walk, usually along a jungle track or nullah if available. The presence of game is detected, it is said, not so much by scent* as by hearing and sight, both of which senses are said to be remarkably keen. When it is perceived, the tiger's approach becomes a silent, gliding crawl † until within striking distance.

They prey upon game of all kinds—elephant (even adult cows), bison, buffalo, deer, nilghaie, wild pig, bear, and porcupines, as well as tame cattle and goats and ponies, especially if wild game is scarce. They will also eat their own kind and leopards. Nothing, indeed, seems to come amiss. In flood time they have been known to devour crocodiles, water-tortoises, and fish. A hungry tiger will take frogs, and there is a record of the stomach of one being crammed with locusts. The droppings of a tiger in the Naga Hills were full of salt-lick earth, as noted by R. C. Morris.

A great deal has been written about the tiger's method of seizing and killing its prey. A favourite practice is seizure by the throat or nape, followed, if possible, by dislocation of the neck by a wrenching twist. Another, more particularly adopted in the case of big or powerful beasts like bison and buffalo, is " hamstringing," which renders the victim incapable of putting up a troublesome fight. But often to secure the quarry a leap on the hind quarters has to be resorted to, and a stroke with the paw is sufficient in some cases. Sometimes tigers hunt in couples, one driving a deer towards the

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* According to Dunbar Brander the sense of smell is very poor. Peacock, however, doubts this, and cites the case of a tiger in Burma sniffing his foot-tracks although nearly an hour old. Some of the smaller Cats, with nasal passages no larger relatively than in a tiger, have, as I know, a keen sense of smell.

† My nephew, Nicholas Pocock, R.C.S., who watched a tigress stalking a herd of Sambar along a track strewn with dead leaves, told me she was almost invisible owing to her coloration, and her movements practically imperceptible. Only when he looked from her to the deer and back again did he notice that she was nearer each time to her quarry, which did not perceive her until too late.

place where the other lurks in wait, and sometimes the hunt is conducted by a family party.

As a general rule, if not invariably, the tiger starts feeding on the buttocks of its kill and works forwards, continuing his meal, which may amount to as much as " three-quarters of a fair-sized buffalo," until gorged. At sunrise the remainder, if any, may be hidden from vultures either beneath a bush or under mouthfuls of grass torn up by the tiger for the purpose, as seen by Dunbar Brander. After drinking, the tiger sleeps till sunset, then returns to finish the carcase. But the animal is not particular to what he kills himself or to the freshness of the meat. If he comes across a carcase in the jungle he will eat it even in an advanced state of putrefaction, maggots and all.

For some inexplicable reason, tigers as a general rule, it seems, refrain from killing man, as if they had an instinctive fear of him. But if once the fear is overcome and the facility with which men and women can be killed is found out, tigers will thereafter take them on every possible occasion, and may become a scourge to a district by turning into " man-eaters." The first attack on a man may be due to any cause compelling irresistible hunger, such as great scarcity of other game or some physical defect, like old age, which makes its capture unusually difficult. Or it may be induced by the ferocity of a tiger when pairing*. At this time they lose all fear of man and are particularly dangerous, since they attack at sight if he happens to be near. Although a man so attacked would not be killed for prey in the first instance, he would probably be eaten by the tiger or tigress and the appetite for him excited.

Of their physical prowess there are many records. Half lifting, half dragging, they can transport a bulky carcase many times their own weight. A tigress was seen by Dunbar Brander to drag without apparent effort a half-grown buffalo up a steep river-bank covered with alluvial soil so soft that she sank at every step. In Burma, Peacock tells us, a tiger shifted for 15 yds. the carcase of a bison which thirteen strongish men could not drag, and he saw another swim over a river with a medium-sized cow in its mouth. They are, indeed, strong swimmers, and readily take to water. In the Sundarbans, according to Hickie, they have been known to cross tidal rivers some 4 miles wide and running with

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* This characteristic was recorded by Dunbar Brander. Many years ago I noticed the same thing in lions at the Zoological Gardens. They became savage to a degree when pairing, and would charge the bars of the cage, growling fiercely at a keeper with whom on other occasions they were on the most friendly footing. Resentment of the possibility of interference with the business in hand seemed to be the explanation of the change in temper.

a tolerably swift current. Their liking for water is further evinced by their habit sometimes of lying immersed up to the head in a pond in hot weather. Dunbar Brander saw a tiger clear a 6 ft. wall "like a greyhound" and a tigress take a gully 19 ft. wide in her stride without checking speed. Having very little to fear in the jungle, they have less occasion to exercise their climbing powers than the smaller species of Cats; but, like them, they can climb, and have been known to do so to fetch men out of trees and to escape when hunted. Of many records collected by Gen. R. G. Burton one may be quoted as evidence that they climb as well as ordinary cats. A tigress enclosed in a shola near Ootacamund ascended a tree-trunk about 1 ft. in diameter and rising vertically without a branch for 25 ft. Here she was shot and fell heavily to the ground, but, recovering, went again up the tree, despite her wounds. Tigers are also "treed" sometimes when bayed by a pack of wild dogs, incidentally one of the few denizens of the jungle with which they do not know how to deal.

Tigers utter a variety of sounds expressive of different emotions. The most impressive is a deep-throated, loud, far-carrying roar, unmistakably like a lion's. This may be repeated at short intervals and is used as a mate-call*.

There is also the peculiar note very puzzlingly rendered as "pook," "moop" or "titting," which has been likened to the call of a Sambhar, and believed by some sportsmen to be uttered as a lure to attract the deer. That is probably pure fancy; but it is not known what the sound expresses or what purpose it serves. Both tigers and tigresses when approaching one another, or even human beings, in a friendly spirit utter a gentle puffing sound by expelling air in rapidly repeated jets through the nostrils. When suddenly surprised and startled they give vent to a loud "whoof." As a rule they attack prey in silence; but commonly when charging a man they utter a kind of barking cough two or three times, which may rise to a harsh roar. Anger is expressed by a menacing growl or by wind-like expulsion of air with the mouth open and the fangs bared.

At pairing time the sexes keep together, a tiger being sometimes accompanied by two tigresses. The period of gestation is usually said to be fifteen weeks (105 days), but Dr. Vevers informs me that in the case of a litter born at Whipsnade in 1937 it was sixteen weeks (112 days). Before

* In the Zoological Gardens I have heard a tiger and tigress answering one another at night from cages some half a mile apart. Inexperienced people often mistook a tiger's roar for a lion's, and if a tiger started to roar in the Lion's House the lions would take up the chorus, as is their custom when one of their own kind begins.

the birth of the cubs, usually two or three but occasionally as many as six in number, the parents separate and the sole duty of looking after them devolves on the tigress. Cubs may be born anywhere in the jungle, but usually an overhanging rock or a cave is selected as a shelter. About two months after birth they begin to venture out of the lair and, when big enough, they accompany the tigress on her hunting, and may stay with her until about two years old, even after she has paired again and has another litter on the way. Sometimes she tolerates their company even longer, and may be seen with young of different ages. There is some doubt as to the age at which tigers can be said to be full-grown. Blanford, on unstated authority, says three years; Dunbar Brander says five, adding that they put on muscle even after that; but the ability of a tigress to breed long before she is full-sized was shown at Whipsnade, where one produced a litter when she was only two years old, as I learn from Dr. Vevers. Regarding the age to which tigers may live, Dunbar Brander quotes a case of one well known in a particular jungle as an adult for fifteen years. Since it was in prime condition when killed, at the computed age of twenty, it may be inferred that the animal would not have been far short of thirty if it had died as the result of old age. This view is supported by a case recorded by Sanderson, and cited by Blanford, of a tiger known as a cattle-eater for twenty years which, when killed, showed no definite signs of decrepitude.

22. **Panthera leo** (Linnæus). The Lion.

Felis leo, Linn., Syst. Nat. ed. 10, p. 41, 1758; and of most subsequent writers.

Panthera leo, Pocock, Ann. Mag. Nat. Hist. (8) xviii, p. 306, 1916; id., Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 638, 1930.

Locality of the *type*, Barbary.

Distribution.—Within historic times S.E. Europe, S.W Asia, NORTHERN INDIA, and nearly the whole of Africa, except the western and central forested area; but now exterminated in many districts.

Approximately equal to the tiger in size and in the relative length of the tail, but distinguished from it by the complete or almost complete loss of the pattern in the adult*, by the uniformly darker or lighter tawny hue of the upper side, due to the blending of blackish and pale speckling of the individual hairs, by the presence of a black tuft at the tip of the tail,

* On the underside and on the inner side of the limbs spots are sometimes traceable in the adult, especially in the ♀, and occasionally, in some E. African lions, at least, a faint pattern of rosettes, showing a vertical, lineal arrangement, is visible on the flanks from the spinal area downwards, and becoming stronger on the belly and limbs.

of a black patch behind the ear, and by the absence of sharp contrast between the tint of the flanks and belly and of the outer and inner sides of the limbs. Also by the forward and upward streaming of the hairs on the sides and top of the neck to form a higher or lower median erect crest on the nape ; and in almost all cases by the forward direction of the hairs

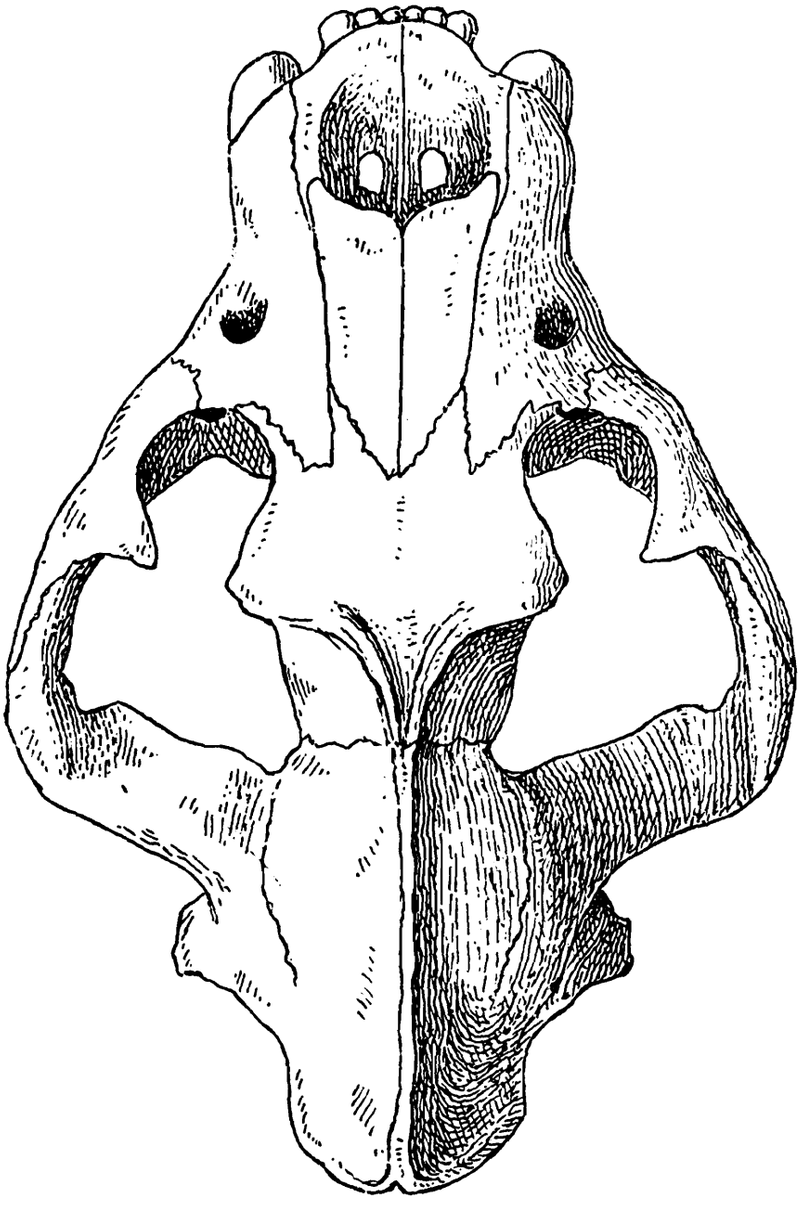


Fig. 60.—Upper view of skull of Lion from Amreli.

on the middle of the back from a whorl in front of the loins.

The ♂ is larger than the ♀ and, as maturity approaches, typically develops a mane on the neck, consisting of a median crest running along the nape from the shoulders to the crown, of a fringe on the cheek, and of longer hairs extending over the sides of the neck to the breast between the fore legs. This is

accompanied by a tuft of hair on the elbow and frequently by longer hairs on the chest and abdomen. But these hair-growths are very variable in length and luxuriance even in specimens from the same locality. In the extinct races from Cape Colony and Algeria the long, thick mane covered the entire neck and shoulders, and the hairs on the chest and belly formed a luxuriant fringe; but in none of the existing races are such manes developed, and "maneless" lions have been recorded from East Africa and Persia*.

Newly-born cubs are sometimes uniformly coloured, except for faint spots on the underside; but as a rule they have a distinct pattern on the upper side consisting of rosette spots like those of a jaguar or leopard, but these spots commonly show a tendency to arrangement in vertical lines and, as a further stage, to coalesce and form looped stripes like those of a well-marked tiger. Usually the pattern disappears in about six months, but is occasionally retained for two or three years or even more.

The skull typically differs from a tiger's by being lower and flatter in the frontal region, with the "waist" or post-orbital region, measured from the frontal process to the fronto-parietal suture, shorter, so that the facial portion looks longer and more massive as compared with the cranial; the anterior nares are wider, the nasal bones shorter, not projecting posteriorly beyond the maxillæ, and the lower edge of the mandible is slightly convex in the middle, so that the skull "rocks" slightly when placed on a flat surface; also the inner lobe of the upper carnassial tooth is smaller. These differences hold good in a great majority of cases; but tigers' skulls are so variable that occasionally they are difficult to distinguish from those of lions. The only difference I have found to be absolutely constant lies in the mandible, which in the tiger is slightly concave below, so that the skull never "rocks" when resting on a flat surface.

22 *a*. **Panthera leo persica** Meyer.

Felis leo persicus, Meyer, Diss. inaug. de genere Felium, Vienna, p. 6, 1826; Fischer, Syn. Mamm. p. 197, 1829; and of some later authors.

Felis leo bengalensis, Bennett, The Tower Menagerie, p. 1, 1829 (nom. preocc.).

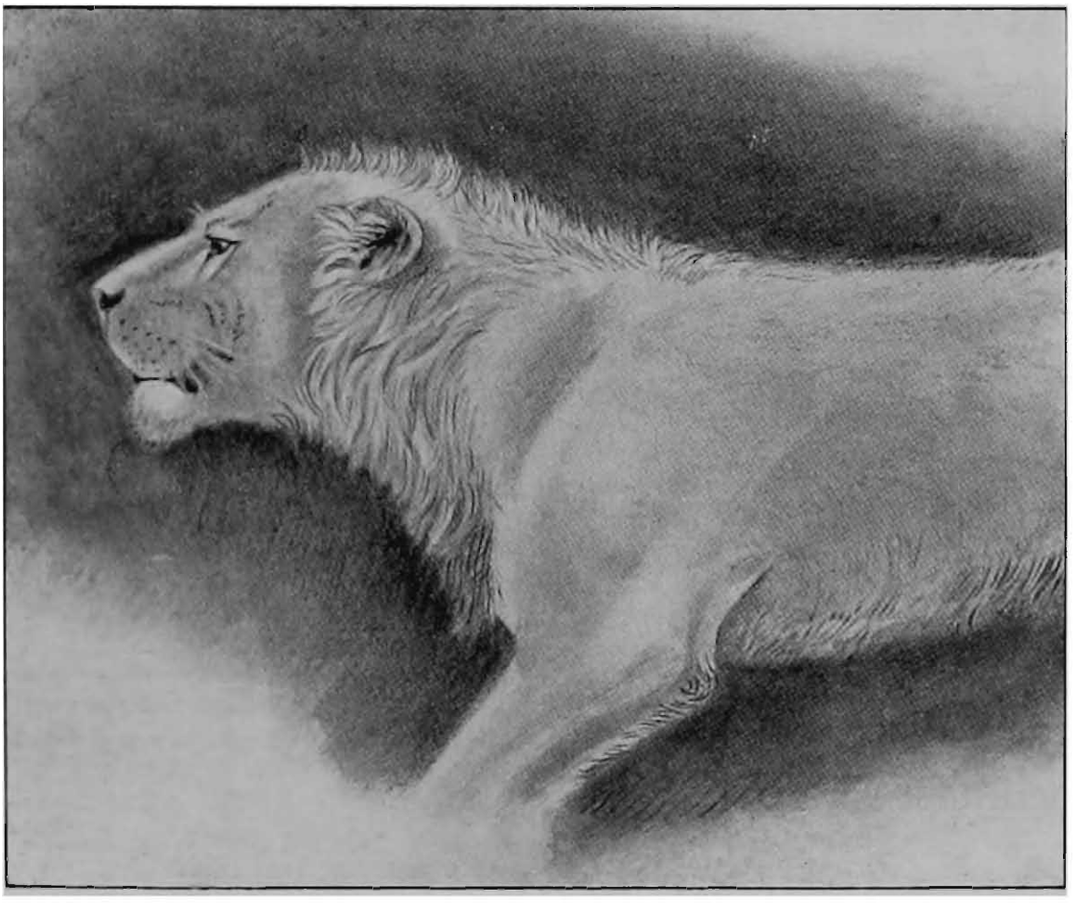
Leo asiaticus, Jardine, Nat. Libr., Felinæ, pp. 121 and 266, 1834.

Felis leo goojratensis, Smee, Proc. Zool. Soc. 1833, p. 140, id., Trans. Zool. Soc. i, p. 165, pl. xxiv, 1834; and with various renderings by several subsequent authors.

* The mane presents many analogies to the human beard. Its growth is arrested by castration, and a small one may be acquired by old lionesses.



Head of Indian Lion. (Adapted from engraving by Bennett of specimen from Hariana exhibited in the Tower of London.)



The "Maneless Lion of Gujerat." (Drawn from one of Capt. Smee's specimens.)

Felis leo indicus, Blainville, Ostéogr. Mamm. Atlas, Felis, pl. vi, 1843.

Felis leo persicus, asiaticus, and *goojrattensis*, Matschie, SB. Ges. Nat. Fr. Berlin, p. 94, 1900.

Panthera leo persica, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxiv, pp. 638–65, 1930 *, and xxxviii, p. 382, 1935.

Vernacular.—*Sher*, *Babar-sher*, *Singh* (Hindi); *Untia-bágh* (Camel-tiger) (Guzerati); *Sáwach* (Kattywar); *Shingal* (Bengali); *Süh* or *Suh* ♂, *Siming* ♀ (Kashmiri); *Rastar* (Brahui).

Locality of the *type* of *persicus* of Meyer, "Persia"; of Fischer, Teheran (ex Temminck, Mon. Mamm. p. 86, 1827); of *bengalensis*, Hariana (according to Blyth); of *asiaticus*, Bussorah or Basra (but probably based on the same specimens as Fischer's *persicus*); of *goojratensis*, Ahmedabad; of *indicus*, India.

Distribution.—Formerly Persia, Mesopotamia †, no doubt Baluchistan, and Northern India from Sind in the west to Bengal in the east and from Rampur and Rohilkund in the north to the Nerbudda in the south. Now restricted to the Gir Forest in Kathiawar.

Distinguished, on the average at least, from existing African races by the sum of a number of characters:—The skull has the auditory bullæ less inflated, the postorbital area, or "waist," measured from the frontal process to the fronto-parietal suture, shorter and the infraorbital foramen typically divided into two by a bridge of bone; in external characters the tail-tuft is larger, and the elbow-tuft and belly-fringe are comparatively well developed in association with a poorly developed mane.

The coat, according to the season, may be short and sleek or tolerably thick and long, long enough to be brushed in all directions. The general colour is very variable, ranging from ruddy-tawny, heavily speckled with black, to sandy- or buffish-grey, sometimes with a silvery sheen in certain lights and with the black speckling much less in evidence,

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* Reasons for the synonymy here quoted were given in this paper and need not be repeated. It is necessary, however, to add that the evidence of racial identity between the Indian and the Persian lion is not complete owing to the scarcity of Persian material. The skull, for example, of the Persian lion is unknown to me. If ever the Indian lion is shown to be distinct it will take the name *goojratensis*, since the older name *bengalensis* is unavailable from having been applied to the Leopard-Cat (*F. bengalensis*) in 1792.

† Fitzinger (SB. Akad. Wiss. Wien, i, p. 362, 1868) stated that this lion occurred in Greece and Palestine, which he could not have known, and also in Afghanistan. I am not aware of the evidence of its former existence in Afghanistan, but it may have been found in the southern parts of that country.

and below, including the chin, and on the inside of the legs from buff to nearly white. The mane also varies in luxuriance and colour. It may consist merely of a crest running along the nape from the shoulders to the crown and of a scanty fringe on the cheek and throat, where the hairs are only about

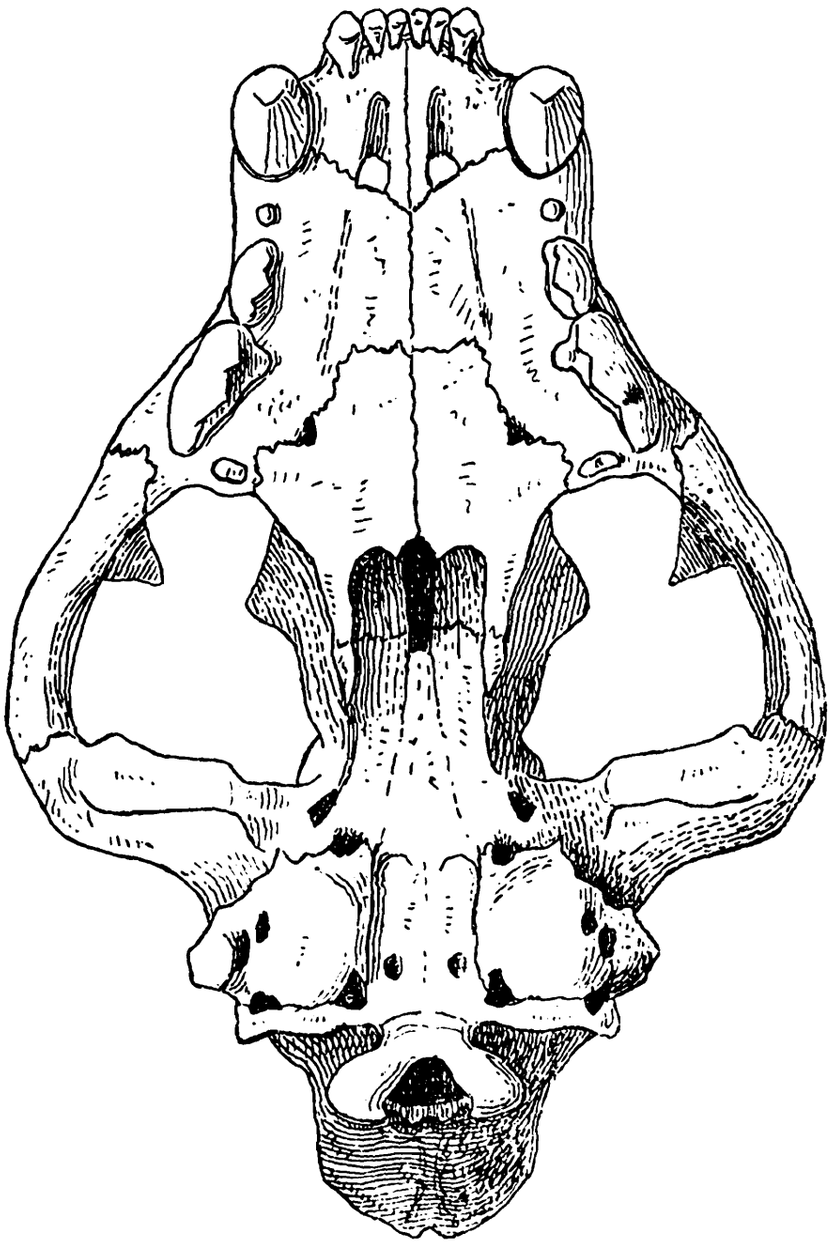


Fig. 61.—Lower view of skull of Lion from Amreli.

4 in. long; or it may form a luxuriant mat over the summit and sides of the neck, the longest hairs being nearly a foot in length. Its colour is usually tawny, with a mixture of blackish and grey hairs, but it may be tolerably golden-tawny almost throughout, or it may be heavily blackened along the crest and low down in front of the shoulder.

Some recorded flesh-measurements are as follows :—

Locality, authority, and sex.	Head and body.		Tail.		Total.	
	ft.	in.	ft.	in.	ft.	in.
Gir Forest (Lord Harris) ; ♂	–	–	–	–	9	7
Gir Forest (Col. Fenton) ; ♂.	6	6	2	11	9	5
Gir Forest (Count Scheibler) ; ♂	6	6	2	7	9	3
Gir Forest (Col. Fenton) ; ♂.	–	–	–	–	9	1
Gir Forest (Col. Fenton) ; ♂.	–	–	–	–	9	0
Gir Forest (A. S. Vernay) ; ♂.	–	–	–	–	9	1
Ahmedabad (Capt. Smee) ; ♂	–	–	–	–	8	9½

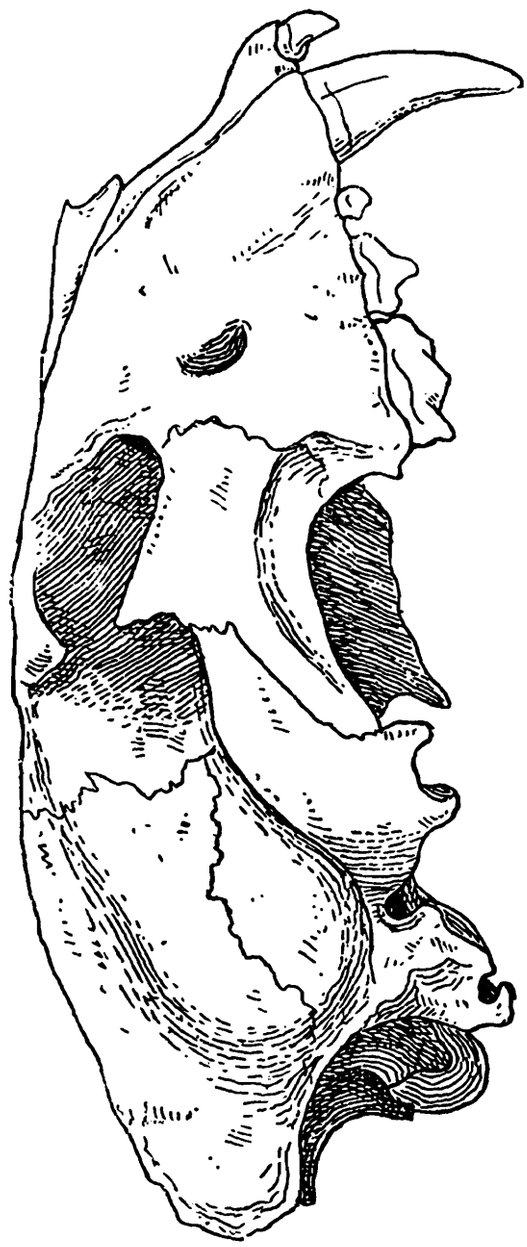


Fig. 62.—Lateral view of skull of Lion from Amreli.

None of the many dressed ♂ skins that have been measured exceed the dimensions given above ; but a freshly stripped, pegged-out skin measured by Lord Lavington was :—Head

and body 7 ft. 6 in.; tail 2 ft. 8 in.; total 10 ft. 2 in. This was no doubt stretched, as Col. Fenton supposed. A dressed ♀ skin from Gujerat in the British Museum has the head and body 5 ft. 4 in., the tail 2 ft. 8 in., and the total 8 ft. From the evidence quoted above the Indian lion is the same size approximately as Central African lions.

The essential characters of the skull of the lion are given above. To this it may be added that the skull is exceedingly well developed muscularly. The ♂ from Amréli, of which the dimensions* are entered below, for instance, has a more strongly developed sagittal crest than in any African lion's skull I have seen. Although fully adult it is not an old skull. In connection with that peculiar feature, the division of the infraorbital foramen into two orifices, it

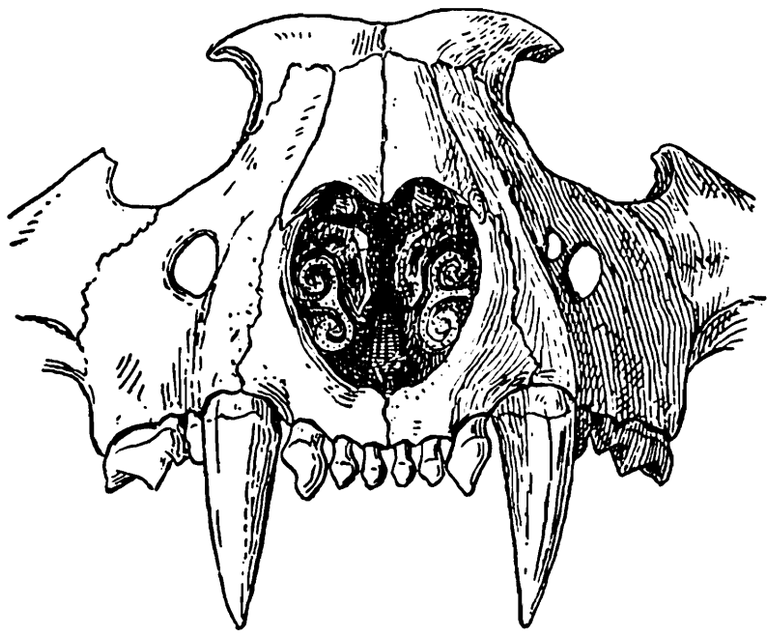


Fig. 63.—Front view of skull of Lioness from Amreli, showing the duplication of the infraorbital foramen on the left side.

may be stated that out of thirteen skulls examined, eleven have it divided on one or both sides, two only resembling African lions in having it undivided. Sir Richard Owen first drew attention to this phenomenon in the skulls collected by Smee.

The first skull on this list was presented to the British Museum by the Maharajah of Bhavnagar through the kind offices of Col. A. H. E. Mosse, I.A.; the second belonged to a specimen shot by H.H. the late Maharajah Jam Sahib of

* Since sportsmen interested in "records" usually quote the total length and the zygomatic width in English inches, I may add that these dimensions in this skull are respectively 13·4 in. and 9·1 in. It is as long as any recorded skull and a trifle wider.

Measurements (in mm.) of skulls of Indian Lions.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Amreli District; ad. ♂	340	307	231	54	73	101	—	37	25
Gir Forest; ad. ♂	340	313	225	58	73	97	238	37	25
Gir Forest; ad. ♂	330	299	221	54	67	88	229	36	25
Gir Forest; ad. ♀	302	277	203	51	63	89	206	31	22
N. Gujerat; ad. ♀	297	271	209	51	60	86	—	34	25
Assund; ad. ♀	292	266	195	54	60	86	—	36	24

Nawanagar ; the third and fourth were presented by H.H. the Nawab of Junagadh ; the two remaining skulls of lionesses are preserved in the Museum of the Royal College of Surgeons.

A Theory about the "Maneless Lion of Gujerat."

When Captain Smee described the Indian lion he unfortunately chose for his paper the misleading title "The Maneless Lion of Gujerat." Although he explained that "maneless" was used merely in a comparative sense to indicate, as he erroneously thought*, that his lions differed from African lions by their smaller manes, the Gujerat lion was over and over again cited as "maneless" by subsequent writers. This race indeed seems to have been the source of the highly fanciful theory put forward by General Rice to account for the small manes many of them developed. In years preceding the Mutiny, he wrote, lions were much more plentiful in that part of India than afterwards and used to live more in the open plains. No fewer than eighty were shot in three years by a cavalry officer who chased them on horseback over the open country. From being constantly hunted and persecuted the lions were driven to take refuge in the forests, where the numerous thorn-bushes dragged out the best part of their manes until all except very old lions ceased by degrees to have any manes left.

This notion that the combing action of thorns accounts for the scantiness of manes in many lions has often been thoughtlessly quoted with approval as supplying a satisfactory explanation of the fact. There is not a word of truth in it. The most that thorns could achieve would be keeping the mane tidy by the removal of dead, moulted hair which might for a time adhere to the growing mane before being shed. They could no more affect its potential luxuriance than the daily use of a comb can reduce the quantity of living hair on a woman's head.

The Original Home and Destruction of the Indian Lion.

From the discovery of fossil remains of the lion in England, France, and Germany, and from unmistakable sketches of it left by early man † it is known that in prehistoric times

* His conception of African lions was probably founded on menagerie specimens, which may grow heavy manes, or upon the naturally full-maned lions of Cape Colony or Algeria, which in the early part of the nineteenth century were not uncommonly exported to Europe for exhibition.

† The only sketch known to me represents the beast as maneless. This is noteworthy because the Neolithic artist would surely not have selected a lioness for portrayal and would have depicted such an impressive feature as the mane if is had been present in the lion. Possibly at that date the lion had not acquired that secondary sexual character.

the species was widely distributed over the whole of Central Europe; and from historical records it is also known that it still existed in Macedonia at the time of the invasion of Greece by Xerxes, and was tolerably abundant in Palestine, as told in biblical stories. It has long since ceased to exist in those countries, but in Persia and Mesopotamia it occurred until comparatively recently, although it is now apparently extinct there.

At the time of the English occupation of India lions were abundant throughout the northern portions of that country from Sind in the west to Bengal in the east, and from Hariana, Rampur, and Rohilkund in the north to the Nerbudda in the south; but the last of them are now restricted to the Gir Forest in Kathiawar, an area of about 500 square miles, which was set aside as a sanctuary and is owned by H.H. Sir Mahabat Khan, Nawab of Junagadh. In 1880, before protection was extended to them, there were said to be only about a dozen left in that district; but in 1930 their number was computed to have increased to 200. This, however, was probably an exaggeration, since Sir Patrick Cadell guessed there were not more than seventy or eighty in 1935. The dates of the extermination of the species in a few districts, compiled by N. B. Kinnear from various sources, are as follows :—Palamau 1814, Baroda 1832, Hariana 1834, Ahmedabad 1836, Kot Diji in Sind 1842, Damoh 1847, Gwalior 1865, Rewah 1866, Abu and Guna 1872, Deesa 1878, Palanpur 1880.

The above stated evidence of the occurrence of lions in Europe and South-Western Asia in early times supports the view that the species made its way into India through Persia and Baluchistan. That it is a comparatively recent immigrant into India is attested by its restricted distribution in that country. If India had been its home the lion would almost certainly have travelled southwards to Cape Comorin and reached Ceylon before the severance of that island from the mainland. Probably, too, it would have crossed the Ganges and Brahmaputra and entered Burma. Still further evidence of the lateness of its arrival to constitute part of the Indian fauna is supplied by its absence from the whole of the southern part of Peninsular Hindustan. The only plausible explanation of its failure to make its way south of the Nerbudda River is that it was not given sufficient time. A check was put upon its movements, and its rapid extermination was started soon after the administration of India was taken over by the East India Company.

In all parts of the world occupied by Europeans where lions occur the disappearance of the lions is merely a question of time. They are a menace to human life, especially if they become " man-eaters," and they ravage the flocks and herds

of settlers, finding domesticated livestock easier to prey upon than wild game. This antagonism between lions and Europeans, with all their resources for destruction, has led to the extermination of lions in several areas of Africa where they were at one time plentiful. Man, too, was doubtless the principal agent, direct or indirect, aided perhaps by physical factors lessening the abundance of big game or creating unfavourable conditions, in the disappearance of lions from Greece, Palestine, Mesopotamia, and Persia ; and there seems to be no reason to look beyond man as the prime cause of their extermination in India. It is only necessary to cite the following instances attesting extensive slaughter in two localities. During the Mutiny an English officer shot over 300 lions, fifty of them in the neighbourhood of Delhi ; and Capt. Mundy in his ' Pen and Pencil Sketches,' 1832, stated that before his time there were great numbers of lions in the jungle near Hansi in Patiala, but that owing to the rewards offered by Government for their destruction and the zest of English sportsmen they had entirely disappeared from the district. Incidentally he remarked that crack sportsmen considered the lion afforded better sport than the tiger because his attack is more open and his haunts less favourable for retreat. This opinion of the difference in character between lions and tigers agrees with that of Major Leveson, " the old Skekarry," who, after experiences in shooting on foot tigers in India and lions in Africa, came to the conclusion that the lion is the pluckier animal of the two. Perhaps he should have said less cautious and less cunning.

There is no reason to suppose that the two instances quoted in testimony of the wholesale slaughter of Indian lions in two districts were in any way exceptional where they were plentiful. Similar slaughter was no doubt going on elsewhere at the same time and before and after, resulting in the almost complete extinction of the lion in India, as it has been extinguished in Cape Colony, Algeria, and elsewhere in Africa.

Stress has been laid on the cogency of the evidence that the practical disappearance of the lion in India was due mainly to the activities of the English Government and of English army officers and civilians because a famous forest officer and a distinguished sportsman—the latter anxious to prove that the tiger has more claim to the title " King of beasts " than the lion—put forward the opinion, which others have accepted, that the tiger was the principal factor in the tragedy. An obvious objection to this theory is the disappearance of lions in Europe and in the countries of S.W Asia and Africa referred to where there were no tigers to interfere with them. But there are other facts to consider. There is evidence that tigers entered India from the north round the

eastern end of the Himalayas through Burma, a different route from that of the lion. Since, moreover, the tiger spread all over South India, which the lion failed to reach, it seems likely that the tiger's invasion of the country preceded the lion's. In that case the lion made its way into Northern India and multiplied exceedingly despite the tiger being already in occupation of the country. Also the average difference between the species in habitat makes it unlikely they were ever brought into serious competition for a livelihood. There would be no necessary rivalry between them; and the view that tigers waged organized warfare against the lions or that combats between individuals, in which tigers were victorious, were sufficiently frequent to lessen appreciably the number of lions may be dismissed as fanciful, because an encounter would just as likely end in mutual avoidance as in a fight, and in the event of a fight the lion's chance of success, so far as anything is known to the contrary, would be as good as the tiger's. Hence there does not appear to be a particle of evidence that the tiger played even a subordinate part in the extermination of the lion in India.

In the old days, as recounted by General Rice, Indian lions were sometimes pursued in the open on horseback, but in thicker cover they were hunted on foot, unless elephants were used for the purpose. In comparatively recent years they were also shot on foot in the Gir Forest, as, for instance, by Col. Fenton and his companion, who employed a gang of beaters to drive them within range of the places where the sportsmen were stationed. Some had narrow escapes from following up wounded beasts; and finally the killing of an English officer by a lion led to the prohibition of "foot-hunting" by those to whom the privilege of shooting in the Gir was granted. Since then the method has been for sportsmen, safely lodged in a "machan," to wait for the lions near a "kill" or to shoot them from these platforms when driven beneath by beaters.

A great deal has been written about the habits of African lions, much less about those of the Indian race, and such accounts as have come down to us are mostly records of slaughter. But there is no reason to suppose there is any difference in the two continents.

Except that lions generally frequent more open country and are less secretive and more regardless of exposure than tigers, the habits of these two great cats are on the whole tolerably similar. Being approximately equal in size and strength, they are alike capable of killing large and powerful game. Lions, however, except at the breeding season, appear to be more sociable, judging from accounts by African sportsmen of two or more full-grown males combining to pull down

a buffalo. It is well known that in Africa lions may become habitual man-eaters, like tigers, and apparently under the same circumstances. It is likely enough that in the past Indian lions did the same; but at the present time they seem usually to avoid man, and only to attack him in self-defence. In the Gir Forest they prey mainly upon the big game and domesticated livestock. It has been recorded that they lie up during the day in their lairs, and issuing from them just before sunset make straight for the nearest hamlet of buffalo-herdsmen. If unsuccessful in their quest they move on to the next and wait for stragglers from the byres. Since the cattle are driven out to pasture long before daybreak, the lions have a good chance of a kill while it is still dark.

In the case of African lions it has often been stated that the male, unlike the tiger, stays with the female after the birth of the cubs and helps her to protect them and later to get food for them. That the same is true of the Indian lion is attested by an account given by General Watson of an unprovoked attack made upon him at Hariana by a lion and lioness who were lying up in a patch of thick jungle and sprang out as he was riding past. He shot the pair and afterwards found a couple of small cubs in the thicket*.

A lion is in his prime when about five years old; but Dr. Vevers tells me of an instance of a lioness that bred when she was only twenty-two months. Their potential length of life is probably the same as in tigers. The period of gestation is about sixteen and a half weeks (116 days); and the cubs, usually from two to five in number, may be born with their eyes already open, although frequently they are closed.

23. **Panthera pardus** (Linnæus). The Leopard or Panther.

Felis pardus, Linn., Syst. Nat. ed. 10, p. 41, 1788; and of most subsequent authors.

Panthera pardus, Pocock, Ann. Mag. Nat. Hist. (8) xviii, p. 316, 1916; id., Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 64, 1930.

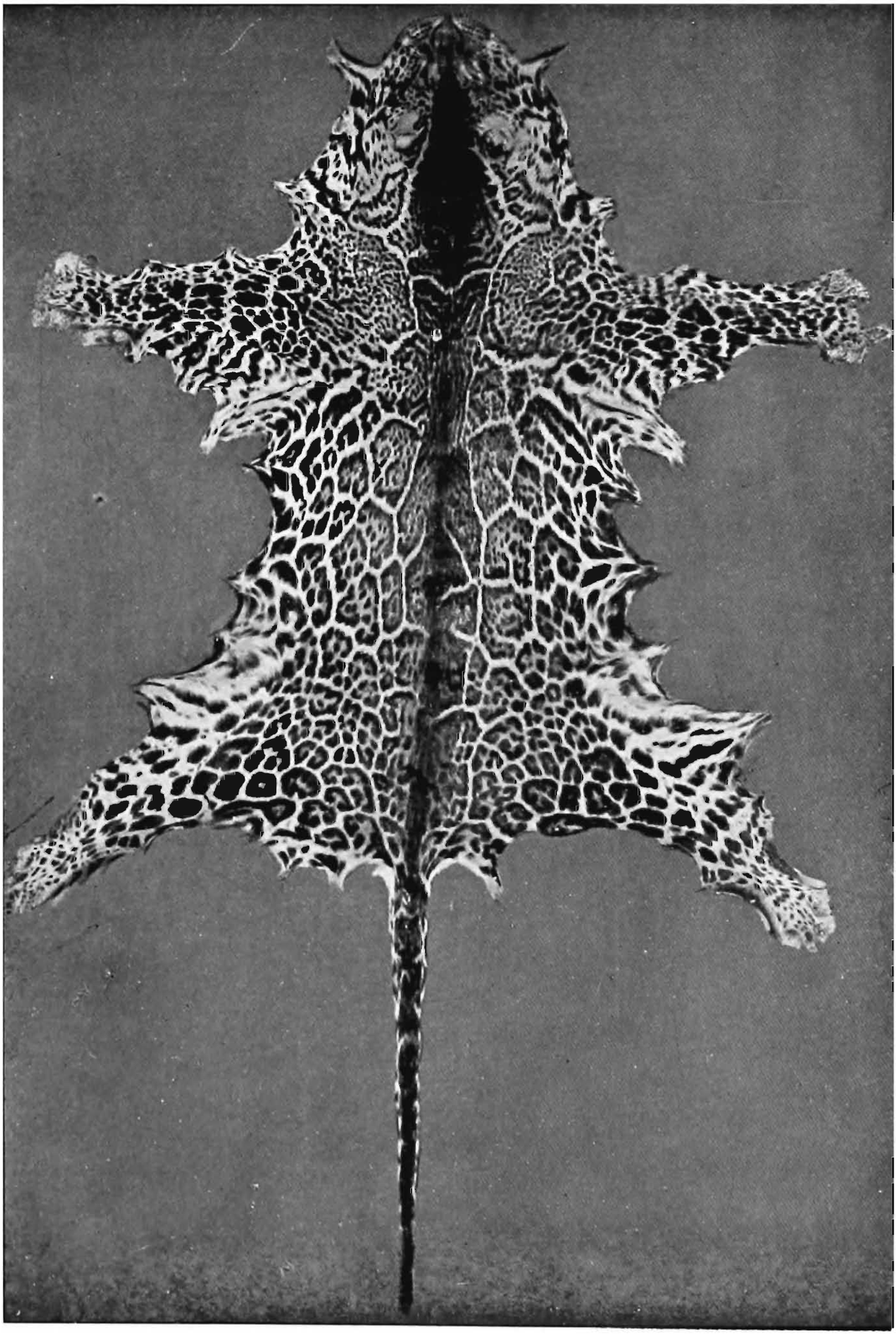
Locality of the *type*, Egypt (Cabrera and Thomas; restricted to the Egyptian Sudan by Hollister).

Distribution.—The whole of Asia south and east of a line running roughly from Asia Minor and the Caucasus to Manchuria and Amurland, and reaching Kangean Island to the east of Java; also practically the whole of Africa except the Sahara.

Size considerably less † than that of the tiger or lion, the

* This was in the early twenties of the last century. The two cubs were hand-reared and sent to England to make history as the first Indian lions exhibited in this country.

† These remarks apply to Indian representatives of *Panthera pardus*.



Variety of Indian Leopard from Cuddapah.

length of the head and body seldom exceeding 4½ ft., with the tail considerably over half the length of the head and body, the hair on the cheeks never growing into a definite fringe longer than that of the body and, although the hair on the nape typically forms a median crest from the junction of convergent streams from the sides of the neck, as in lions, it never, even in the ♂, forms anything approaching a definite mane. The coat varies greatly in length, thickness, and texture, according to the season, in some races; the ground-colour above is also exceedingly variable, from greyish or whitish-buff, with sometimes hardly a trace of buff, to olivaceous with a buffish tinge, or to bright reddish-ochreous; below, from the front of the upper lip and chin backwards, including the lower cheek, the lower side of the tail and the inner surfaces of the limbs, it is generally wholly white, and sharply contrasted with the tint of the upper side and outside of the limbs, though the paws may be paler than the rest of the limbs; there is a white patch on the otherwise black back of the ear, but there is no white patch over the eye as in the tiger. The pattern is very different from that of the tiger, but not unlike the pattern of some lion-cubs. It consists of solid black spots on the head, sometimes for a short distance behind it, on the outer side of the limbs and on the belly, which is typically heavily spotted, but elsewhere on the body the pattern mostly consists of definite "rosettes" which appear to result from the coalescence of some four or five smallish solid spots to form definite but irregularly shaped rings surrounding an area of darker tint as a rule, especially low down on the sides, than the brighter tint of the interspaces between the spots. The rosettes vary considerably in size and spacing, and on the spine, especially over the hind back and loins, they are usually more elongated and show a tendency to run in longitudinal stripe-like lines. On the tail the pattern is less regular and less rosette-like, the individual rosettes being liable to coalesce more or less towards the end above, whereas the underside here may be almost wholly unspotted, so that when upturned it looks white.

The normal pattern of leopards, above described, with its suggestion here and there of longitudinally lineal arrangement, is much more primitive than the highly specialized transverse stripes of the tiger.

Variation in the Colour and Pattern of Leopards.

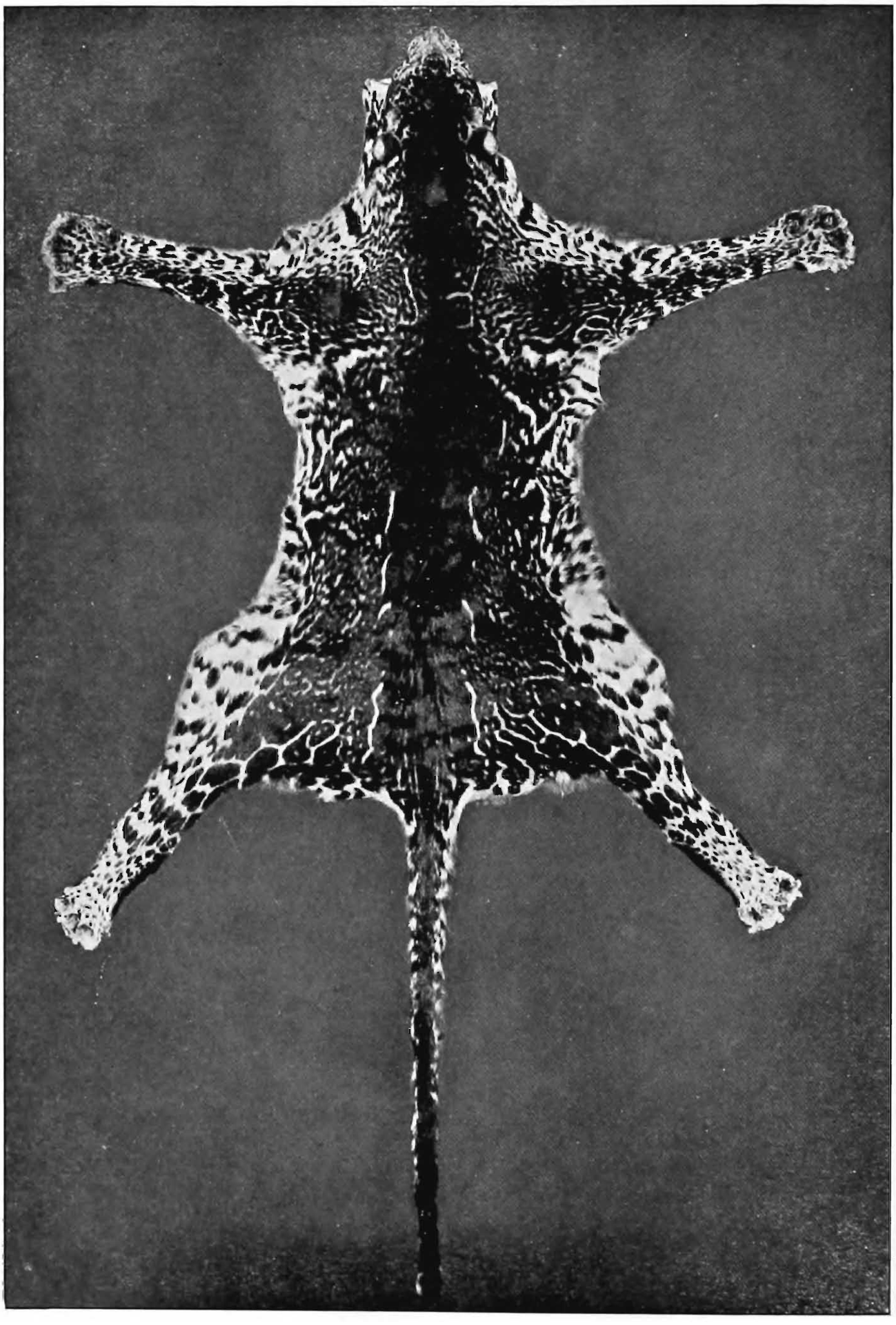
On account of its extensive distribution and capacity for adaptation to widely different environments the leopard varies locally in coloration much more than the lion or tiger, and many geographical races or subspecies of it have been described.

Those admitted in the Indian fauna are considered below. But the species is also susceptible to an unusual amount of individual variation in colour and pattern in the same locality. These variations are termed "varieties" or "sports." The "black" variety is the commonest of them. In this type the blackness is due to the deposit of black or dark brown pigment in the hairs that are normally yellow or white, so that the spots are obscured although probably always visible in certain lights and generally at least better defined on the underside because the normally white hair is browner than the normally yellow hair of the upper side.

There is no doubt that in certain parts of British India black leopards are much commoner than in others. They have been recorded from Ceylon, and appear to be not uncommon in parts of South India and Assam. They crop up in Burma, and the percentage of black specimens seems to increase southwards through the Malay Peninsula until they become the dominant, if not the sole, type of leopard found in the south of that country. There is some evidence that the blackness is associated with localities where heavy rainfall is prevalent. As a very general rule, at all events in British India, blackness is a discontinuous variation—that is to say, a leopard is either "black" or normally coloured, and cubs of the two types have been found in the same litter. But at Melghat in the Central Provinces Dunbar Brander saw a dark chestnut leopard, with black spots, which apparently represented an intermediate stage.

Leopards sometimes also exhibit the opposite phenomenon, namely, failure to develop pigment in the normally pigmented areas. This may result in complete albinism, when the pattern as well as the interspaces are white. I have seen only one skin in this condition, and it was said to have come from Africa. But there is a partially albino skin in the British Museum which came from Hazaribagh in Bengal (R. E. S. Thomas). In this the ground-colour is much paler than usual, almost cream, and the pattern is tan.

The pattern of leopards also sometimes varies remarkably, as attested by two skins from S. India. In one specimen shot by F A. Coleridge at Putnam in Cuddapah the ground-tint is normal, but the rosettes on the whole of the upper side have fused into a number of large blotches, with black rims and enclosing many small spots, separated from each other on the flanks by narrow pale lines forming a network pattern, but on the spinal area fusing across the middle line. This pattern recalls that of some so-called Clouded Leopards (see p. 247). The second skin was secured by Sir C. A. Souter, I.C.S., at Kanara. It differs from the last in that the blotches have fused almost everywhere and additional black



Variety of Indian Leopard from Kanara.

pigment has been added; with the result that the leopard is mainly black above and on the sides, with a few yellow streaks and spots representing the normal yellow ground-colour. Although this leopard is nearly black, it is not a "melano" like the ordinary black leopard. Its blackness is due to an entirely different process, namely, the distintegration and fusion of the pattern, and the underside is white*. The skin of the hind quarters of another leopard of the same general type as the one from Kanara, but black and marked with yellow stripes on the sides, was purchased in Madras and presented to the British Museum by Mr. P. Deraniyagala.

Skulls of Indian Leopards.

In shape and general proportions the skulls of leopards typically look like small tigers' skulls. So far as British India is concerned the difference in size is always well marked, the largest ♂ leopard skull being a good deal smaller than the

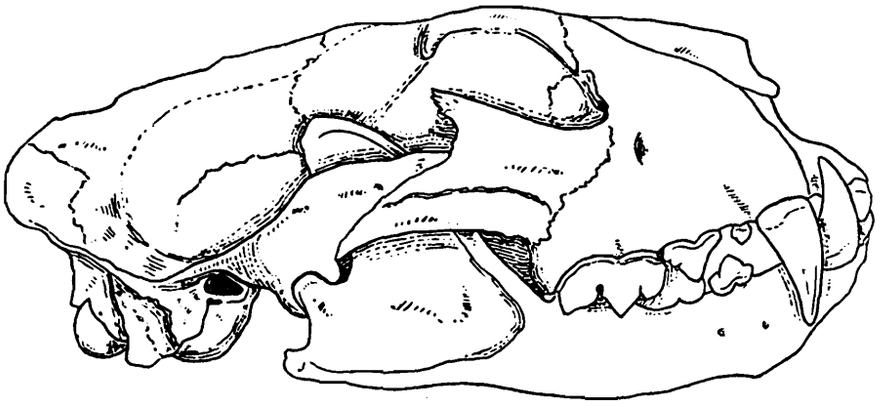


Fig. 64.—Side view of skull of adult ♂ Leopard from Kumaun, showing flat dorsal profile. × ½.

smallest skull of a tigress or lioness; but the small tigress of Bali, the south-eastern limit of the species, hardly exceeds a ♂ leopard in the size of the skull. In general characters the skulls combine the characters of the skulls of the two larger species. As a general rule, and for the same reason, the skulls of British Indian leopards will "rock" to a varying degree backwards and forwards like a lion's when on a horizontal plane; but sometimes, as shown by an adult ♂ skull from Ashkote in Kashmir, they rest as steadily as a tiger's. On the other hand the general shape of the skull, with its more or less convex dorsal profile, due to the elevation of the

* Photographs of this skin and of the one from Cuddapah were published in my paper in 1930, cited above. Sir C. A. Souter informed me that when the native who killed this leopard in Kanara applied for the bounty his application was refused because the Commissioner did not recognize the animal as a leopard!

frontal region, is typically much more like a tiger's than a lion's skull; but Col. Stockley sent me the skull of a ♂ leopard from the Kumaun Hills which has the dorsal profile as flat as in a lion. It looks indeed like a diminutive lion's skull (fig. 64). The nasal bones in leopard skulls may fall short of the maxillæ as in lions or surpass them as in tigers, but they never surpass them to the same extent as in typical tigers. The skulls, in short, vary in all details, in the width of the mesopterygoid fossa, the inflation of the auditory bullæ, the development of the sagittal crest, and the inflation of the forehead, the highest point of which may be in front of the postorbital processes or behind them; and these differences are not racial, but individual and of no systematic importance.

The differences between ♂ and ♀ skulls are usually well marked and similar to those of the tiger and lion. The ♂ skull is not only larger but is more moulded by the action of the jaw-muscles, the fore part of the cranial portion being more compressed so that the postorbital area or "waist" is lengthened and narrowed, and is about the same width as the interorbital area. In the ♀ the "waist" is typically short and broad, broader than the interorbital area. The teeth of the ♀ are on the average smaller, the canine particularly being narrower (shorter) close to the socket*.

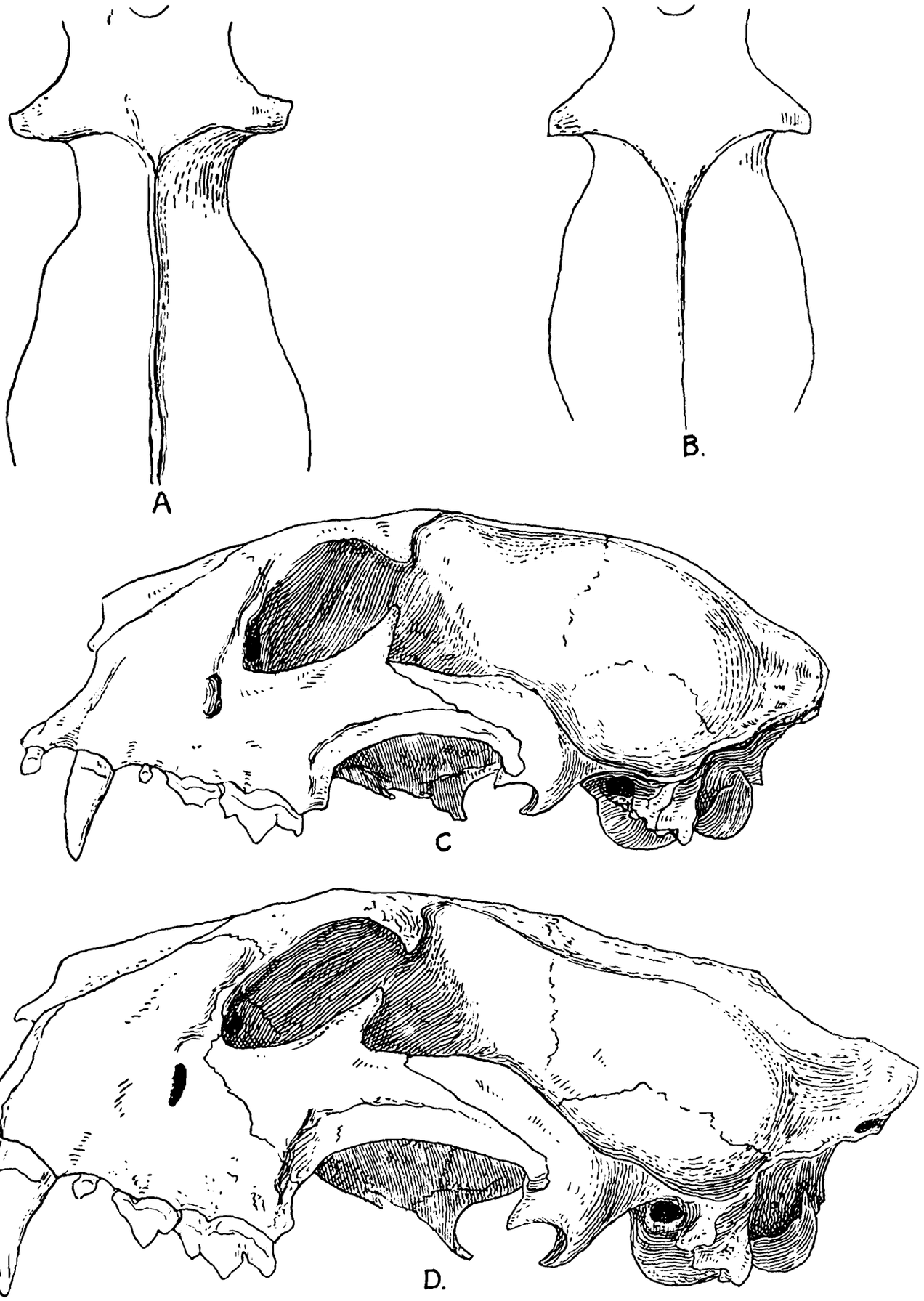
23 *a*. **Panthera pardus fusca** (Meyer). The Common Indian Leopard or Panther.

Felis fusca, Meyer, Zool. Ann. i, p. 394, 1794 †.
Felis longicaudata, Valenciennes, C. R. Acad. Sci. Paris, xlii, p. 1036, 1856 (nom. preocc.).
Panthera antiquorum, Fitzinger, SB. Akad. Wiss. Wien, lviii, p. 47, 1868.
Felis pardus antiquorum, Matschie, SB. Ges. Nat. Fr. Berlin, 1895, p. 194 (not *F. pardus antiquorum* Gray, 1827).

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* The difference between the ♂ and ♀ skulls of this species was one of the sources of the belief that two distinct kinds, the panther and the leopard, live side by side in the same locality. This opinion dates back to the time of Temminck. It is quite needless to discuss the point further, since all zoologists, and probably most sportsmen, now know that the panther and the leopard are specifically the same animal. Blanford devoted a good deal of space to the discussion of this topic, which formerly greatly exercised the minds of naturalists and sportsmen. He and others also discussed at some length the supposed differences between "the Asiatic" and "the African" leopard. But it is now known that there are several local races in both continents, and that there are no such things as "the Asiatic" and "the African" leopard. On the material at my disposal I am unable to find any difference between the typical leopards of India and of Kenya Colony in East Africa.

† The name *Felis fusca*, the earliest apparently given to an Indian leopard, was based by Meyer upon the figure and description published by De la Métherie (Journ. de Phys. xxxiii, p. 45, pl. ii, 1788) of a black specimen alleged to have come from Bengal and exhibited in the Tower



A & D. "Waist" and side view of skull of Indian Leopard.
B & C. The same of Indian Leopardess.

Felis pardus pardus, Dollman, after Lydekker, Game Animals of India, p. 314, 1924; Rowland Ward's Records, p. 482, 1928 (not *F. pardus* Linn.).

Panthera pardus fusca, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 307, 1930; Phillips, Man. Mamm. Ceylon, p. 162, 1935.

Vernacular.—*Tendwa*, *Chita*, *Sona-chita*, *Chita-bágh*, *Adnára* (H.); *Palang* (Pers.); *Diho* (Baulch.); *Súh* (Kashmiri); *Tidua*, *Srighas* (Bundelkand); *Gorbacha* or *Borbacha* (Deccan); *Karda*, *Asnea*, *Singhal*, *Bibia-bágh* (Mahr.); *Tenduwa*, *Bibla* (Bauris of Deccan); *Honiga*, *Kerkal* (Canarese); *Teon-Kula* (Kol.); *Jerkos* (Paharia of Rájmehál); *Burkál*, *Gordág* (Gond.); *Sonora* (Korku); *Chiru-thai* (Tam.); *Chinna-puli* (Tel.); *Puli* (Mal.); *Kutiya* (Cingalese); *Bai-hira*, *Tahir-hé*, *Goral-hé*, or *Ghor-hé* (hill-tribes near Simla) (according to Jerdon, generally known as *Lakhar-bagha*, a name elsewhere used for the hyæna); *Sik* (Tibetan); *Syik* or *Syiak*, or *Sejjiak* (Lepcha); *Kajengla* (Manipuri); *Misi patrai*, *Kam-kei* (Kuki); *Hurrea kon*, *Morrh*, *Rusa*, *Tekhu Khuia*, *Kekhi* (Naga); *Kya-lak* or *Kya-thit* (Burmese); *Kla-preung* (Talain); *Kiché-phong* (Karen); *Rimau-bintang* (Malay).

Locality of the *type*, Bengal.

Distribution.—The whole of INDIA from Kashmir and apparently the foothills of the Himalayas in the north to Cape Comorin in the south and thence to CEYLON; also found in BURMA.

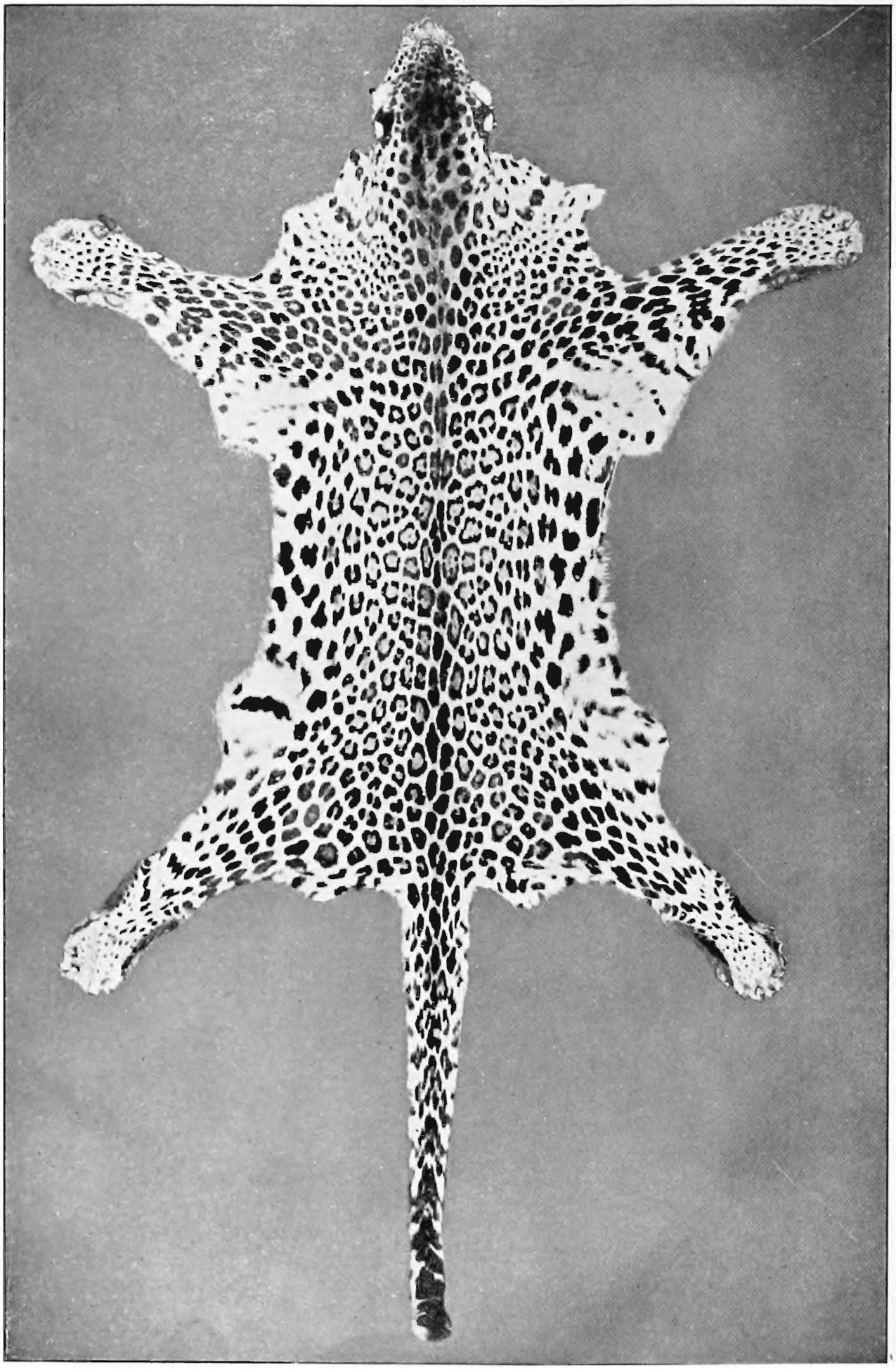
The coat soft and smooth, at its best seldom exceeding 25 mm. (1 in.) in length and not thickened with any appreciable amount of underwool. The general ground-colour of the upper side bright at all seasons apparently, but varying a little in intensity from nearly golden to ochreous or orange-tawny, darker on the back than on the flanks. Pattern also variable, the rosettes sometimes small and close-set, sometimes larger and more spaced, their centres typically darker than the interspaces, but not noticeably in the darker, richer-tinted skins. The underside and inner surfaces of the limbs white with black spots.

In 1930 I described briefly all the Indian panther-skins of this race then available for examination to show their variations in colour and pattern. Most of them were single specimens from the following scattered localities:—Ashkote, Nasair, and Kannah near the western border of Kashmir,

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of London. The second name in the synonymy, *F. longicaudata*, was used by Valenciennes for a supposedly long-tailed leopard from Ceylon and the Malabar coast. But the name had been previously applied by de Blainville to a specimen of Clouded Leopard (*Neofelis*) from Cochin China. The other names given to Indian leopards were discussed in my paper in 1930 and need not be further considered.

north of Srinagar (Mrs. Entwistle); Rhikhikesh, 3,000 ft., probably near the Siwalik Hills (Capt. F S. Tuker); Haripur Kheri in Oudh (A. P. Millard); Daltonganj in Western Bengal (C. A. Crump); Mandri on the Tapti, 24 miles east of Surat (T. B. Fry); Byadgi Station, east of Hausbari, 2,000 ft., in S. Dharwar; Kolar Town, E. Mysore, 4,026 ft., and Wottekolle, S. Coorg, 2,000 ft. (G. C. Shortridge). Apart from the skin from Rhikhikesh, which is exceptionally pale, owing, I am now convinced, to exposure to light as a rug, all these skins are of the same general type, but differ individually to a certain extent in tint and pattern. Of particular interest is the closeness of the likeness both in colour and pattern between the skins from S. Dharwar and from Nasair in Kashmir, both agreeing tolerably nearly with the skin from Daltonganj which, coming from Bengal, may be regarded as approximately a topotype of *fusca*. The occurrence of the same leopard, with similar individual variations in tint and pattern, practically over the whole of Peninsular India is shown by many specimens received since 1930, namely, from Manikpur, N.P. (Major G. Burrard) (December); from Gir, and Bhavnagar in Kathiawar (January and February), and Mahi Kantha, N. Gujerat (Col. A. H. Mosse, I.A.) (April); from Mt. Abu, Rajputana, Bhopal and Narsinghgarh in the Vindhya Hills, Bhandara and the Surguja State, C.P. (H.H. the Maharaj Kumar, Heir Apparent of Bikanir); from Gundlupet, S. Mysore, 2,600 ft. (Major E. G. Phythian Adams); and from Hogainakal in the Dharmapuri Range, N. Salem 850 ft. (N. A. Baptista) (August). The last, the only specimen seen from the Eastern Ghats, was procured on A. S. Vernay's expedition. The dated skins presented by Major Burrard and Col. Mosse establish the absence of appreciable underwool in the tolerably long winter coat. Of six skins from Ceylon, one from Ambawela is a trifle darker and richer in colour than any of the Indian skins examined, whereas one from Kala Oya is a little paler, a third from Hambantota, S.P., being intermediate. These were collected by E. W Mayor. Two immature skins from Gammaduwa (W. W A. Phillips) are about average in tint, and an adult ♀ from Pollaranua, N.C.P. (E. C. Fernando) (July), is very nearly as dark and rich as the Ambawela skin, but agrees tolerably closely with the richest skins from Surguja State, C.P., India. These skins fit the general description of the Ceylonese leopard published by Phillips. Possibly the pale skin from Kala Oya represents the lighter, " almost lemon-yellow variety " he mentioned as occurring both in the hills and low country, more particularly in the latter. All the Ceylon skins I have seen have small close-set rosettes, smaller on the average than in Indian skins.



Skin of Indian Leopard with exceptionally bold pattern from Rhikhikesh.

According to Phillips black leopards are occasionally found in the island.

There are very few records of Burmese leopards. The only normally tinted skin I have seen came from Tounghoo (J. M. D. Mackenzie). In its bright colour, medium-sized rosettes, and shortish thin coat it is inseparable from several of the handsomer skins of *fusca* from India. Other skins seen from Burma were black, namely, from Mogaung, Upper Burma (Capt. W. Abbey), the Shan States (Poland's Coll.), and Mt. Popa (G. C. Shortridge).

Most of the recorded flesh-measurements of British Indian leopards were, unfortunately, taken from "tip to tip" or "between pegs," an unsatisfactory method because it gives no idea of the proportion of the head and body to the tail. There are only a few properly measured skins in the British Museum; but Gen. R. G. Burton recorded the dimensions of several from Berar (Journ. Bomb. Nat. Hist. Soc. xxi, p. 1063, 1911), and Mr. W W A. Phillips has done the same for Ceylon specimens. The results are entered in the following table, which shows that the average total length of the males is a little over 7 ft. and of the females nearly 1 ft. less. 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." Possibly an exceptionally large ♂ may reach 8 ft. or a little over.

Locality, authority, and sex.	Head and body.		Tail.		Total.	
	ft.	in.	ft.	in.	ft.	in.
Berar (Burton); ♂	4	6	2	9	7	3
Berar (Burton); ♂	4	3	2	9	7	0
Berar (Burton); ♂ .	4	2	2	6	6	8
S. Dharwar (Shortridge); ♂	4	2	3	0	7	2
Ceylon (Phillips's largest); ♂.	4	8	3	2	7	10
Ceylon Phillips's av. of 11 (approx.); ♂	4	2	2	10	6	11½
Berar (Burton); ♀	3	8	2	6	6	2
Berar (Burton); ♀ .. .	3	7	2	7	6	2
Daltonganj (Crump); yg. ad. ♀.	3	5½	2	7	6	1
Toungoo (Mackenzie); ad. ♀ ..	3	10	2	10½	6	8½
Ceylon, Pollaranua (Fernando); ad. ♀	4	0	2	9	6	9
Ceylon (Phillips's largest); ♀. ..	3	9	2	9	6	6
Ceylon (Phillips's av. of 7) (approx.); ♀.	3	5	2	6½	5	11½

The weight of Phillips's largest ♂ was 170 lb., the average of that sex being 124 lb. His largest ♀ was 75 lb., and the average of 7 ♀♀ 64 lb. The difference between the two sexes is very remarkable. Dunbar Brander gave the weights of 2 ♂ leopards from Central India as 152 and 110 lb. respectively.

The table of skull-measurements, containing the largest

Skull-measurements (in mm.) of the typical Indian Leopard.

Locality, collector, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Ashkote, Kashmir (Entwistle); ad. ♂	248	221	160	37	38	62	164	26	20
Bhagalpur (Oldham); ad. ♂	250	218	156	42	41	63	156	25	20
United Provinces (R. Burke); ad. ♂	247	219	157	46	45	62	158	25	19
Gorakhpur, U.P. (A. Osmaston); ad. ♂	234	210	151	45	43	59	153	24	17
Sannawani Block, C.P. (Major W. Lindsay); ad. ♂.	232	207	141	42	40	58	146	25	19
Sannawani Block, C.P. (Major W. Lindsay); ? ad. ♀.	201	185	140	36	37	51	135	24	17
Central Provinces (Dunbar Brander); ad. ♀	200	181	130	43	36	51	132	23	—
Coimbatore (R. C. Morris); ad. ♀	194	174	124	43	36	50	127	24	17
Mt. Abu (Heir Apparent of Bikanir); ad. ♀	180	166	116	42	31	48	123	24	17
Bhandra, C.P. (Heir Apparent of Bikanir); ad. ♀.	177	167	122	43	33	50	121	24	19
Bolaghat (Col. J. H. Carlisle); ad. ♀	177	159	114	38	30	43	117	24	17

and smallest available, shows that the total length in the ♂ varies from about 9 to 10 in., in the ♀ from 7 to 8 in. The only specimen of special interest is the one queried as ♀ from Sonnawani Block, C.P. It is unsexed and is not represented by a skin. Although its condylobasal length and zygomatic width are exceptionally large for a ♀, it is too small for a ♂, but the practical equality in width between the postorbital and interorbital areas is a ♂ character, and it may be the skull of a "dwarfed" ♂. There are one or two dwarfed races of leopard in Africa in which the skull of the adult ♂ has ♀ characters.

The average condylobasal length in 16 adult ♂ skulls from India is just over 212 mm., and of nine adult ♀ skulls 172 mm. In two adult ♀ Burmese skulls from Mt. Popa and Toungoo respectively the condylobase is 176 mm., in one from the Ruby Mines (Shortridge) it is 165 mm. They thus agree with the Indian series. The same applies to Ceylonese skulls. The largest ♂, from Gammaduwa (Phillips), has a condylobase of 217 mm.; in the smallest from S. Ceylon (Bevan) it is 206 mm., the average of five adult ♂♂ being 211½ mm. The condylobase in the largest and smallest ♀ skulls is 178 and 173 mm. respectively, but the size is more uniform than in Indian skulls, the average of seven, mostly from S. Ceylon (Bevan), being 175 mm.

23 *b*. **Panthera pardus pernigra** (Hodgson) *.

Leopardus perniger, Hodgson, Cat. Mamm. etc. Nepal, ed. 2, p. 3, and Preface, p. v, 1863.

Locality of the *type*, Sikhim, 6,000 to 8,000 ft.

Distribution.—SIKKIM, NEPAL.

Distinguished from the southern race, *fusca*, at least by the coarser, thicker, more woolly winter coat. In normally coloured specimens the rosettes are large and stand boldly out against the paler ground-colour.

Three out of the six skins belonging to Hodgson's collection, and definitely assignable to this race, are black; and in his Catalogue he remarked, "Many more were got. I have a dozen skins. People say it is a distinct species." From this it may be inferred that a considerable percentage of the leopards

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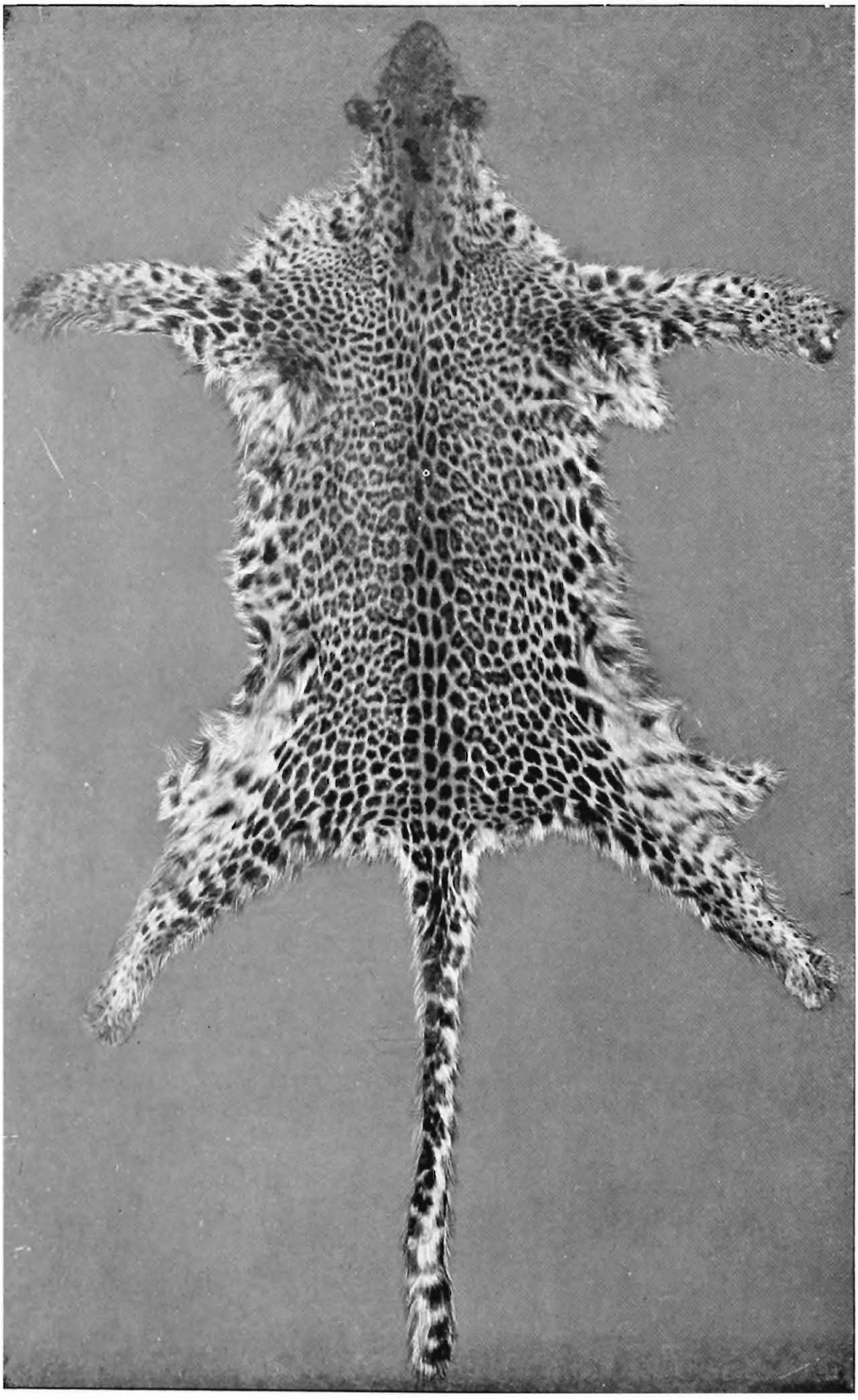
* The type of this race is one of three black leopards from Sikkim which Hodgson recorded as a "black variety of Leopard" in the Preface to his catalogue, giving no description of it, under the name *Leopardus perniger*. I overlooked the description in the Preface and also Cabrera's reference to it when I wrote my paper on the Panthers of Asia in 1930, and in the account of Hodgson's specimens (p. 309) I identified them as *P. p. fusca*, cited Nepal as their locality, and quoted *pernigra* as a *nomen nudum*.

at 6,000 or 8,000 ft. in Sikkim is black. In addition to these black specimens, two in Hodgson's collection labelled "Nepal" have similar thick, longish, and rather harsh coats. One has the ground-tint darkish, nearly rusty-buff, with darker centres to the rosettes, the belly is pale buffish and the hind throat decidedly buff. The other has the shoulders and flanks unusually pale and emphasizing the rosettes, which have rusty centres. A third Nepalese skin (R. Everest) is very like the last in coat and colour; but a skin from Kaknai, Khatmundu, 7,000 ft. (Col. R. L. Kennion), in summer coat, is not distinguishable from the southern race, *fusca*. Also apparently referable to *pernigra* is a skin from Barkat, Dehra Dun, 5,000 ft. (Capt. F S. Tuker), December. The coat, about 30 mm. long, is decidedly thickened with wool, and the colour is like that of the pale specimens from Nepal, much paler than in typical *fusca*, the dorsal area being buffy and the sides greyish, emphasizing the rosettes, with their dark ochreous centres. Very similar to the last, both in coat and colour, is a half-grown specimen from Bharnabari, Bhutan Duars, 600 ft. (N. A. Baptista), collected in March. If this identification be correct, the race is not restricted to high altitudes. Very likely the leopards descend to lower levels in the winter*.

In the table of skull-measurements (p. 236) I have provisionally entered under *pernigra*, on account of their localities, there being no skins for examination, a skull from the Kumaun Hills (Col. C. S. Stockley) and one from Mundiapani in Garhwal (B. B. Osmaston). The latter is fully adult, and is only remarkable for its small size. The skull from the Kumaun Hills, on the contrary, is very peculiar. It was referred to above (pp. 225–6) on account of the flatness of its dorsal profile and generally lion-like aspect. Although not quite adult, it has an exceptionally high sagittal crest and salient occipital ridge. The teeth also are unusually large, partly, no doubt, because they are quite unworn. There is a skull of *fusca*, from the United Provinces (R. St. G. Burke), with the carnassials 28 and 20 mm. respectively; but these teeth are on the average much smaller in Indian leopards than in the skull from Kumaun.

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* A few years ago Col. F. M. Bailey sent to me the skin of a very beautiful leopard, richly coloured, and with a full, long coat, the hairs being about 47 mm., nearly 2 in., long, which was killed near Shigatse in Tibet. On the evidence of a single skin I cannot separate this leopard fron the race from Shensi, in China, which I described as *Panthera pardus bedfordi* in 1930. It is possible that this leopard may occur on the northern slopes of the Himalayas and be later recorded as a member of the British Indian fauna.



Skin of Millard's Leopard (*Panthera pardus millardi*) from Kashmir.

23 *c*. **Panthera pardus millardi** Pocock.

Panthera pardus millardi, Pocock, Journ. Bomb. Nat. Hist. Soc xxxiv, p. 316, pl. viii, 1930.

Locality of the *type*, " Kashmir."

Distribution.—KASHMIR only, so far as is at present known.

Distinguishable at a glance from the typical Indian race *fusca* and from the Nepalese and Sikkim race *pernigra* by the entire absence of bright hue in the pelage, the general colour being dull, dark buffy-grey, almost olivaceous, the pattern consisting of small close-set rosettes. The coat, too, is much thicker with underwool than in *fusca*.

Only two specimens of this race are known, both received from Mrs. Entwistle and labelled " Kashmir," without further particulars. They are entirely different in appearance from the skins, also procured from Mrs. Entwistle from Ashkote and Nasair in Kashmir, which are identified as *fusca*. From the thickness of the coat it may be inferred that *millardi* occurs at much higher altitudes in Kashmir than the other race. The only known skull, that of the type, an adult ♀, shows no peculiarities except that it is unusually large for a ♀, a little longer in its total and mandibular lengths than the largest ♀ of *fusca* entered in the table.

23 *d*. **Panthera pardus sindica** Pocock.

Felis tulliana, Blanford, Mamm. Brit. Ind. p. 69, 1888 (in part) (not *tulliana* Valenciennes).

Panthera pardus sindica, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 80, 1930.

Locality of the *type*, the Kirthar Range on the Sind–Baluchi border.

Distribution.—The KIRTHAR RANGE and S. WAZARISTAN.

Intermediate in colour between the typical Indian and the Persian races, not so bright as the former, but brighter than the latter, and differing from both in its winter coat and slightly in pattern, the winter coat being thick, erect, and peculiarly harsh, but not long and tufted, about 26 mm., with the tips of the hairs curled; and the pattern consisting of rosettes, which on the average are larger, more spaced, more annuliform, with thin unbroken rims, but no contained spots.

This race is not well known. I have seen only two skins. The type, a young ♂, shot by H. E. Watson in the Kirthar Range, was identified by Blanford as *tulliana* and described as representing " a race inhabiting Persia and found in Baluchistan and the mountains of Sind that differs widely from all the others [Indian leopards] and is quite intermediate in coloration and spotting between the leopard and the ounce."

This description applies well enough to the race described below as *saxicolor*, but not to the skin from the Kirthar Range, which, although undated, was apparently shot in winter, the coat being thick and harsh, as stated above; the flanks are washed with buff, which becomes intensified on the back, the general hue being much brighter than in the Ounce, but not so bright as in the ordinary Indian leopard. It is significant, however, that Blanford could see the difference between this skin and skins of the typical Indian race. The second skin, received since the race was described, was sent to me by Major D. G. Lowndes from S. Wazaristan. In colour and pattern it closely resembles the skin from the Kirthar Range, but the coat is very different, being short and sleek, as in the July skin of *saxicolor* from Kushnob, but it decidedly differs from that skin in its brighter hue and pattern.

The only known skulls of this race, both from the Kirthar Range, show no structural peculiarities.

Of the habits of this leopard nothing has been recorded.

23 *e*. **Panthera pardus saxicolor** Pocock. The Persian Leopard.

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

Felis tulliana, Blanford, Mamm. Brit. Ind. p. 69, 1888 (not of Valenciennes).

Felis pardus panthera or *tulliana*, Lydekker, Game Animals of India, p. 322, 1924 (not *Felis panthera* Schreber).

Panthera pardus saxicolor, Pocock, Ann. Mag. Nat. Hist. (9) xx, p. 213, 1927; id., Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 77, 1930.

Locality of the *type*, Asterabad, Persia.

Distribution.—Persia and BALUCHISTAN.

Distinguished from the Indian races in both summer and winter coat by its much paler colour, the general tint being grey, with at most a pale buff or sandy wash, particularly on the dorsal area. Also by the very marked seasonal difference in the coat, which in summer is short and sleek, in winter long, thick, tufted, and woolly, the colour and coat combined at this season giving the animal a pronounced likeness to the Snow-Leopard, with which it has more than once been confounded (see p. 240).

This race is included in the fauna of British India on the evidence of two specimens received since it was described. The skin of an adult ♂ from Kushnob, Ziarat, about 50 miles north-east of Quetta (H. J. Todd), July 9, has the summer coat short and sleek and the general colour sandy-grey, with the rosettes mostly broken up into five or six spots, the centres

of those on the spinal area not darker and of the flanks only slightly darker than the ground-colour; the underside and inner sides of the legs white. This skin closely resembles skins from Persia in summer coat.

A second skin, from Sambaza, Baluchistan, 4,500 ft. (A. H. K. Sangster), April, has the full winter coat thick, loose, tufted, and long, about 50 mm. (2 in.) in length, the tail bushy and the general colour pale grey, with a sandy wash on the back. It closely resembles a skin from Palang Kuh, in Seistan, collected by Col. R. L. Kennion, which in that author's book, 'By Mountain, Lake, and Plain,' p. 267, 1911, was referred to by Lydekker as representing an undescribed variety of leopard. Both are very similar in colour and coat to the Snow-Leopard, except that the spots are smaller, more numerous, and less spaced.

The flesh-measurements, presumably, of the ♂ from Kushnob, recorded by Mr. Todd, are: head and body 5 ft., tail 3 ft. 2 in., total 8 ft. 2 in. Since the large size is not borne out by the skull, the dimensions were possibly taken from the stripped skin. The skull of this race from Kushnob entered in the table of measurements (p. 236) is only just adult, perhaps not quite full-sized. It is at all events a good deal smaller than an adult ♂ skull from Mishun in Persia (C. E. Capito), in which the condylobasal length is 218 mm. and the zygomatic width 155 mm.

This leopard has long been known, and there are earlier records of it than the one that heads the list of synonyms; but it has passed under inadmissible names, being regarded by some authors as the Snow-Leopard (*Uncia*) and by Blanford and Lydekker as identical with the more richly coloured race inhabiting Asia Minor, *Panthera pardus tulliana*, the type of which came from near Smyrna. The two appear to intergrade in Mesopotamia. I am indebted to Mr. C. E. Capito and to Mrs. Lane for the opportunity to examine several skins from the Pusht-i-Kuh Range in Laristan and the province of Fars in S. Persia. Sir Percy Cox and Major Cheesman also secured it in Pusht-i-Kuh, where, according to Mr. Capito, it inhabits caves and gorges in the barren limestone and gypsum hills down to about 900 ft. Its habitat appears to be much the same as that of the Snow-Leopard, and its coloration no doubt harmonizes with the of the rocky hillsides it frequents.

Origin and Habits.—All the evidence known to me points to the conclusion that the leopard, like the tiger and lion, was of northern origin and migrated southwards to the countries where it is now found. Fossil remains have been recorded from Central and Southern Europe. It is

Skull-measurements (in mm.) of *Panthera pardus pernigra, millardi, saxicolor*, and *sindica*.

Name, locality, collector, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbita width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. p. pernigra.									
Kumaun (Col. Stockley), ? this race ; yg. ad. ♂	228	207	144	41	41	60	153	29	21
Garhwal (B. Osmaston), ? this race ; ad. ♂ .	226	203	141	43	40	54	150	24	18
Nepal (Hodgson) ; ad. ♂ .	233	209	153	41	42	57	—	25	—
Nepal (Everest) ; ad. ♀ .	187	172	125	43	32	50	128	25	19
P. p. millardi.									
Kashmir (Entwistle), type ; ad. ♀ .	208	185	135	43	36	51	139	24	17
P. p. saxicolor.									
Kushnob (H. J. Todd) ; ad. ♂ .	228	206	146	45	42	61	153	27	21
P. p. sindica.									
Kirthar Range (H. Watson) ; yg. ad. ♂ .	212	—	134	44	40	55	141	25	18
Kirthar Range (H. Watson) ; ad. ♀ .	194	175	125	42	37	51	130	23	17

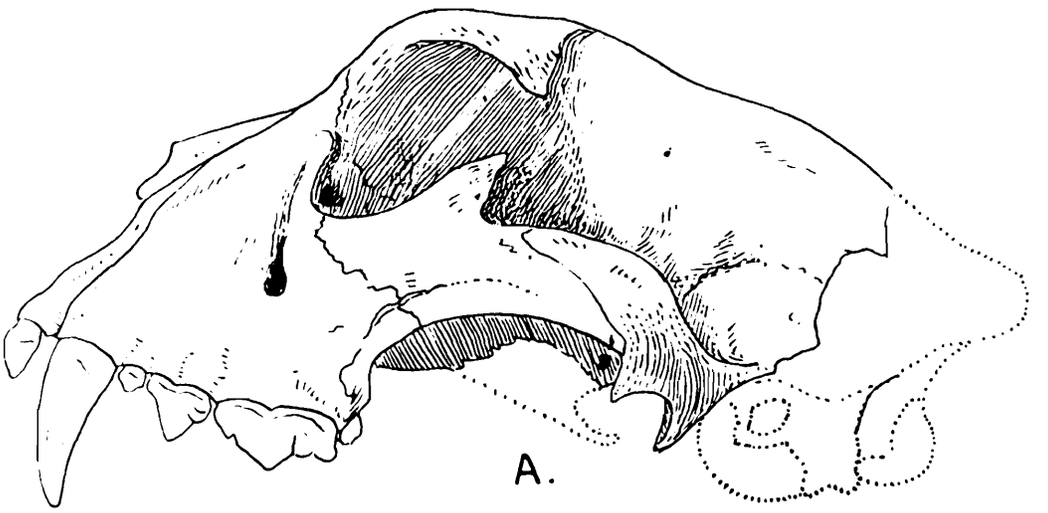
a more primitive and no doubt earlier type than the lion and the tiger; and since its nearest ally, the jaguar, is an American species, the common ancestor of both must have inhabited northern Asia at a time when the two continents were joined by the bridge of land that formerly separated the Arctic and Pacific Oceans. That the leopard was already in Hindustan when the tiger reached it is shown by its presence in Ceylon; and there is no reason to doubt that it similarly preceded the lion in its occupation of the country. By what route it entered India is uncertain; but since the resemblance between the typical Indian race and the leopards of Burma and China is greater than the resemblance between the former and the leopards of Baluchistan and Persia, I incline to the view that it probably came into India, like the tiger, by a north-eastern route, perhaps across the Himalayas, since it occurs in Tibet, north of Sikkim, as well as to the south of that range. But the known facts do not justify more than a suggestion on that point.

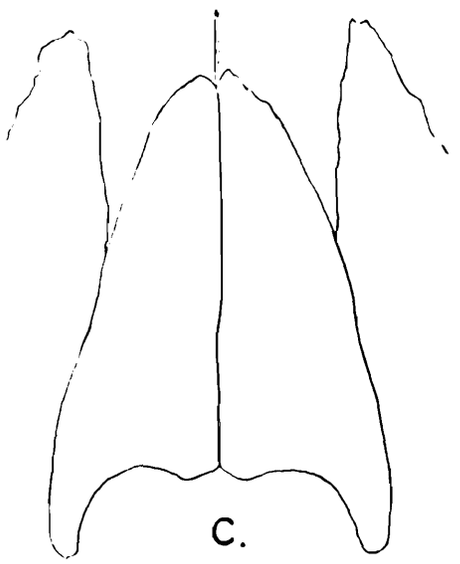
Although the habitats of the different races of British Indian leopards vary, the habits of all in a general way are probably very much the same. Those of the ordinary Indian leopard are well known, and they differ in certain respects from those of tigers. Being much less intolerant of the sun than tigers, leopards are less nocturnal and more often hunt by day, especially in the event of failure to kill by night, their usual time of activity. They are, too, less addicted to thick forest and jungle, and frequent on the whole more open country such as is supplied by scrub-jungle or rocky hills with bushes, caves, and crevices for shelter. Many sportsmen have testified to the obliterative effect of their coloration in foliage or grass, and Col. Stockley noticed that a leopard that proved to be of the normal colour when shot looked quite grey by daylight, and was difficult to see at a comparatively short distance when passing over the exposed face of a cliff in the Salt Range. Although unable to kill such large prey as tigers, leopards similarly prey upon almost all kinds of animals worth killing that they can seize with safety, ranging in size, as Blanford tersely expressed it, from an ox to a sparrow. A list of the animals they feed on would include all the comparatively defenceless hoofed denizens of India, as well as monkeys, jackals, porcupines, peafowl, and junglefowl, and to these Dunbar Brander adds lizards, snakes, and crabs; but according to the same observer they leave alone adult bull nylghaie, and stag sambhar and swamp-deer (barasingha). On the other hand, while confirming their avoidance of sambhar, Col. A. E. Ward states that in Kashmir they easily overcome full-grown stag hangul when hampered by deep snow. Often

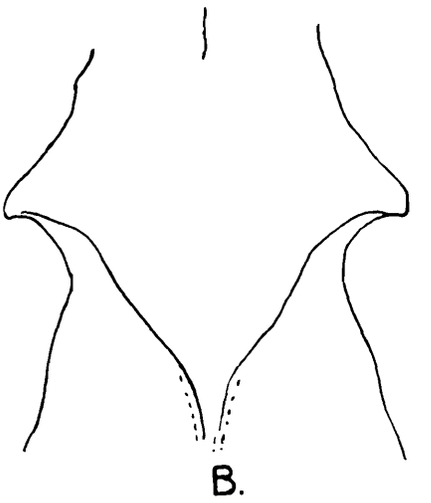
frequenting the neighbourhood of villages and harbouring in the crops or scrub nearby, leopards may be great pests to the inhabitants by preying upon calves, goats, sheep, donkeys, ponies, and other domesticated livestock. Of dogs they seem to be particularly fond and, being more venturesome than tigers, will enter bungalows and take them from under the very noses of their owners. Monkeys may be seized when feeding or drinking on the ground; but langurs up in the trees, where they would be safe if they had the sense to stay there, allow themselves to be caught either by falling or jumping to the ground in panic when the leopard is after them. This has been recorded both by Dunbar Brander in India and by Phillips in Ceylon.

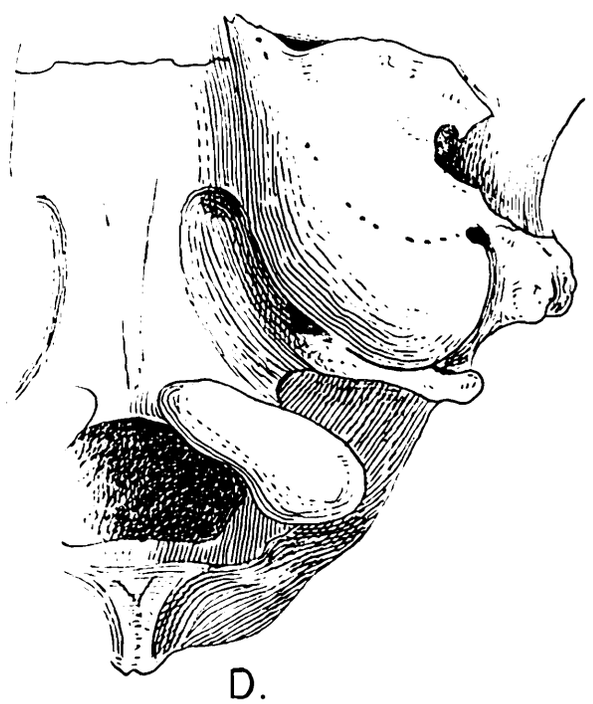
In relation to their size leopards are as powerful as tigers, and are at the same time more active and lithe in all ther movements. Their strength has often been shown in connection with their not uncommon habit of stowing away their prey in some place of safety. Of this two instances may be cited. Dunbar Brander found the carcase of a swamp-deer lodged by a leopard in a tree, and the leopard above referred to, watched by Col. Stockley in the Salt Range, sprang to a rock 10 ft. above it, carrying a ewe oorial held by the chest in its mouth. Dunbar Brander thinks the taking of prey into trees is due to fear of being robbed of it by tigers. To this might be added hyænas, which the same author has seen drive leopards from their kill. But the habit is practised, according to Phillips, in Ceylon, where there are no tigers or hyænas. Hence the habit in India is probably actuated by the wish to save the prey, or what may be left over for a second meal, from jackals as much as from tigers or hyænas; and jackals are probably the sole factor in Ceylon. Like tigers, leopards disregard the state of putrefaction of a carcase.

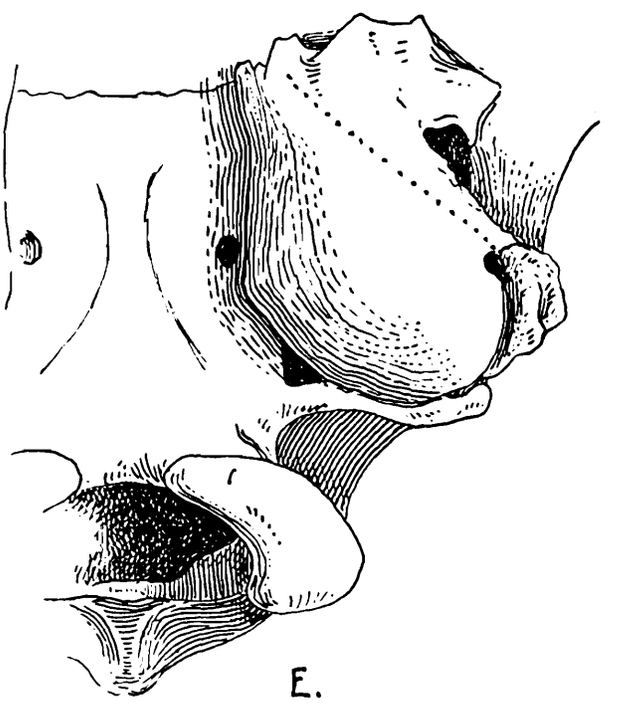
When leopards have found out the ease with which man can be killed, they may become confirmed "man-eaters." Once the habit is adopted they become a worse menace even than tigers, on account of their greater boldness and activity. They have been known to enter huts and tents at night after their victims and to take men from "machans" set up in crop-fields. Blanford quotes from Sterndale and Forsyth the case of a man-eater at Seon which is alleged to have killed 200 human beings in two years before it was shot. In Ceylon, according to Phillips, there are very few records of man-eating leopards, possibly, he suggests, because game may be more plentiful than in India. There was one well-known case in the island of a leopard that used to lie in wait for passers-by on a main road. It was happily shot, however, before it had accounted for more than twelve human lives.











Skull of Snow-Leopard.

A. Side view. B. "Waist." C. Nasals. D. Left auditory bulla, the dotted line showing position of partition, E. The same of Common Leopard.

The attacking roar of a leopard is tolerably similar to that of a tiger; but the ordinary roar, uttered as a mating call, is unmistakably different. It is not so loud and resonant, and consists of a series of about three or four harsh, coughing barks, with an interval of a second or so between each, and aptly compared by many to the sound made by the strokes of a coarse saw through hard, vibrating wood.

The period of gestation, supposed by Blanford to be about fifteen weeks and by Dunbar Brander twelve, was observed at Whipsnade, as I learn from Dr. Vevers, to be thirteen weeks as nearly as possible—to be precise, ninety-two days—in an Indian leopardess*. As in the lion, but unlike the tiger, the male stays with the female up to and after the birth of the cubs which, from two to four usually in number, are born in some sheltered spot like a cave or overhanging boulder, but sometimes, according to Dunbar Brander, in a porcupine's burrow.

Genus **UNCIA** Gray.

Uncia, Gray, Ann. Mag. Nat. Hist. (2) xiv, p. 394, 1854; Pocock, Ann. Mag. Nat. Hist. (8) xviii, p. 306, 1916; id., Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 330, 1930.

Type and only species of the genus, *Felis uncia* Schreb.

Distribution as below, under the species.

Distinguished from *Panthera* by the shape and some other structural characters of the skull, which is short and wide, with the orbits high, the frontal interorbital region being strongly elevated so that the upper profile of the cranial and facial portions is respectively steeply inclined backwards and forwards, the facial portion is markedly concave where the nasals abut against the frontals, and the basicranial axis slopes noticeably forwards and upwards to meet the basifacial axis at an obtuse angle; the nasals are short and broad; their anterior width nearly equalling their median length, the maxilla is narrow above and the partition of the bulla is remote from the auditory orifice, so that the two chambers are subequal in size, with the anterior half of the inner chamber very narrow; the occiput has a deep depression close to the bulla on each side; the mandible has the lower edge straight, the chin nearly rectangular, with the alveolus of the canine only slightly elevated, so that the post-canine space is moderate in size.

The skull of the Snow-Leopard differs far more from the skulls of the lion, tiger, and leopard than these differ from each other.

* In an African specimen, from an unknown locality, it was, curiously enough, 102 days or 14½ weeks.

24. **Uncia uncia** Schreber. The Snow-Leopard or Ounce.

Felis uncia, Schreber *, Säugeth. iii, pl. C, 1775, p. 586, 1777 ; and of most subsequent authors, including Blanford.
Felis irbis, Ehrenberg, Ann. Sci. Nat. xxi, pp. 394 and 410, 1830.
Uncia irbis, Gray, Ann. Mag. Nat. Hist. xiv, p. 394, 1854.
Felis uncioides, Horsfield, Ann. Mag. Nat. Hist. (2) xvi, p. 105, 1855.
Uncia uncia, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 331, 1930.

Vernacular.—Ikar, *Zig*, *Sachak*, *Sâh* (Tibetan Bhotia) ; *Bharal he* (hills N. of Simla) ; *Thurwágh* (Kunawar) ; *Stian and Safed Cheetah* (Tibetan) ; *Burhel Haye=Burhel Killer* (east of Kumaun), according to Col. A. E. Ward.

Locality of the *type* of *uncia*, unknown ; of *irbis*, the Altai ; of *uncioides*, Nepal.

Distribution.—Central Asia, the Altai, and Tibet ; British India, from Kashmir apparently to the eastern end of the Himalayas †

Coat in winter on the upper body thick, tufted, broken, and from 40 to 50 mm. (2 in.) long, about twice as long on the belly, but shorter and smoother on the shoulders and nape, and quite short and smooth on the head, apart from the cheeks, where it may form a longish, thick fringe ; it is also short on the limbs, but the tail is uniformly bushy throughout. General colour of the upper side grey with a cream or buff tinge, the buff brighter in some skins than others, the individual hairs being buffish-grey with a black tip and the underwool dark grey or brownish-grey ; the head is clearer grey, with some white about the eyes and in the upper lip. The backs of the ears are black, with a conspicuous white patch. The pattern consists of solid black spots on the crown, of streaky spots on the cheeks, but on the nape and shoulders they are larger and begin to form rosettes ; on the body generally they typically form large, irregular rosettes, with dark grey

* *Note on the synonymy.*—Schreber gave the name *Felis uncia* to a specimen from an unknown locality figured and described by Buffon as "L'Once" (Hist. Nat. ix, pl. 13, 1761). The name *irbis* was substituted by Ehrenberg because he disapproved of the use of *onca* for the Jaguar and *uncia* for the Snow-Leopard. The available material is at present insufficient for the separation of the Himalayan Snow-Leopard from the one inhabiting the Altai. Hence *uncioides* is regarded as a synonym of *uncia*, although it will have to be employed if the British Indian form proves racially distinguishable from the Central Asiatic form.

† Records of the Snow-Leopard from the Caucasus, Asia Minor, and Persia, owing to confusion between it and the panther or common leopard of those countries, were discussed in my paper in 1930, and need not be repeated. Similar records of it from Manchuria and Amurland were also no doubt due to skins of the leopard of those parts of Asia being mistaken for it (p. 234).

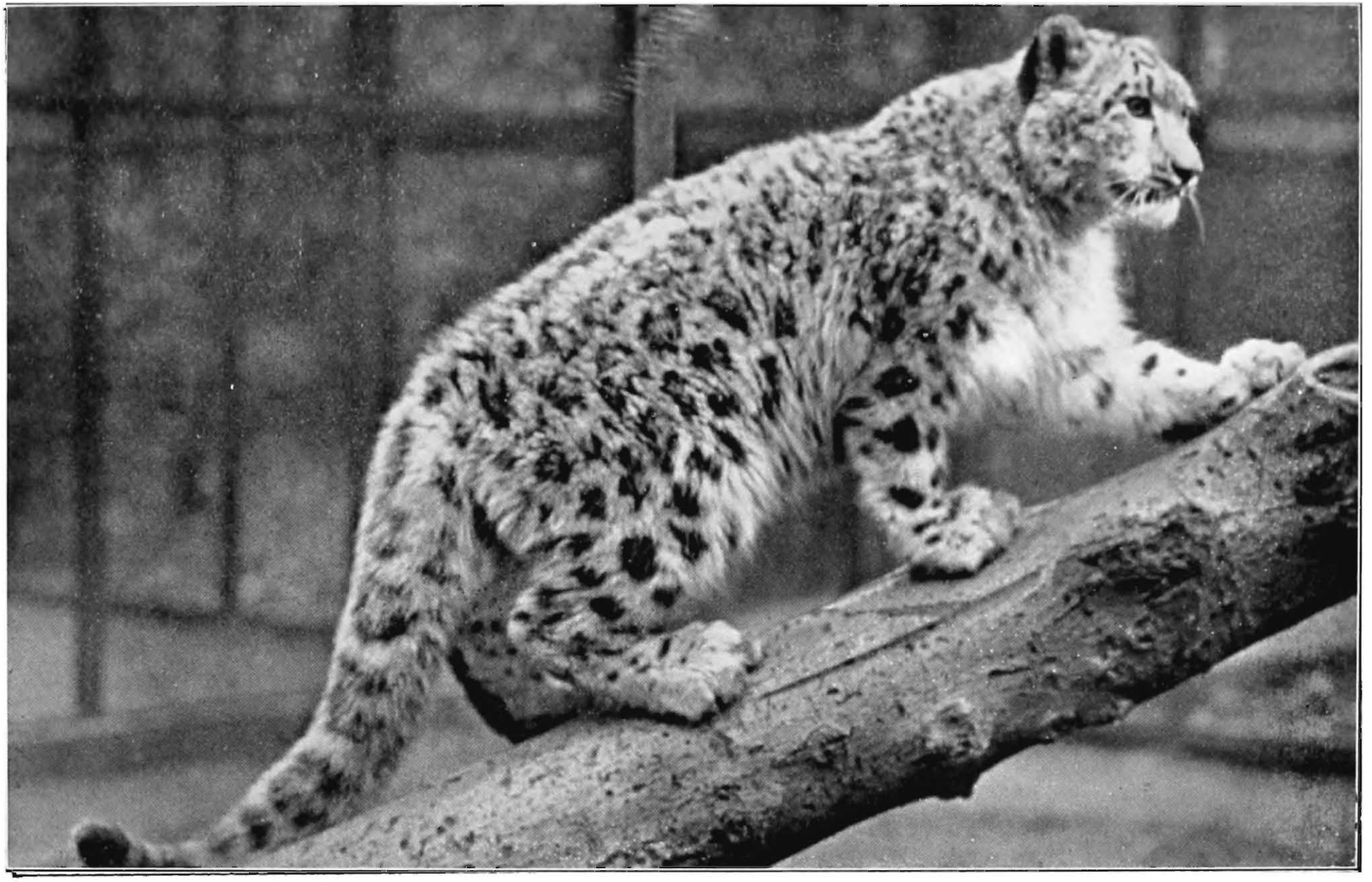


Photo D. Seth-Smith

Snow-Leopard or Ounce (*Uncia uncia*).

centres, and two or three sometimes coalesce, forming elongated blotches, with a tendency to run into longitudinal chains, especially on the hind back and loins dorsally, where there is an irregular median black spinal stripe; these dorsal bands on the loins may be traceable on the base of the tail, but posteriorly they break up into separate blotches; the legs below the thigh and shoulders are marked with solid black spots which become smaller inferiorly; the fore paws are typically spotted, but the hind paws are spotless, and there is a mat of dirty whitish hair on the back of the hind leg up to the hock. Except for some solid spots on the belly, the underside is white from the chin backwards, and the underside of the tail is white throughout. When the coat is loose and tufted the rosettes become broken up and the pattern obscured. This is illustrated by a skin from Gilgit, 6,500 ft. (Col. W F. R. Trevelyan), dated March 25th, and in full, long winter coat. In a second specimen, received from the same donor, from the Ghazi Area, Gilgit, February 1st, the pattern is normally well defined, the coat being somewhat shorter. The only other British Indian skins examined are one from Srinagar, Kashmir (Christie), with shortish coat and distinct pattern, one from " Kashmir " (Mrs. Entwistle), and one from Simtola in the Himalayas, which has the coat tufted and the pattern obscure, irregularly mottled with black and grey. Tibetan skins are indistinguishable.

The newly-born cubs, as shown by three from Gyantze, Tibet (Col. F. M. Bailey), are darker than adults, being brownish-grey in general hue, with the head and fore quarters confusedly and sparsely spotted, the flanks and thighs marked with larger spots with paler centres, and the spinal area of the loins marked with three conspicuous, close-set longitudinal black stripes.

The size of the Ounce given by Blanford, as head and body 4 ft. 4 in. and tail 3 ft., was apparently copied from Sterndale; but I feel sure these dimensions were taken from a flat skin with the head and body stretched. The total length is the same, at all events, as in the flat skin of a ♀ sent by Col. Trevelyan from Gilgit. Both considerably exceed the dimensions of three specimens, measured in the flesh and recorded by Col. A. E. Ward, which are entered below. In the absence of skulls it is, however, not possible to affirm that Ward's animals were absolutely full-sized.

Locality and sex.	Head and body.		Tail.		Total.	
	ft.	in.	ft.	in.	ft.	in.
Kashmir; ♂	3	8	3	0	6	8
Baltistan; ♂	3	5	3	0	6	5
Baltistan; ♀	3	3	2	9	6	0

According to this table the Snow-Leopard is a little smaller than the leopard or panther and has the tail relatively longer.

The measurements recorded in the table below show that the skull of the Snow-Leopard is shorter than that of the common Indian leopard (see tables, pp. 230 & 236). The skull of the ♂, for example, is about the average length of the skull of the leopardess. But the postorbital and interorbital widths are relatively wider. The first three were collected by Col. W F R. Trevelyan, the fourth by Dr. T. P. Longstaff.

Skull-measurements (in mm.) of the Snow-Leopard.

Locality and sex.	Total length.	Condylo-basal length.	Zygomatic width.	Postorbital width.	Interorbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Gilgit, Hunza; ad. ♂ .	185	171	126	46	44	50	126	24	18
Gilgit, Gozi Ghizar; ad. ♀	175	160	119	46	40½	47	119	22½	18
Gilgit, Ish Koman; ad. ♀	171	158	125	47	41	48	119	22	17
Gilgit, Bunji; ad. ♀? .	168	155	114	47	36	46	115	24	17

Habits.—Near or within British Indian limits the Snow-Leopard, according to Burrard, ranges from the Hindu Kush throughout the Himalayas. It is abundant in the Zaskar Range and occurs in limited numbers a few miles along the Dauladhar and Pir Panjal Ranges from their junction with the main Himalayan chain, being everywhere apparently commoner on the northern than on the southern slopes. It is not found in scrub or jungle, but on rocky hill-sides above the tree-line at altitudes as low as 6,000 ft. in winter and as high as 12,000 or 13,000 ft. in summer. That its colour is adapted to that of its environment no one doubts, and the high position of its orbits enables it to peer over the edge of a rock to reconnoitre for prey and locate it with the least possible exposure of the head before creeping forth to stalk it. It lives on ibex, bharal, and other wild goats and sheep as well as on musk-deer, hares, marmots, picas probably, and such game-birds as the monal pheasant. In Kashmir, according to Ward, when the upland grazing grounds are open to the flocks it takes the goats, sheep, and occasionally ponies of the herdsmen. That it may prove a costly nuisance to livestock owners is shown by Col. R. H. Percy's account of a pair that for long harassed the farm of the Moravian Mission at Kailing in Lahul. It lies up most of the day and starts to hunt about sundown, its generally nocturnal habits, combined with the



Left.—Flat skin of cub of Snow-Leopard.
Right.—Made-up skin of cub of Common Leopard.

inaccessibility of its home, being the reason why it is so seldom seen by English sportsmen.

Of its breeding habits nothing seems to have been recorded; but the discovery of three cubs at Gyantse, Tibet, by Col. F. M. Bailey suggests that the litter consists usually of from two to four.

Skins of Snow-Leopards are greatly in demand in the fur trade, and the beast is usually secured by trapping in deep pits wider at the bottom than at the top and baited with kids.

Subfamily FELINÆ.

The suspender (suspensorium) of the hyoid of the normal mammalian type and consisting of a chain of three bones jointed end to end and holding the larynx close to the base of the skull, thus restricting its movement. The tips of the digits of both fore and hind feet furnished at least with a single cutaneous lobe protecting the retracted claw on the inner side of the second and third digits and on the outer side of the fourth and fifth; frequently there is an additional lobe on the opposite sides, constituting a complete sheath to the claw, as in the Pantherinæ.

The difference between this subfamily and the Pantherinæ in the structure of the hyoidean suspensorium is associated with a difference in the voice. The sexual call is not a deep-toned roar, but a higher-pitched sound, varying according to the species, where it has been recorded, the most familiarly known being that of the common House-Cat; and, as in the common House-Cat, pleasure or content is expressed, at least in some widely divergent species, like the American Puma and the African Serval, in which it has been heard, by "purring."

The Felinæ are more generalized in structure than the Pantherinæ and Acinonychinæ, and are ancestral to both. In addition to the genera and species inhabiting British India, the subfamily contains a large number of different kinds found in other parts of Asia, in Europe, Africa, and America. In the south-eastern parts of Asia there are two peculiar forms, the Flat-headed Cat (*Ictailurus*) of the Malay Peninsula and Sumatra and the Bay-Cat of Borneo (*Badiofelis*), which are generically distinct from those of British India, but the rest of the Asiatic Felinæ, as well as the European and African species with one exception, the Serval (*Leptailurus*), belong to the genera *Felis*, *Caracal*, *Lynx*, and *Profelis*, represented in the British Indian fauna. All the heterogeneous series of Felidæ inhabiting America, except the Jaguar (*Panthera onca*), belong to the Felinæ. The largest, dominant,

and most widely distributed form is the Puma or Cougar (*Puma*) ,which has no close kinship with any Old World species*. Other well-known forms, such as the Ocelots (*Leopardus*), and the Eyra or Jaguarondi (*Herpailurus*), come nearest to the Leopard-Cats (*Prionailurus*) of India and Eastern Asia ; but the only genus which is common to the eastern and western hemispheres is *Lynx*, the most northern of all the genera of Felidæ. This genus has a bearing upon the value attached to the characters I have adopted in this volume and elsewhere for the division of the Felinæ into a number of distinct genera. It is a species which, apart from the Cheetah or Hunting Leopard, has been most frequently separated as a distinct genus from *Felis* by authors who assigned to the latter all the remaining species of the family, including even the Lion, Tiger, and their allies. Yet the Lynx is, beyond question in my opinion, much more closely akin to typical *Felis* than are the Marbled Cat, Leopard-Cat, and others, being connected with it by such more or less intermediate forms as the Caracal and Jungle-Cat, whereas there is no such connection between typical *Felis* and the Leopard-Cat. Hence the latter must logically be given generic status if that rank is granted to the Lynx.

In the following analytical keys for the determination of the genera, the second, based on the skulls, contains the characters on which they are mainly distinguished. The first is an artificial arrangement in the sense that Pallas's Cat (*Otocolobus*) comes under the section containing species with which it has no close kinship, the structure of its skull showing it to be a highly specialized cat related to *Felis*. Setting *Otocolobus* aside, the shape of the ear readily distinguishes *Felis*, *Caracal*, and *Lynx* from *Neofelis*, *Pardofelis*, *Profelis*, and *Prionailurus* ; but the differences enumerated for separating the four genera included under *b* and the three included under *a'* are of specific rather than generic importance.

Key to the British Indian Genera of Felinæ based on the more obvious external features.

a. Ears low, rounded at summit, usually with white patch.

b. Ears normally set ; body-pattern fundamentally consisting of spots or rosettes on the flanks, sometimes coalescing to form large " clouded " blotches, and of longitudinal stripes on the head and back, occasionally secondarily lost.

* There is an unmistakable likeness between the pattern of the newly-born cubs of this species and of the Snow-Leopard or Ounce, which may point to kinship between them, despite the difference in the hyoidean apparatus.

c. Tail not tapering, very long, nearly as long as the head and body and about four times as long as the hind foot; pattern "clouded" or "marbled."

d. Head long, not rounded; size large. NEOFELIS Gray, p. 247.

d'. Head short and rounded; size small . . . . . [p. 253 PARDOFELIS Severtz.,

c'. Tail tapering typically, shorter, at most a little more than half the length of the head and body, only occasionally as much as three times the length of the hind foot; pattern of spots or rosettes, not "clouded" or "marbled."

e. Tail conspicuously pale at the tip beneath; no conspicuous white patch on ear . . . . . [p. 258. PROFELIS Severtz.,

e'. Tail not conspicuously pale at tip beneath; a pale, usually white patch on back of ear . . . [Severtz., p. 265. PRIONAILURUS

b'. Ears set laterally, separated by a very wide area of the crown; body-pattern consisting at most of a few abbreviated vertical stripes on the loins . . . [p. 315. OTOCOLOBUS Brandt,

a'. Ears high, triangular, narrowed towards the point, often tufted.

f. At most a small tuft on the ears; pattern consisting mostly of transverse stripes on the sides, sometimes evanescent in the adult, or of spots which, at least behind the fore limb, tend to run into vertical stripes . . . . . FELIS Linn., p. 285.

f'. A long erect tuft on the ear, nearly as long as the height of the ear; pattern, when present, spotted, not vertically lineate.

g. Pattern lost on the back and sides; tail moderately long, reaching the hocks; no cheek-ruff . . . . . CARACAL Gray, p. 306.

g'. Pattern manifest at least at certain seasons; tail short, reaching about half-way to the hocks; a distinct cheek-ruff or fringe LYNX Kerr, p. 310.

Key to the British Indian Genera of Felinæ based upon Cranial Characters.

a. Skull long and low, with short, blunt, widely separated frontal and zygomatic post-orbital processes, very long canine teeth, and large postcanine space . . . . . NEOFELIS Gray, p. 247.

a'. Skull with long, well-developed postorbital processes and normal canines and post-canine space.

b. Outer chamber of auditory bulla small, the partition rising close to the orifice; facial portion of skull shorter, tip of frontal postorbital process in front of middle of skull (only slightly in *Pardofelis*).

c. Skull high, wide, and short, mastoid width more than half condylobasal length; posterior edge of palate deeply notched laterally, mesopterygoid fossa lanceolate or ovate in front . . . [p. 253. PARDOFELIS Severtz.,

c'. Skull lower, narrower and longer, mastoid width less than half the condylobasal length; a shallow emargination on each side of hinder edge of palate; mesopterygoid fossa truncated, with median notch, in front.

d. Nasal branch of premaxilla slender; maxillæ not expanded above, and the nasals not compressed, postorbital bar never complete; external pterygoid crest well developed. . . . . [p. 258. PROFELIS Severtz.,

d'. Nasal branch of premaxilla broad; maxillæ expanded above and nasals compressed; postorbital bar complete, usually only in old skulls of one species . . . . . [Severtz., p. 265. PRIONAILURUS

b'. Outer chamber of bulla comparatively or very large, the partition rising some distance from the orifice; tip of frontal postorbital process about the middle of the length of the skull.

e. Outer chamber of bulla smaller, inner broad in front*, skull narrower, mastoid width seldom as much as half the condylobasal length; lower rim of orbit below the level of the summit of the anterior nares.

f. Nasal branch of premaxilla broad, posterior edge of palate deeply notched laterally; postorbital processes broad and ligulate; mesopterygoid fossa with median angular point in front; small upper *pm* typically retained . . . . . FELIS Linn., p. 285.

f'. Nasal branch of premaxilla slender and long, hinder edge of palate not conspicuously notched laterally; mesopterygoid fossa typically with median notch in front; small upper *pm* absent or early shed.

g. External pterygoid crest a posterior triangular spike, as in *Felis* . CARACAL Gray, p. 306

g'. External pterygoid crest obsolete. LYNX Kerr, p. 310.

e'. Outer chamber of bulla very large, inner chamber narrow in front; skull broader, mastoid width much more than half condylobasal length, lower rim of orbit about on a level with upper edge of anterior nares. [p. 315. OTOCOLOBUS Brandt,

* In one or two desert species of *Felis* outside the limits of the British Indian fauna the outer chamber is very large and the inner is narrowed in front.

Genus **NEOFELIS** Gray. The Clouded Leopard.

Neofelis, Gray, Proc. Zool. Soc. 1867, p. 265; Pocock, Ann. Mag. Nat. Hist. (8) xx, p. 343, 1917.

Type of the genus, *Felis macrocelis* Horsfield* (=*diardi* Cuv.).

Distribution.—From NEPAL and SIKKIM eastward to S. China, Hainan, and Formosa, and southward to BURMA, Annam, the Malay Peninsula, Sumatra, Java, and Borneo.

One of the largest of the Oriental Felinæ, with the ears rounded, the head, body, and tail long, the legs short and stout with broad paws, in which the four main digits are fully webbed and provided with double claw-sheaths both on the fore and hind foot; but chiefly characterized by cranial and dental peculiarities associated mainly with the fore part

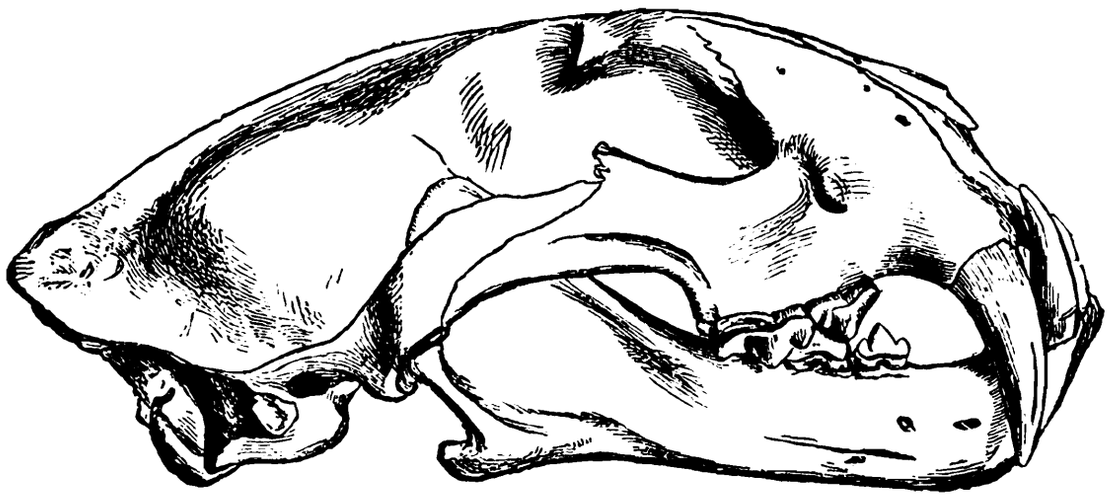


Fig. 65.—Skull of Clouded Leopard (*Neofelis nebulosa*), about half natural size. (From Blanford.)

of the jaws, which carry exceptionally long, piercing canine teeth, the upper being about three times as long as its basal width at the socket; the chin is prominent, flattish, and nearly vertical in front, nearly rectangular below, and the alveolar edge of its incisors is raised well above the alveolus or socket of its canine, so that, when the mouth is shut, the upper jaw is uptilted and the alveolar lines of the upper and lower cheek-teeth are widely divergent in front, producing a large post-canine space which gives deep penetration to the canine teeth. The entire skull is long and low, with lightly convex upper outline, a strong sagittal crest, salient zygomatic

* Zool. Journ. i, p. 542, pl. 21, 1825. *F. macrocelis*, from Bencoolen, Sumatra, is a subspecies of *nebulosa*. It was the first of the two forms cited by Gray as representing *Neofelis*, and is here selected as the type of the genus. The second was *Leopardus brachyurus* Swinhoe, from Formosa (Proc. Zool. Soc. 1862, p. 352).

arches, narrow postorbital and interorbital areas, short, widely separated frontal and malar postorbital processes, broad, nearly parallel-sided nasals, slender premaxillæ, anterior nares sloped at about an angle of 45° to the cranio-facial axis, and the outer chamber of the auditory bulla small as in all forest cats.

Apart from the special modifications of the fore part of the jaws and the long canine teeth, which are larger in the male than the female, the skull recalls the long, low skull of a small male panther, more particularly in its short, blunt, frontal postorbital processes and the wide separation between them and the corresponding processes rising from the zygomatic arches. It is very distinct from the skulls of the rest of the Felinæ found in British India and elsewhere.

25. **Neofelis nebulosa** Griffith.

Felis nebulosa, Griffith, Descr. Vert. Anim. Carn. p. 37, pl., 1821; id., Anim. Kingd. ii, pp. 449–51, pl., 1827; and of all recent authors.

Locality of the *type*, Canton.

Distribution.—As under the genus.

Ground-colour dark grey or ochreous, often largely obliterated by the black and dark dusky-grey blotched pattern. Crown spotted, with a larger patch above the eye, a stripe running from the corner of the eye backwards over the cheek, another from the corner of the mouth along the sides of the neck, one from behind the black ears and two on each side along the nape to the shoulders, sometimes partly fused or broken up; similar stripes or elongated blotches continued down the spine, commonly forming a single median stripe on the loins and passing as such on to the basal part of the tail; on the sides of the shoulders two large blotches of dark dusky-grey hairs, each emphasized posteriorly by a black stripe which passes on to the fore leg and breaks up into irregular spots; the flanks typically somewhat similarly marked by large dusky-grey irregular blotches bordered behind by long, oblique, irregularly curved or looped stripes and in front by much fainter spots or lines; on the hind quarters the blotches are smaller, frequently almost surrounded by nearly horse-shoe-shaped stripes. These blotches, yielding the clouded pattern suggesting the popular English name of this species, are often so large and close set that the intervening spaces look like pale irregular stripes on a dark ground; but sometimes the blotches take the form of large, somewhat "jaguarine" rosettes, dusky patches surrounded by a black ring as wide in front as behind. The hind leg is spotted like



Clouded Leopard (*Neofelis nebulosa*). (After a painting by H. Wall.)

the front, and the tail is marked by large, irregular, paired spots, often coalescing to give an annuliform pattern to the organ. The front of the upper lip, the underside from the chin, and the inner sides of the limbs are white, except for two black collars on the throat and some large black spots on the chest behind the fore legs and on the inner surface of the limbs*.

The original figure of the type of this species represented the ground-colour as brightish ochreous and the pattern as consisting on the sides of the body of long, widely spaced, conspicuous black stripes forming the posterior borders of large dusky patches defined in front by narrower stripes or spots, the combination suggesting the name Tortoiseshell Tiger for the species. Canton was probably the port of shipment of this animal, which was exhibited in the so-called "Exeter Change" menagerie. Another, and better drawn, illustration of it by Landseer, reproduced by Griffith in 1827, is not so bright a yellow as the first. That the Clouded Leopards of the Chinese area are at least on the average lighter and brighter than those of the Himalayas and the Sunda Islands is borne out by other skins. In the British Museum there is a native skin, picked up by Delacour and Lowe at Laoboa, Annam, which is the brightest of all, and agrees tolerably closely both in tint and pattern with Griffith's original figure. Also there are four skins from Formosa, referable to the form named *brachyurus* by Swinhoe †, which are tawnier, paler, and less grey than the Himalayan skins I have seen; and B. Howell referred to a specimen from Hainan as "ochreous."

Another synonym of this race is *Felis* (*Necfelis*) *melli* Matschie (Arch. Naturg. 1922, pt. 10, pp. 19 and 35), based on a skin purchased in Canton; and G. M. Allen has recorded it from Fokien (Amer. Mus. Novit. no 360, p. 11, 1929).

Apparently a second race is the form described as *Felis*

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* Discussing the alleged but unsubstantiated reports of the occurrence of true leopards in Sumatra, Mr. E. Jacobson stated his belief that all the so-called black leopards said to have been shot or seen in that island were black examples of *N. nebulosa* (Journ. Fed. Mal. St. Mus. x, p. 238, 1921).

† This is, I believe, a synonym of *nebulosa*. Swinhoe described it as a "species" on the evidence of the shortness of the tail in the type, that organ being only a little over half the length of the head and body of the stripped skin. But in another Formosan specimen it is over two-thirds the length. The length of the tail is too variable to be trusted. The flesh-measurements of an adult ♂ (? subspecies) from Chumpawn in Peninsular Siam (Robinson and Kloss) are:—Head and body 32 in., tail 30½ in., hind foot 7 in., the tail being very nearly as long as the head and body. No other flesh-measured specimens are available for record.

diardi Cuvier ('Ossemens Fossiles,' new ed. iv, p. 437, 1823), based on a skin from Java. *F macrocelis* Horsfield, from Sumatra, is, I believe, a synonym of it. In the type of the latter the tint is darker and greyer than in *nebulosa* from the Chinese area, and the pattern on the flanks is more rosette-like, the blotches being less elongated, smaller, sometimes nearly circular, with the anterior rim about as thick as the posterior, and small black spots involved in the blotches are more in evidence. I provisionally assign to this race skins from Borneo and Malaya, which, although resembling Himalayan skins in general colour, are not quite like them in pattern. The attempt to define these races is, however, tentative owing to scarcity of material.

25 *a*. **Neofelis nebulosa macrosceloides** (Hodgson).

Felis macrocelis, Tickell, Journ. As. Soc. Beng. xii, p. 814, 1843; Blyth, Mamm. Birds Burma, p. 27 (not of Horsfield, 1825.)

Felis macrosceloides, Hodgson, Proc. Zool. Soc. 1853, p. 38 (spelt *macroceloides* as *nom. nud.*, Hodgson, Calc. Journ. Nat. Hist. iv, p. 286, 1844, and misprinted *macroselloides*, without description, Proc. Zool. Soc. 1853, p. 192); Blyth, Cat. Mamm. As. Soc. p. 58, 1863 (*macroceloides*).

Felis diardi, Blyth, Proc. Zool. Soc. 1863, p. 183; Jerdon, Mamm. Ind. p. 102, 1867 (not of Cuvier, 1823).

Felis nebulosa, Blanford, Mamm. Brit. Ind. p. 72, 1888; and of later writers on the Indian fauna (not of Griffith, 1821).

Vernacular.—*Pungmar*, *Satchuk* (Lepcha); *Zik* (Limbu); *Kung* (Bhotia); *Lamchitia* (Khas tribe, Nepal); *Thit Kyoung* (Burmese); *In-cha* (Tavoy).

Locality of the *type* of *macrosceloides*, Nepal.

Distribution.—NEPAL, SIKKIM, and BHUTAN; range to the eastward unknown, possibly ASSAM and at least parts of BURMA, but no doubt blending with typical *nebulosa* in Upper Burma. At Darjeeling, according to W H. Matthews, it occurs up to 3,000 ft.

Distinguished from typical *nebulosa* by its generally darker, greyer, less yellow hue, and from *diardi* by the more extensive blotches of its marbled pattern and possibly larger skull.

Hodgson's skins, including the type, from Nepal, have an ochreous wash over the generally dark grey ground-colour, but there is hardly a trace of this in another skin from Nepal, nor in one from Sikkim.

Tickell described his specimen from the Snowy Range of Northern Sikkim as "bistre brown or dull clay brown" above and as "pale, rufous tawny below and on the inside of the limbs." This skin seems to have agreed with Hodgson's except in the richer hue of the lower side. Blyth, who in 1863 recorded this animal from Nepal, Sikkim, Bhutan, Tibet, and Upper Assam, referred to two specimens from Sikkim, one "fulvous," the other "grey." Incidentally he also

mentioned a " remarkably handsome " skin from the Ya-ma-doung Mountains, between Pegu and Arakan. This vague description suggests the occurrence of a bright-tinted Clouded Leopard, like typical *nebulosa*, in that part of Burma. I have seen only three skins from Burma. There is one from Bhamo (C. F Gilbert), which closely resembles the brightest of the Nepalese specimens. According to the collector's note this skin was brought in by natives for the reward, and may have come from over the Chinese border It approaches typical *nebulosa* in colour. The remaining two are native skins picked up by J. M. D. Mackenzie 8 miles west of Toungoo. They are covered with dusky olivaceous blotches, separated by narrow pale interspaces, but on account of their immaturity no importance can be attached to their generally dusky hue because, according to Blyth, typical *macrosceloides* is darker and greyer in hue when young. They may, however, represent the provisionally admitted southern form, *diardi*, which apparently occurs in Peninsular Siam.

No certainly known flesh-measurements of Himalayan specimens are available, but the following (in English inches), taken mostly from skins, may be recorded. To these are added, for comparison, the flesh-measurements of the example from Peninsular Siam given by Robinson and Kloss :—

Locality and sex.	Head and body.	Tail.	Hind foot.
N. Sikkim (Tickell), *macrosceloides*; ? ♂	41	34½	—
Nepal (Brit. Mus.), *macrosceloides*; ? ♂	42	36	—
Nepal (Hodgson), *macrosceloides*; old ♂	37½	29	—
Sikkim (Brit. Mus.), *macrosceloides*; ad. ♀	32	25	—
Nepal (Brit. Mus.), *macrosceloides*; ad. ♀	27	24	—
Peninsular Siam (Rob. and Kloss); ? *diardi*; ad. ♂	32	30½	7

The weight of Hodgson's old ♂, probably measured in the flesh, was 44½ lb. W H. Matthews recorded two ♂♂ as 39 and 42½ lb. respectively, the larger being 65½ in. in total length.

Measurements of the skulls from Peninsular Siam, Sumatra, and N. Borneo are added for comparison with those of *macrosceloides* to support the view that specimens from the Himalayas have larger skulls than those from the southern countries assigned to *diardi*.

Habits.—The Clouded Leopard is everywhere rare, or at all events seldom seen by European sportsmen, probably because it inhabits dense forests and is nocturnal. A good deal of the material in museums is of native origin, and most of the

Skull-measurements (in mm.) of Himalayan and southern examples of *Neofelis nebulosa*.

Locality, name, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Nepal (*macrosceloides*); ad. ♂	180	162	121	27	30	44	120	21	16
Sikkim (*macrosceloides*); ad. ♀	156	140	100	27	26	37	102	18	13
Peninsular Siam (? *diardi*); ad. ♂.	163	149	105	28	28	40	112	19	14
N. Borneo, Padang Pand Jang (? *diardi*); ad. ♀	141	129	99	29	27	35	99	17+	12½
W. Sumatra, (? *diardi*); just ad. ♀	140	130	95	30	26	33	96	17	13
Acheen, Sumatra (? *diardi*) (Frost); subad. ♂.	161	144	103	28	25+	39	108	20	17
Acheen, Sumatra (? *diardi*) (Frost); subad. ♂.	158	142	100	29	25	40	106	21	16
Acheen, Sumatra (? *diardi*) (Frost); ad. ♀.	143	131	95	30	26	35	97	18	14

information about its habits is of native source, as Blanford said.

From what he was told in Sikkim, Tickell reported it as frequenting the dense jungles, chiefly near river-banks, in the valleys north of Darjeeling, and as sometimes visiting the villages of the Bhotias and Lepchas to prey upon goats and pigs. It is savage and wary and, when wounded, may turn savagely on its assailants. Tickell, not without reason, ridiculed Raffles's statement that in Sumatra the Clouded Leopard subsists by preying upon the birds it catches in trees and on the poultry of the villagers. From the deep penetration of its bite, attested by the long canines and large space behind them, not to mention its powerful build, this cat is obviously adapted for preying upon herbivorous mammals of considerable bulk; and Swinhoe says that in Formosa it commits great havoc among deer, no doubt the Formosan Sika. He adds, however, that it never attacks man unless provoked. A case, nevertheless, was recorded by A. Brownlow (Journ. Bomb. Nat. Hist. Soc. xxxii, p. 789, 1932) at Tavoy of a specimen, which had killed several head of cattle, stalking and attacking a native boy who killed the beast by splitting its skull with his knife. But, despite their savage disposition, some Clouded Leopards are capable of being tamed. A full-grown specimen that lived many years in the Zoological Gardens, London, would let its keeper do anything with it. Nothing appears to be known about the breeding habits.

Genus **PARDOFELIS** Severtzow.

Pardofelis, Severtzow, Rev. Mag. Zool. (2) x, p. 387, 1858; Pocock, Ann. Mag. Nat. Hist. (8) xx, p. 339, 1917 (in part); id., Proc. Zool. Soc. 1932, p. 742.

Catolynx, Gray, Proc. Zool. Soc. 1867, p. 267 (not of Severtzow, 1858).

Type-species of *Pardofelis* and of *Catolynx* (Gray), *Felis marmorata* Martin.

Distribution.—The Eastern Himalayas, Nepal, Sikkim, Assam, Burma; the Malay Peninsula, Sumatra, Borneo, and Annam, and no doubt in suitable localities in the intervening countries.

A comparatively small species, about the size of a domestic cat, but with the ears rounded and the tail very long, about as long as the head and body, or longer, and over four times as long as the hind foot. The coat long, full, and soft; the ground-colour varying from tawny or brownish-grey to rich ochreous-brown above, greyish to buff below. The pattern is individually variable, always consisting of blackish stripes on the head, neck, and back, of more or less black-edged blotches on the flanks, and of solid spots on the tail, limbs,

and underside, but the blotches on the flanks are very inconstant in size; in their simplest form they are comparatively small, numerous, and tolerably widely spaced; frequently, however, they fuse to form large dark areas defined by narrowish pale lines, giving the impression of a dark brownish cat with pale stripes. This phase constitutes the so-called "marbled" pattern; but the simpler phase is clearly derivable from the pattern of some of the handsomer examples of the Leopard-Cat, and, like the latter, the Marbled Cat often has white on the chin and upper lip, and always the back of the ear, and the tail uniformly coloured beneath and not conspicuously white at the end as in Temminck's Cat. The pupil of the eye is circular when contracted.

The skull differs from that of *Prionailurus* in the sum of a number of characters. It is short, broad, strongly convex

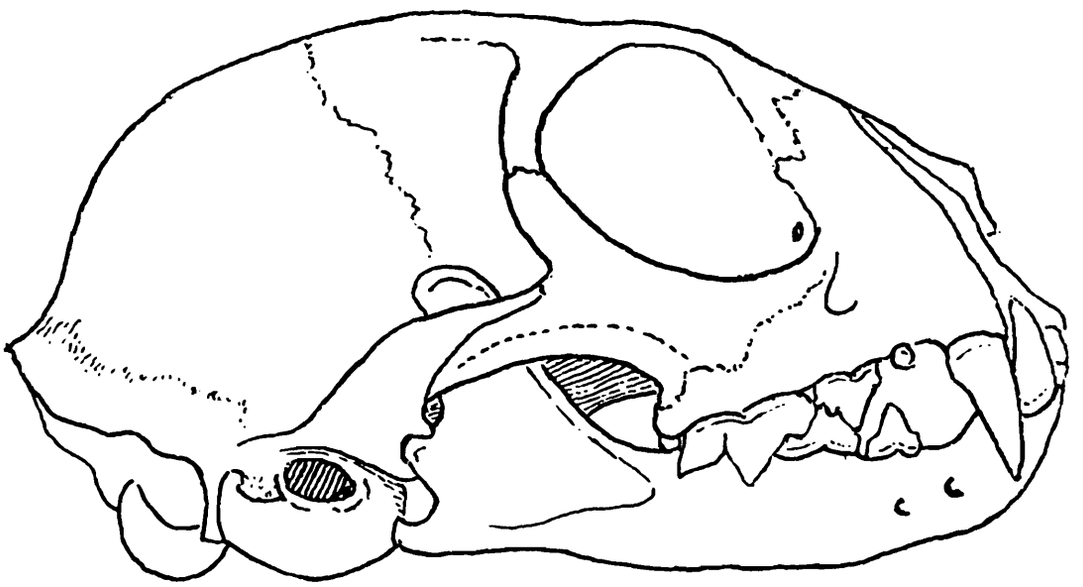
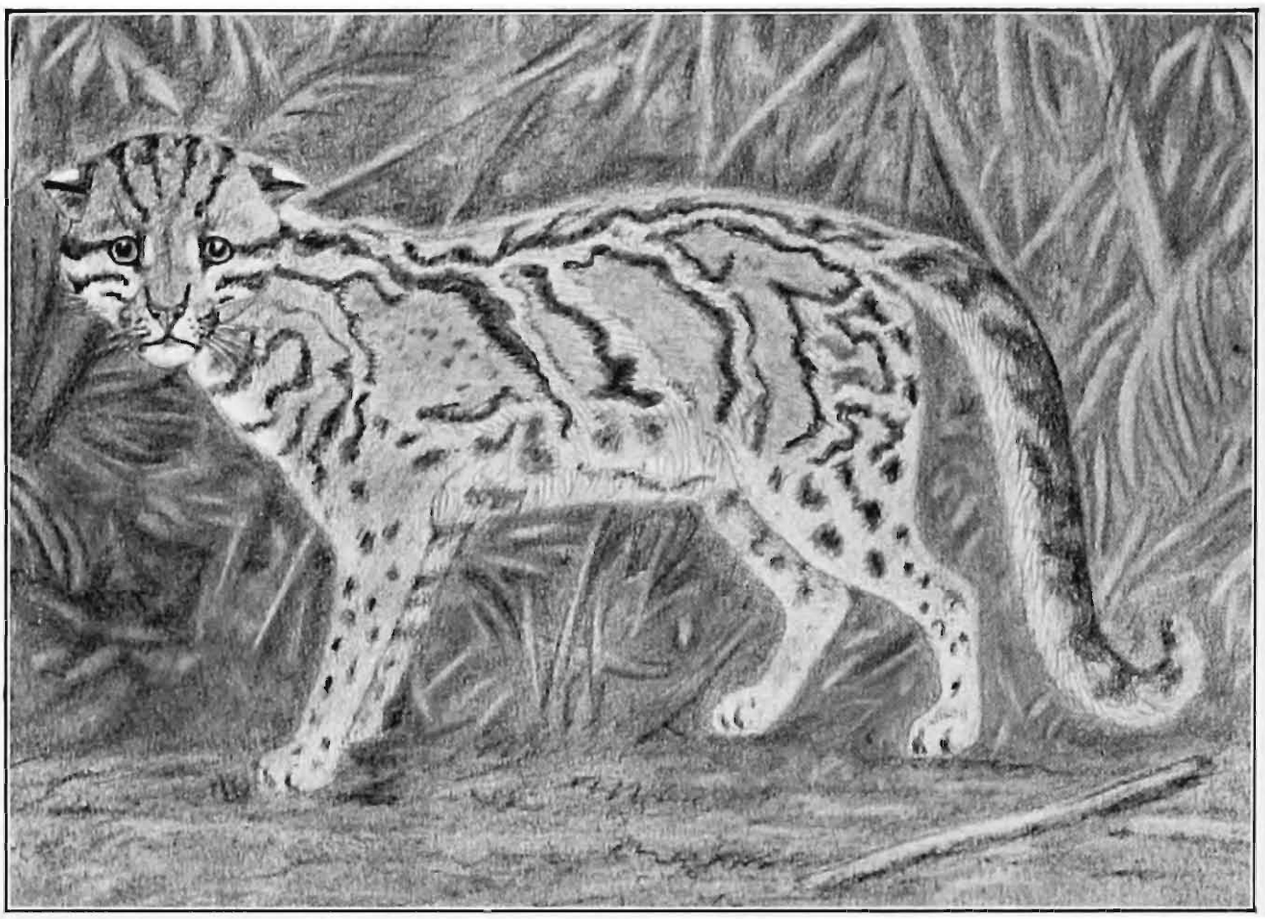
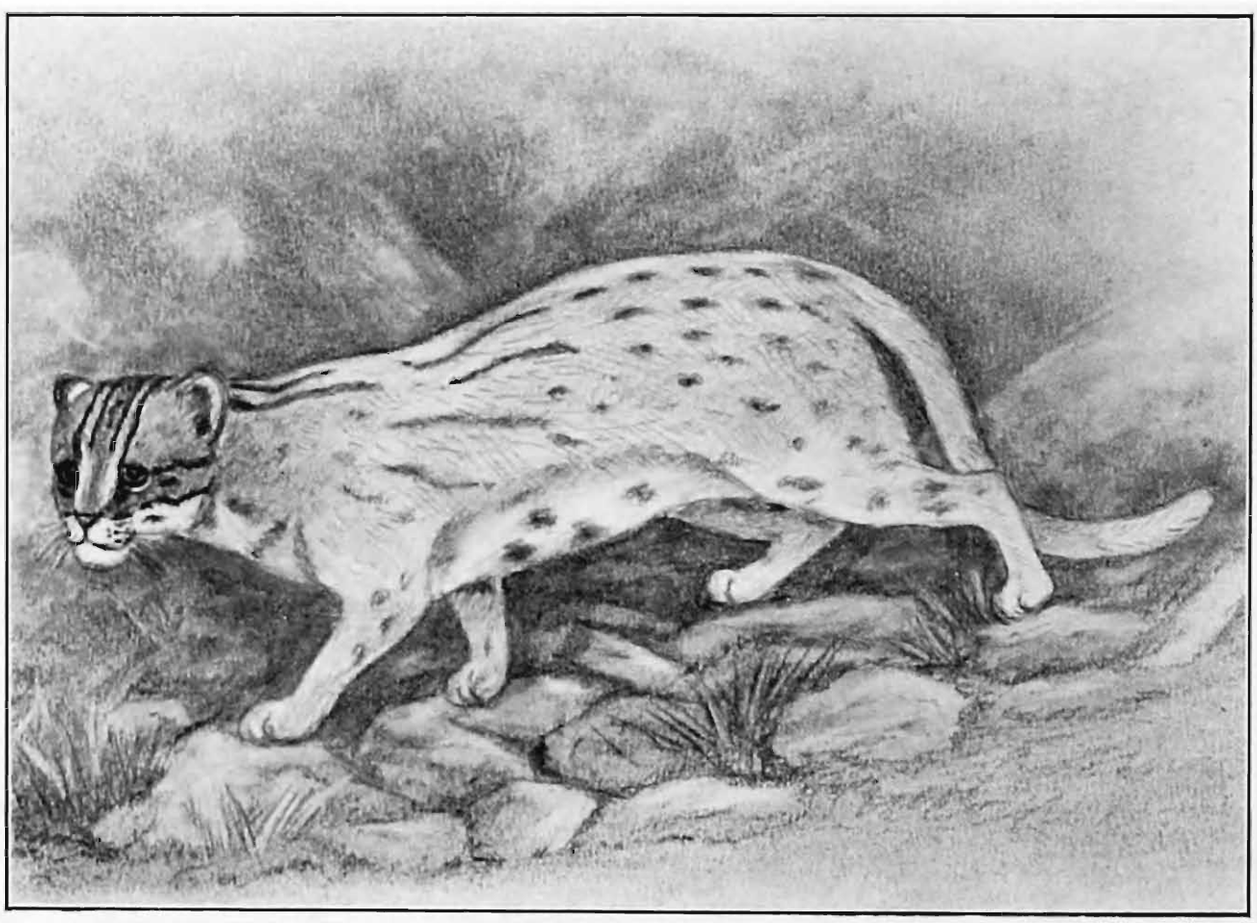


Fig. 66.—Skull of the type of the Himalayan Marbled Cat (*Pardofelis marmorata charltoni*), nat. size. From Darjeeling.

in dorsal profile, not comparatively long and low; the nasal branch of the premaxilla is thin, not expanded, the summit of the muzzle is not compressed above, the maxilla is not expanded where it abuts against the nasal bone, and develops no excrescence outside the suborbital foramen; the mesopterygoid fossa is lanceolate, not transversely truncated in front, and its side margins are thicker; the occipital region is much wider as compared with its height, the width across the mastoids exceeding half the condylobasal length of the skull, these processes projecting farther beyond the auditory orifice, and there is a wider shelf-like ridge above this orifice; the occipital crest is less steeply inclined, less emarginate laterally and, like the posterior end of the sagittal crest, weaker; the mandible has the chin less sloped, more vertical, and the coronoid higher, with its summit narrower and projecting farther backwards.



Marbled Cat (*Pardofelis marmorata*). (Adapted from a painting by C. E. Swan.)



Rusty Spotted Cat (*Prionailurus rubiginosus*).

Other cranial characters are the shortness of the nasal bones, the wide suborbital portion of the zygomatic arches, the comparatively early fusion of the malar and frontal postorbital processes completing the orbital ring, the wide separation of the temporal ridges to form a long tongue-shaped area, and their union, at least in some old males, to give rise to a low sagittal crest.

One of the peculiarities of the Marbled Cat is the profound difference between its skull and that of the Clouded Leopard, associated with several resemblances in external characters, such as the feet, which have deep interdigital webs and complete and double claw-sheaths on all the digits, the long tail, and the colour and pattern, all probably correlated with arboreal forest life. The tail, however, is even longer in the Marbled Cat and the head much shorter and rounder.

Only one species of the genus is known.

26. **Pardofelis marmorata** (Martin). The Marbled Cat.

Felis diardii, Jardine, Nat. Libr. Mamm. ii, Felinæ, pp. 221 and 271, pls. 21 and 22, 1834 (not *Felis diardi* Cuv.).
Felis marmorata, Martin, Proc. Zool. Soc. 1836, p. 107 ; and of most subsequent authors, including Blanford.
Pardofelis marmorata, Pocock, Proc. Zool. Soc. 1932, p. 744.

Locality of the *type* of *diardii* (Jardine), Java ; of *marmorata*, Sumatra *.

Distribution.—As under the genus.

General characters as above, under the genus.

In the typical form of this race, *P. marmorata marmorata*, from the Malay Peninsula, Sumatra, and Borneo, the coat is moderately long and thick and the tail moderately bushy ; the general colour is comparatively dull greyish-brown or brown, without rich ochreous wash on the flanks and back, and the pattern is obscure or conspicuous, varying in the size and confluence of the rosettes as described above.

The following three adult examples, measured in the flesh (in English inches), give reliable dimensions † :—

Locality.	Head and body.	Tail.	Hind foot.
Palembang, Sumatra ; ad.	18	19⅖	4⅘
Babu Tiga, Malacca, ad.	20⅘	21⅗	4⅘
Barito River, S. Borneo, ad.	19	18⅘	4½

* Martin's specimen was recorded from Sumatra or Java, but Sumatra was selected as the type-locality by Robinson and Kloss (Journ. Fed. Mal. St. vii, p. 261, 1919. The existence of the species in Java is doubtful.

† The first two specimens were collected and measured by Robinson and Kloss. The third, collected by W. Frost, was measured at the British Museum. Since the skull of Martin's type from Sumatra is small and immature, his measurement of the head and body as 23 in. and the tail 15½ must be taken with reserve.

The occurrence of this race in the Malay Peninsula suggests the possibility of its extension into Tenasserim and, perhaps, other parts of Lower Burma.

26 *a*. **Pardofelis marmorata charltoni** (Gray). The Himalayan Marbled Cat.

Felis charltoni, Gray, Ann. Mag. Nat. Hist. (1) xviii, p. 211, 1846.
Catolynx charltoni, Gray, Proc. Zool. Soc. 1867, p. 268.
Felis ogilbii, Hodgson, Calc. Journ. Nat. Hist. (8) p. 44, 1847 *.
Leopardus dosul and ? *duvaucelli*, Hodgson, Cat. Mamm. Nepal, ed. 2, p. 3, 1863 (no description).
Felis marmorata, Blanford, and other writers on the Indian fauna (in part, not of Martin).
Pardofelis marmorata charltoni, Pocock, Proc. Zool. Soc. 1932, p. 746.

Vernacular.—Dosal (Lepcha) ; *Sikmar* (Bhotia).

Locality of the *type* of *charltoni*, Darjeeling ; of *ogilbii* and *dosul*, Sikkim.

Distribution.—NEPAL, SIKKIM, ASSAM, and UPPER BURMA ; range to the east and south of Upper Burma unknown.

Distinguished from the typical race by the much thicker and longer coat and rich ochreous-brown colour, the pattern less mottled, consisting of large ochreous-brown areas edged with black behind and sometimes in front, and separated by a few greyish-buff wavy lines ; the legs the same rich tint as the body, heavily spotted with black basally ; tail not so rich, duskier than the body, with the pattern somewhat obscurely defined.

No flesh-measurements of this race are available , but they are probably approximately the same as those of the typical race, since the skulls of the two are alike in size and other particulars.

Apart from Horsfield's statement that this cat is found " in the hilly regions of Nepal " † next to nothing is known about it (Proc. Zool. Soc. 1856, p. 396). There are only three skins in the British Museum, the type from Sikkim, one

* *Felis ogilbii* Hodgson has been added to the synonymy of this race because the dimensions of the skin were given as head and body 18½ in., tail 14 in. The tail is shorter in proportion than in the flesh-measured skins of the typical race quoted above ; but the head and body in stripped skins is nearly always stretched, and no doubt this was the case in the skin in question. But even if it was unstretched the tail is much longer in proportion to the head and body than in any known skin of the Leopard-Cat (*Prionailurus bengalensis*). This was overlooked by Blanford when he identified as the type of *ogilbii* an unusually red, artificially-dyed skin of a comparatively short-tailed example of *bengalensis* sent by Hodgson from Sikkim and preserved in the British Museum. This skin is clearly not the type in question (see p. 272).

† Blanford's assertion that the species had not been recorded from Nepal is clearly an error.

labelled "Nepal" (Hodgson), and one from Nam Tamai, Upper Burma (Kingdon Ward). The last is very richly coloured, and differs from the type in having the upper lip and chin ochreous, not white, and the underside washed with buff. Hodgson's skin is intermediate between the two.

Skull-measurements (in mm.) of *Pardofelis marmorata charltoni*.

Locality and sex.	Total length.	Condylo-basal length.	Zygomatic width.	Postorbital width.	Interorbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
"India"; ad. ♂ .	—	—	65	28	13	24	63	13	9
"India"; ad. ♂? .	92	83	63	29	13	23	60	11	8
Darjeeling; yg. ad. ♂?	—	82	61	32	14	23½	58	13	11
„ (type); ad. ♀?	88	81	65	30	14	23	58½	12	8

The width of the mastoid of these skulls, in the order of their arrangement, is 45, 42, 42 mm., in all cases exceeding half the condylobasal length. Although the skulls themselves are



Fig. 67.—The Marbled Cat (*Felis marmorata*). (From Blanford.)

considerably shorter than those of *P. bengalensis horsfieldi* from Almora and the Garo Hills, the mastoid width is greater.

Habits.—Except in one or two localities where its natural habitat has been interfered with by man, the Marbled Cat is essentially a forest species, feeding upon small mammals, like rats

and squirrels, and birds up to the size of pheasants. It is seldom imported alive for menageries and seldom secured by collectors. Those working for the Bombay Mammal Survey failed to capture or to purchase from natives a single specimen in Nepal, Sikkim, Assam, or Burma*. Robinson and Kloss ascribed the rarity with which it is seen to its forest habitat and nocturnal habits rather than to real scarcity. Hose, however, stated (Mamm. Borneo, p. 18) that it is found in the "clearings" in Sarawak, and Frost captured a specimen in a fowl-house on the Barito River, S. Borneo, in a district which for miles around and for many years had been cleared of native forest and planted for rubber and cereals, and the animal was living on the river cliff, which consisted of rocks overgrown with scrub and low bush. This is an interesting case of adaptation to new conditions.

Genus **PROFELIS** Severtzow.

Profelis, Severtzow, Rev. Mag. Zool. (2) x, p. 386, 1858.
Chrysailurus, id., tom. cit. p. 389.
Catopuma, id., tom. cit. p. 387.
Pyrofelis, Gray, Ann. Mag. Nat. Hist. (4) xiv, p. 354, 1874.
Profelis, Pocock, Ann. Mag. Nat. Hist. (8) xx, p. 340, 1917; id., Proc. Zool. Soc. 1932, p. 752.

Type of *Profelis, celidogaster* Temm. (=*aurata*, Temm.); of *Chrysailurus, neglecta* Gray (=*aurata* Temm.); of *Catopuma, moormensis* Hodgs. (=*temminckii* Horsf. & Vig.); of *Pyrofelis, temminckii* Horsf. & Vig.

Distribution.—West and Central African forest region; S.E. Asia from Nepal and Southern China southward through the Malay Peninsula to Sumatra; ? Java, but not Borneo †.

Resembling the Leopard-Cat (*Prionailurus bengalensis*) in its low, rounded ears, in the tail being over half the length of the head and body, and over twice the length of the hind foot, and also in the style of its body-pattern, when retained, but distinguished from the three species of *Prionailurus* in external characters by the absence of a distinct white patch on the ear, by the whiteness of the tail-tip beneath, and by the characteristic facial pattern described below.

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* Two native skins sent by Mackenzie from Toungoo and identified by the late T. B. Fry as *Felis marmorata* (Journ. Bomb. Nat. Hist. Soc. xxx, p. 647, 1929) are young examples of the Clouded Leopard.

† There is no doubt about the kinship between the African and Asiatic species assigned to this genus. Not only are they similar, with minor differences, in their skulls, but in their colour phases as well. In the African Cat (*P. aurata*) the pattern may be manifest or obsolete and the colour nearly black, "red" or "grey"; and since a specimen in the Zoological Gardens, as I recorded in 1907, changed from "red" to "grey" the same phenomenon probably occurs in *P. temminckii*, although not as yet observed.

The skull is distinguished from that of *Prionailurus* by the narrow nasal branch of the premaxilla, the less expanded maxilla where it abuts against the nasals, the less compressed

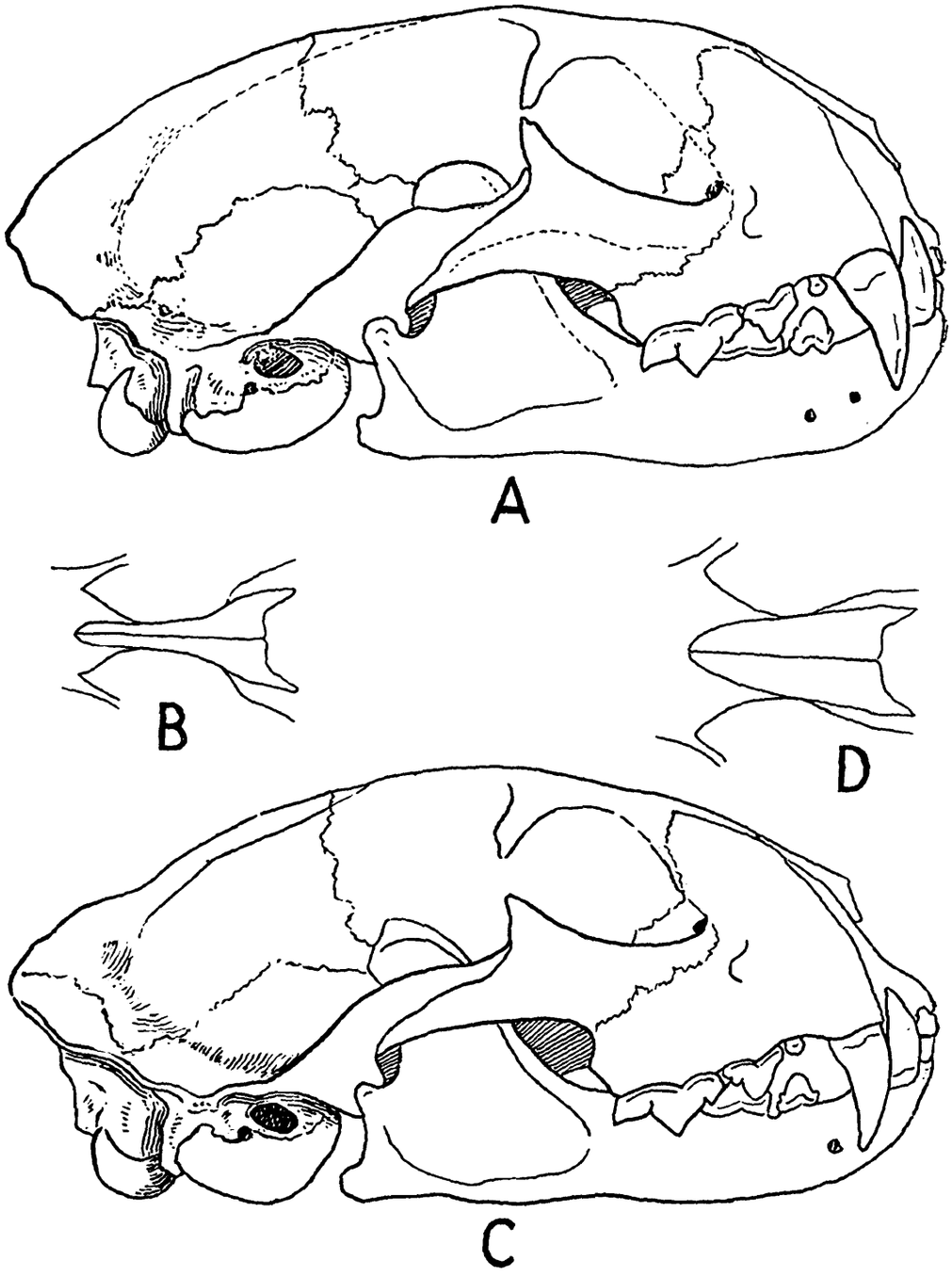


Fig. 68.—A. Skull of adult ♂ Fishing Cat (*Prionailurus viverrinus*) from Sind. B. Nasal bones of example of the same species from Nepal. C. Skull of adult ♂ Temminck's Cat (*Profelis temminckii*) from Tejo in the Mishmi Hills. D. Nasal bones of example of the same species from Myitkyina, Upper Burma.

nasals, more strongly developed pterygoid crest, relatively wider mastoid width, and by the incompleteness of the orbital bar at all ages. In this last character it also differs from the

skull of *Pardofelis*; it is also much narrower, longer, and lower, has the mesopterygoid fossa with its anterior edge transverse, not ovate or lanceolate, and a shallow emargination instead of the deep notch on the posterior edge of the palate on each side.

27. **Profelis temminckii** (Horsfield & Vigors).

(For bibliography see under the subspecies.)

Locality of the *type*, Sumatra.

Distribution.—From Tibet, Szechwan, S. China, and the EASTERN HIMALAYAS over the south-eastern portions of Continental Asia to Sumatra.

One of the largest of the medium-sized Oriental species of Felinæ, with the tail a little over one-half to about two-thirds the length of the head and body, and from over twice to nearly three times the length of the hind foot. Coat varying in luxuriance according to the race. General colour exceptionally variable individually, from very dark brown to red or grey, at least in the typical race. Pattern either conspicuous and consisting of stripes on the dorsal area, rosettes on the flanks, and solid spots on the limbs and below, or obsolete except on the underside, where some spots are retained, and on the face. But two features in the colour and pattern are characteristic. The tail, unless affected by melanism, is noticeably bicoloured, dark above and whitish below, the two sharply contrasted, the whiteness below being particularly conspicuous at the end of the tail, which has no wholly black tip as in most other species. On the face there is nearly always a pair of greyish bands, bordered with black stripes, running up over the forehead from the conspicuous whitish patches on the inner side of the eyes; on the cheek there is a conspicuous white band edged by the two black genal stripes and passing from below the eye to below the ear, and the mystacial area of the muzzle is lined alternately with narrow black and white lines, with some brown in front below the rhinarium. The ears are blackish behind, sprinkled with darkish-grey in the middle and towards the base, but never have a conspicuous white spot.

The two British Indian races of this cat may be distinguished as follows:—

a. Coat shorter, pattern at most faintly indicated dorsally and laterally .	[Vig., p. 260. *temminckii* Horsf. &
b. Coat longer and fuller, a distinct pattern of dorsal stripes and lateral rosettes	*tristis* Edwards, p. 263.

27 *a*. **Profelis temminckii temminckii** (Horsfield & Vigors). The Golden Cat or Temminck's Cat.

Felis temminckii, Horsfield & Vigors, Zool. Journ. iii, p. 451, 1828; and of most subsequent authors, including Blanford and others.
Felis moormensis, Hodgson, Gleanings in Science, iii, p. 177, 1831; id., Proc. Zool. Soc. 1832, p. 10; id., Journ. As. Soc. Bengal, x, p. 908, 1841 (*murmensis*).
Felis aurata, Blyth, Proc. Zool. Soc. 1863, p. 185 (not of Temminck).
Felis nigrescens, Gray, in Hodgson's Cat. Mamm. Nepal in Brit. Mus. ed. 2, p. 4, 1863.
Felis temminckii bainsei, Sowerby, China Journ. Sci. ii, p. 352, 1924.
Profelis temminckii temminckii, Pocock, Proc. Zool. Soc. 1932, p. 754*.

Vernacular.—*Hso-Hpai*, *Miao-Htön* (N. Shan States); *Kya Min* (Burmese).

Locality of the *type* of *temminckii*, Sumatra; of *moormensis*, Nepal; of *nigrescens* Sikkim; of *bainsei*, Tengyueh, S.W Yunnan.

Distribution.—Nepal, SIKKIM, ASSAM, and BURMA; also Yunnan, Laos, Tong-king, the Malay Peninsula, and Sumatra.

Coat short and smooth in summer, moderately full in winter. Colour variable, that of the upper side ranging from very dark brown to red, ochreous-tawny or nearly grey, the spinal area generally darker in all phases than the flanks and outer side of the limbs, the hairs frequently speckled with pale bands, which may be reddish or bleached whitish, the grey phase resulting when the whitish speckling is extensive. The underside ranges from brownish, with the chin buff in dark skins, to whitish, with the chin white in paler skins. Pattern, except on the head, where it is persistent, generally inconspicuous or obsolete, at most consisting of some dark stripes on the nape, faint stripes on the throat and inner side of the fore leg, and of faint pale lines, sometimes forming a network, on the shoulders, flanks, and thighs, and indicating the spaces between large blotches like those of the Marbled Cat.

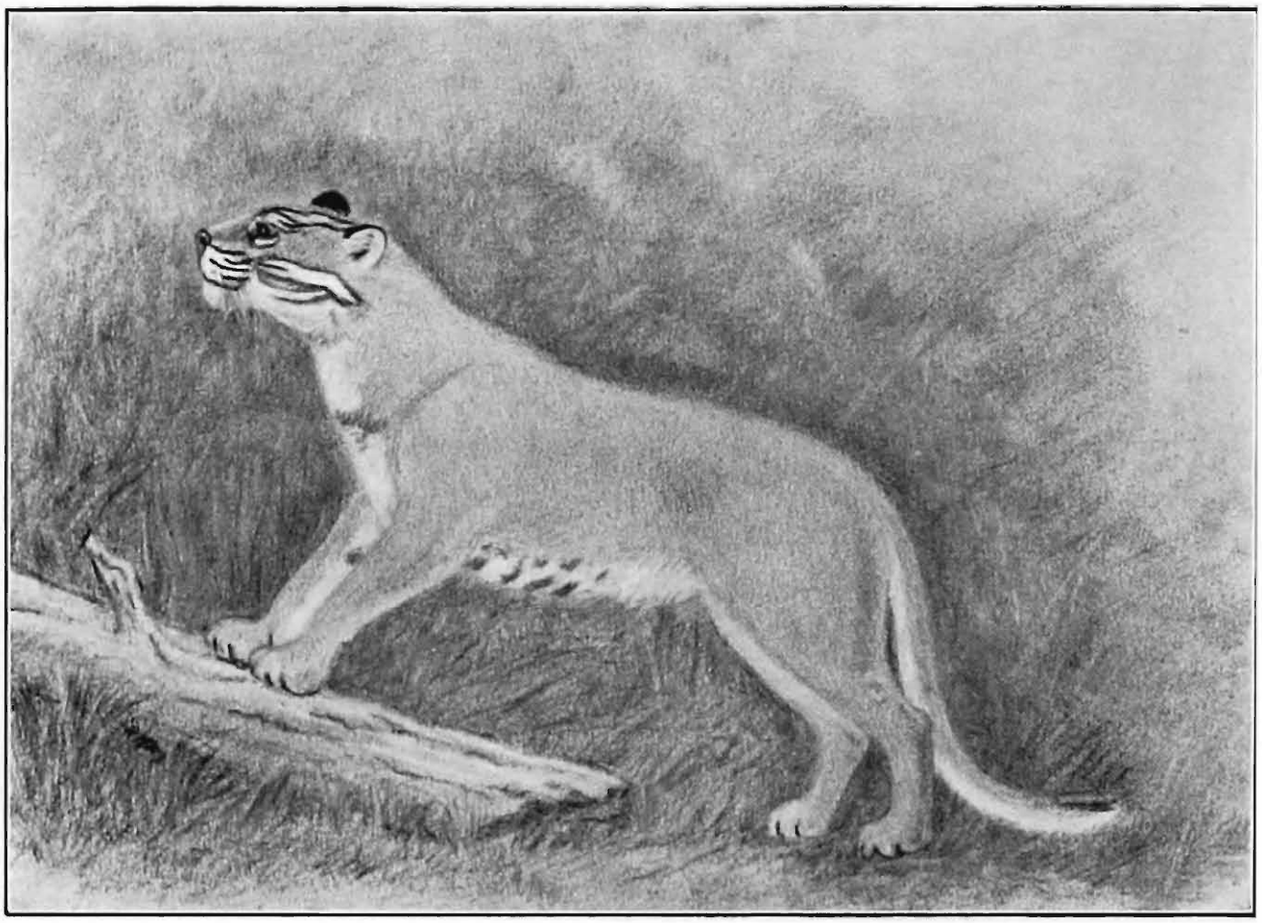
Although some skins show a combination of tints, the dominant colour phases in British Indian skins in the British Museum have the following geographical incidence :—

Dark brown, sometimes silvered on the flanks, from Nepal and Sikkim (Hodgson and Mandelli); bright red, from Nepal,

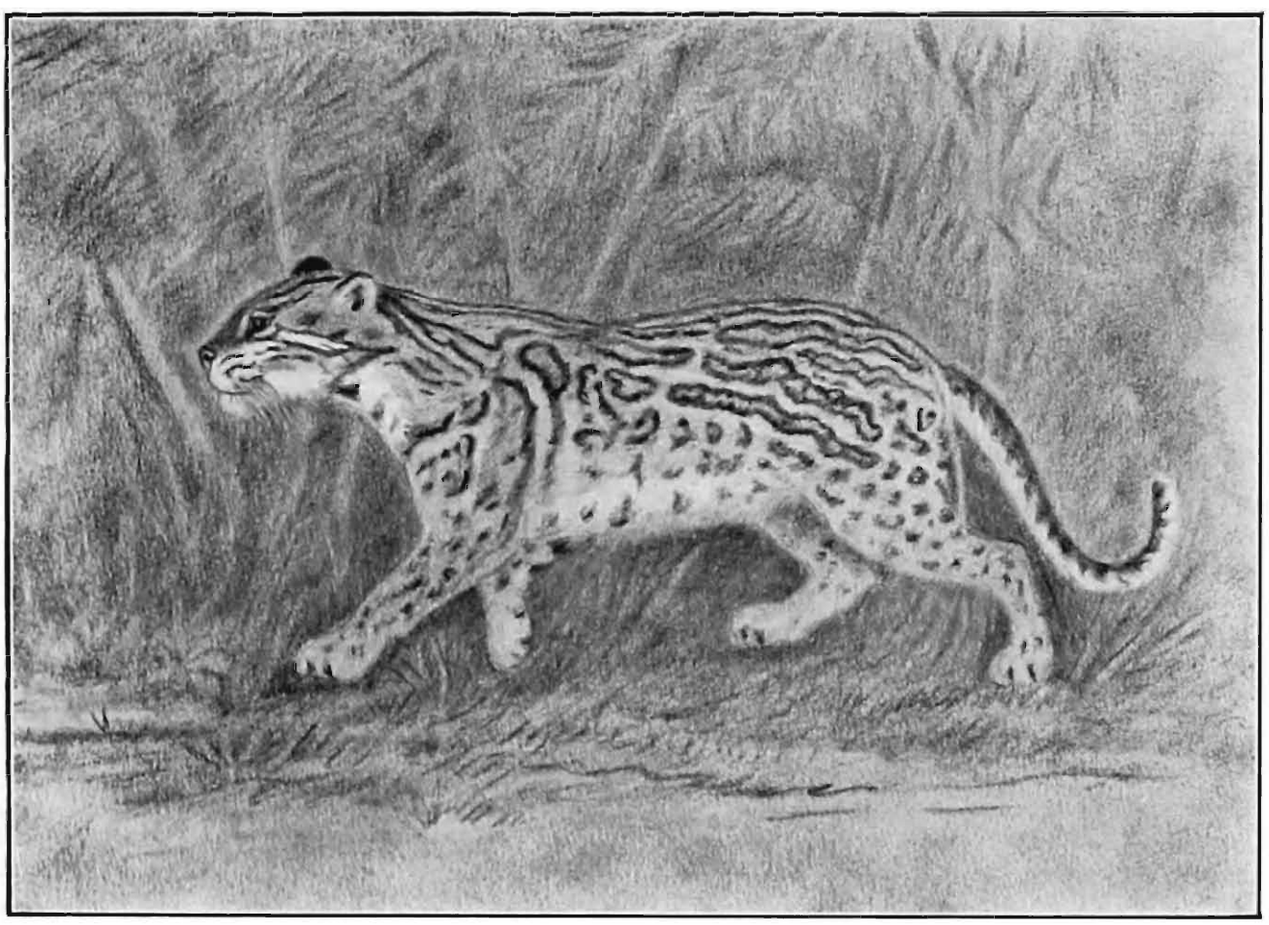
* When more is known about this cat in Sumatra it is possible that the Nepalese form *moormensis* may prove to be racially distinguishable from typical *temminckii*. But at present there is not enough material from that island to separate the two. Sumatran specimens are known to vary from "red" to nearly black, like those from Nepal. Dark specimens from the latter country and Sikkim were called *nigrescens*. The name *bainsei* was given to a trade skin by Sowerby. It was described as brownish, with a tendency to greyish on the sides. All the evidence is against Sowerby's view that the dark and red phases of this cat are racially distinct.

Skull-measurements (in mm.) of British Indian examples of *Profelis temminckii temminckii*.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	$\frac{p}{m^4}$.	m_1.
Myitkyina, Upper Burma ; ad. ♂	157	139	97	32	25	36	99	17	12
Tejo, Mishmi Hills ; ad. ♂	147	133	100	31	22	35	95	17	13
Yekhum, Naga Hills ; ad. ♂	145	—	95	32	26	35	96	16	11
Haka, Chin Hills ; ad. ♂	145	—	93	31	24	34	95	17½	13
Nepal (*moormensis*, type) ; ad. ♂	143	132	92	30	24	33	—	17	—
Sikkim ; ad. ♂	—		98	32	24	36	95	16	11
Pyinimana, Upper Burma ; ad. ♀	126	116	82	32	20+	29	82	15	11



Temminck's Cat (*Profelis temminckii temminckii*).
(Drawn from grey skin from Upper Chindwin.)



Striped Temminck's Cat (*Profelis temminckii tristis*)
from Nam Tamai, Upper Burma.

Sikkim, Sumbrabum in Upper Burma (H. A. C. Stevenson), and Teju in the Mishmi Hills, 3,000 ft. (H. W Wells) ; ochreous tawny in various shades from Sonapur, Kamrup (Sir D. Ezra), Yekhum in the Naga Hills (J. P. Mills), Maymyo, Upper Burma (G. C. Shortridge) ; grey, darker or lighter, from Myitkyina, Upper Burma (Capt. A. W Kennion), and Upper Chindwin (C. W A. Bruce). There is also a grey skin from Xien Quang Koo, Laos (Delacour and Lowe).

Of the skins above referred to, one from Nepal and one from Yekhum in the Naga Hills show grey stripes on the sides, indicating the evanescent body-pattern, which in most skins has disappeared altogether. Similar traces of the pattern are visible in a skin from the Malay Peninsula.

The following are the only flesh-measured skins (in English inches) in the British Museum :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Myitkyina, Upper Burma ; ad. ♂	33	17	—
Tejo, Mishmi Hills ; ad. ♂	32	18⅘	7
Hue, Annam ; ad. ♂	30	19⅕	6½

The weight of the specimen from the Mishmi Hills was 32 lb.

In Fokien and other parts of Southern China this cat is represented by a closely allied form, *P. temminckii dominicanorum* Sclater, which is distinguished by its fuller, longer coat and bushier tail in the winter months.

27 *b*. **Profelis temminckii tristis** (Milne-Edwards).

Felis tristis, A. Milne-Edwards, Rech. Mamm. p. 223, pl. xxxi, 1872 ; id., Congr. Internat. Zool. Nat. Mosc. ii, p. 257, 1893 ; Elliot, Mon. Felidæ, pl. 22, 1883 ; B. Howell, Proc. U.S. Nat. Mus. lxxv, p. 32, 1929.

Felis semenovi, Satunin, Ann. Mus. Zool. Soc. St. Petersb. ix, p. 524, 1904.

Profelis temminckii tristis, Pocock, Proc. Zool. Soc. 1932, p. 760.

Locality of the *type* of *tristis*, unknown (a trade skin from Pekin) ; of *semenovi*, N.E. Szechwan.

Distribution.—Tibet, Szechwan, and ? Upper Burma.

Distinguished from the typical race by its longer, fuller winter coat, and by the retention of the pattern as usually conspicuous blackish stripes on the head, nape, and back, distinct blotches or rosettes sometimes joining to form oblique chains on the flanks, solid spots on the limbs, and transverse bands on the upper side of the tail. General colour typically greyish, but frequently with an ochreous wash on the head, nape, and shoulders. At Tsari, in Tibet, Kingdon Ward picked up a very beautiful skin with the head, nape, spinal area, tail, and underside rich rusty ochreous, the pattern everywhere

black, the interspaces of the flanks silvery and the distal fourth of the lower side of the bushy tail conspicuously white.

No flesh-measured skins are available, but judging from made-up skins in the British Museum from Szechwan and Tibet the dimensions are approximately the same as in typical *temminckii*. The entire skull is unknown, but the jaws and teeth of the type of *semenovi*, a native skin from N.E. Szechwan, seem to agree precisely with those of *temminckii*.

This race is included in the fauna of British India on the evidence of a skin procured by Lord Cranbrook from a native at Nam Tamai, 3,000 ft., in Upper Burma. The specimen may have been locally killed or it may have come from over the Tibetan border. The coat is not so full as in the Szechwan skins, but, as likely as not, was procured in summer. The general colour, too, is darker, the stripes on the back being a good deal obscured by the blackish pigmentation of the interspaces, and the hairs on the neck are speckled with ochreous, on the flanks with grey.

Apparently all the skins of this cat that have come into the hands of zoologists were procured from natives. It was for many years regarded as a peculiar species, and from the nature of its pattern Lydekker thought it was an Asiatic representative of the American Ocelot. There is no doubt, however, of its close kinship with Temminck's Cat.

Habits.—So seldom has Temminck's Cat been observed wild by Europeans that there is very little trustworthy information about its habits. By the natives of the Lushai Hills it is stated to live amongst rocks. Those of the Mishmi Hills report, on the contrary, that the female lies up in hollow trees with her two cubs, which indicates a forest habitat. Probably both accounts are true, the cat adapting its habits to its surroundings. Since one was shot at Maymyo by Major Stewart over a calf it had killed, and another was speared at Victoria Point, Tenasserim, while feeding on a buffalo calf, the species is clearly capable of preying upon comparatively large game, and no doubt it subsists mainly on mammals up to the size of small deer as well as upon such birds as pheasants and wild fowl.

Of the habits of the spotted race *tristis* nothing is definitely known, but there is no reason to suppose they differ from those of its near ally.

Genus **PRIONAILURUS** Severtzow.

Prionailurus, Severtzow, Rev. Mag. Zool. (2) x, p. 387, 1858; Pocock, Ann. Nat. Mag. Hist. (8) xx, p. 338, 1917; id., Proc. Zool. Soc. 1932, pp. 741–66.
Zibethailurus, Severtzow, Rev. Mag. Zool. (2) x, p. 387, 1858; Pocock, Ann. Nat. Mag. Hist. (8) xx, p. 341, 1917.
Viverriceps, Gray, Proc. Zool. Soc. 1867, p. 268.

Type-species of *Prionailurus*, *pardochrous* (=*bengalensis*); of *Zibethailurus* and *Viverriceps*, *viverrinus*.

Distribution.—The whole of south-eastern Asia in suitable localities from Baluchistan and Kashmir in the west and Manchuria and Korea in the north to Borneo and the Philippine Islands in the south-east.

Tolerably large, medium or small-sized cats with the ear low, rounded, and with a whitish patch on the back of it; tail a little over half the length of the head and body or less, and a little over twice the length of the hind foot or less, varying according to the species; ground-colour variable, but pattern always distinct in the fresh coat and consisting of four main stripes running back from the head on to the shoulders, where they are typically broad and conspicuous, but down the spine they are usually more or less broken up into elongated spots; sides of the body marked with spots, which are frequently lanceolate, sometimes rosette-like, occasionally tending to run into longitudinal chains, but never fusing to form vertical stripes as in *Felis*; fore legs typically spotted externally to the paw, the hind at least to the hock; tail paler below than above, but the tints not sharply contrasted, and the tip never conspicuously white beneath; head with two cheek-stripes, a pair of white patches between the eyes; white upper lip.

The skull of *Prionailurus* differs from that of *Felis* (see below, p. 285) in the sum of a number of characters. It is lower and less vaulted; the facial portion is shorter as compared with the cranial, *i. e.*, the distance between the occipital crest and the tip of the postorbital process noticeably exceeds the distance between that process and the end of the premaxilla; the postorbital processes are thinner, sharper, and less ligulate before fusing with the process below them to complete the orbital ring; the nasal bones are not everted above the anterior nares; the floor of the orbit is longer; the mesopterygoid fossa is not widened anteriorly, and the median line of the edge of the palate roofing it in front is typically notched, not produced into a process; the external pterygoid crest is long and rises about the middle of the lateral wall of the fossa, and the outer chamber of the bulla is much smaller as compared with the inner.

The skulls of the three species of this genus differ considerably. That of *P. bengalensis*, the type of *Prionailurus*, is the most generalized and most like the skull of *Felis*. The others depart from it mainly in opposite directions. The skull of *rubiginosus* is smaller and less developed muscularly, resembling the skull of a young *bengalensis*, except in a few specialized features mentioned below. The skull of *viverrinus* is larger, with very marked muscular moulding. This species was made the type of the genera *Zibethailurus* and *Virerriceps* by Severtzow and Gray respectively*. In my paper on the classification of the Felidæ in 1917 I retained *Zibethailurus* as a genus ; but I now think it better to regard it as a synonym of *Prionailurus*, to which, as I pointed out, it is unquestionably nearly allied, differing from it in characters hardly greater than those which separate the skulls of *bengalensis* and *rubiginosus*.

Key to the Three Species based on External Characters.

a. Tail over half the length of the head and body and over twice the length of the hind foot.
  b. Larger, tail with distinct pattern ; body-pattern bold, consisting of large black spots or black and rusty rosettes on the flanks. [p. 267. *bengalensis* Kerr,
  b'. Smaller, tail usually without pattern, at most very indistinct ; body-pattern less bold, consisting of small solid spots, but two stripes on the shoulders always conspicuous [p. 276. *rubiginosus* Geoffroy,
a'. Tail less than half the length of the head and body and less than twice the length of the hind foot ; size, the largest of the genus [p. 281. *viverrinus* Bennett,

Key to the Species based on Cranial Characters.

a. Skull of medium size, with nasals moderately compressed and maxilla moderately expanded above ; postorbital bar completed later in life ; muscular development of skull moderate, at most a small sagittal crest and postorbital area generally wider than the muzzle in front [p. 267. *bengalensis* Kerr,
a'. Nasals strongly compressed and maxilla strongly expanded above ; postorbital bar completed earlier.
  b. Skull large, from 5 to 6 in. long, excessively developed muscularly, with high sagittal crest and postorbital area narrower than muzzle in front, small upper *pm* retained. [p. 281. *viverrinus* Bennett,
  b'. Skull small, about 3 in. long, muscular development weak, no sagittal crest, and postorbital area always wider than muzzle, which is vertical in front ; small upper *pm* lost [p. 276. *rubiginosus* Geoffroy,

* These names were suggested by the specific name *viverrinus*, due to Bennett's curious fancy that this cat is like a Civet.

28. **Prionailurus bengalensis** Kerr. The Leopard-Cat.

(For bibliography of the British Indian races, see under the sub-specific headings.)

Locality of the *type*, " Bengal."

Distribution.—As under the genus, but not found in Ceylon.

Size about the same as in the Domestic Cat, the tail typically exceeding half the length of the head and body, and more than twice the length of the hind foot. The coat soft and, in the northern races, long and full. The ground-colour variable, both individually and racially, from whitish, cream-white, buff, ochreous-buff, to ashy-grey, with no bright tint. Pattern similarly variable on the sides of the body, where the spots may be large or small and solid, but usually the fore part of the spots, especially when large, is invaded by an

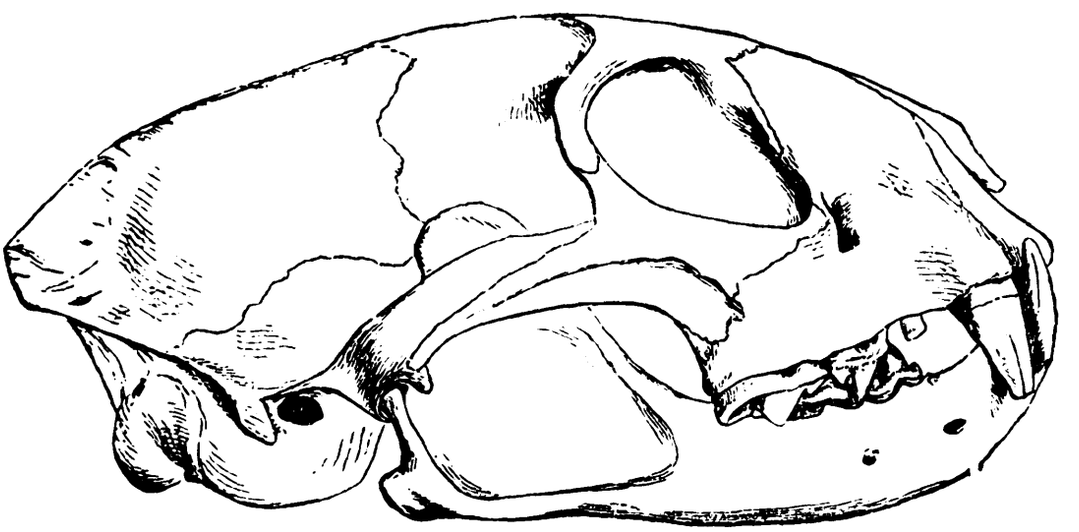


Fig. 69.—Skull of Leopard-Cat (*Prionailurus bengalensis*), about nat. size. (From Blanford.)

ochreous or rusty-ochreous tinge, so that they may become nearly annuliform with dark centres ; and these " pantherine " spots may show a tendency to coalesce in chains forming longitudinal stripes.

The skull exhibits the mean in size and muscular development in the genus. In the cranial part the temporal ridges usually form a narrower or wider lyriform area, but occasionally in the adult ♂ coalesce and give rise to a low sagittal crest ; the postorbital area gradually expands from behind the processes, where it is usually wider than the maxillary width, sometimes about the same width, occasionally a little narrower ; the postorbital bar is sometimes complete in skulls that have just reached maturity, more often in older skulls, possibly always in very old skulls, and the nasal bones are never strongly constricted.

I regard as subspecies of *P. bengalensis* a large number of described forms, including *euptilura* Milne-Edw. of Manchuria, *chinensis* Gray of Southern and Central China, etc., which many, even recent, authors cite as distinct species. They have the same type of skull and teeth and are distinguished merely by intergrading characters, like length of coat and differences of tint and pattern. If granted the status of species, the other British Indian cats, *rubiginosus* and *viverrinus*, assigned to *Prionailurus*, must logically be given generic rank.

The distribution of the Leopard-Cat justifies as a working hypothesis the view that, like the tiger and the panther, it is a northern form that spread southwards over the Indo-Malayan area before its disruption into continental islands, and that it entered Hindostan by the route to the east of the Tibetan plateau, but was too late to get a footing in Ceylon after reaching the southern part of Peninsular India.

Owing to the individual variation in colour many names were given to British Indian specimens. Of these I have selected two as connoting distinguishable subspecies, a northern from the Himalayas, which has retained to a greater degree the fuller winter coat of its still more northern ancestor, and a southern, in which the coat has lost its fullness in warmer latitudes both to the west and east of the Bay of Bengal. This appears to be a plausible explanation of the similarity between skins from Lower Burma and Southern India; and the race to which I assign them, and to which the name *bengalensis* has been restricted, is "environmental" and not "local." Skins from Assam are of doubtful allocation, since, as might be expected, they are intermediate between Himalayan and Burmese skins.

28 *a*. **Prionailurus bengalensis bengalensis** Kerr. Pennant's Leopard-Cat.

Felis bengalensis, Kerr, Anim. Kingd. p. 151, 1792; and of most subsequent authors, including Blanford, Mamm. Brit. Ind. p. 78, 1888 (excl. most of the synonymy).

? *Felis nipalensis*, Horsfield & Vigors, Zool. Journ. iv, p. 382, 1829.

Leopardus ellioti, Gray, Ann. Mag. Nat. Hist. x, p. 260, 1842.

Felis wagati and *tenasserimensis*, Gray, Proc. Zool. Soc. 1867, p. 400*.

* The typical example of this race was a stuffed specimen seen at Hammersmith and described as the Bengal Cat by Pennant (Quadrup. i, p. 272, 1781), who was told that the animal swam to a ship anchored off the coast of Bengal. Although the story hardly bears the impress of truth, and Pennant's description agrees better with rich-coloured examples of the Sumatran race than with any Indian skins I have seen, I adhere to the traditional acceptance of "Bengal" as the locality, and restrict it to the coast of that province to the west of the Ganges. The status of *nipalensis* is doubtful. The name was given to a specimen in the Zoological Gardens "said to have been brought from Nepal

Vernacular.—*Chita Billi* (Hindi); *Ban Biral* (Bengal); *Borka* (Coorg); *Wagati* (Kanara and Dharwar); *That-qyuk* (Burmese); *Hen-wap* (Shan States).

Locality of the *type* of *bengalensis*, Southern Bengal; of *nipalensis*, ? Nepal; of *ellioti*, the Bombay Presidency; of *wagati* and *tenasserimensis*, Tenasserim.

Distribution.—Peninsular India, Burma, Siam, Indo-China.

Coat comparatively short and thin and the tail not fluffy in the winter months, as attested by specimens from S. Coorg (Shortridge) in January and February and in the Palni Hills (McCann) on April 25. Ground-colour and pattern alike variable individually, the colour from ochreous-buff to buffish-white on the flanks, but typically darker on the head and back, "bright" and "dull" specimens occurring in the same or adjoining localities, but the "bright" dominant. Spots on



Fig. 70.—The Bengal Cat (*Prionailurus bengalensis*). (From Blanford.)

the flanks typically large and well spaced, sometimes "solid" with scarcely any brown dilution, more often "pantherine," and sometimes showing a tendency to run into chain-like lines; the stripes on the back also vary, particularly the broad ones on the shoulders.

Pennant described the type of *bengalensis* as "beautiful pale yellowish-brown." The type of *ellioti*, on the other hand, is dull buffish-white or grey, with the well-spaced spots on the flanks mainly black. It is possibly faded; but an adult ♀

to Calcutta." The type is unlike any skin of this species I have seen from Nepal. Its darkish-grey hue suggested to Blyth the possibility of the specimen being a hybrid between a Domestic Cat and a Nepalese example of *bengalensis*. But the ears and the pattern, as well as the jaws and teeth left in the skin, are of the *Prionailurus*-type. The skin, indeed, differs only in its softer fur from grey, bold-patterned skins of *P. viverrinus*, and almost exactly matches a skin of the *bengalensis*-type from the Malay Peninsula (Dr. Cantor).

from Virajpet, S. Coorg, 2,000–3,000 ft., closely resembles it. Between this and the richest-coloured skin from the same locality, which has the dorsal area from the head to the root of the tail rich ochreous-buff, with the flanks paler and the spots diluted in front or centrally with rusty-ochre, every gradation exists. An example from Haleri, N. Corg, 3,555 ft., is like the brightest from Virajpet, but has the spots more diluted and hence more "pantherine." A skin from Ootacamund in the Nilgiris, 7,000–8,000 ft. (Gosse), and two from the same range (Phythian Adams) are richly tinted; and one from Tiger Shola in the Palni Hills, 5,700 ft. (McCann), is intermediate in tint between the bright and dull types, and has markedly pantherine rosettes.

A series of six, mostly rich-coloured, "native" skins from the Chin Hills, 50 miles west of Kindat in Upper Burma (Mackenzie), shows similar variation in tint. One is "dull-coloured," another almost exactly matches the skin from N. Coorg, and also closely resembles the type of *tenasserimensis*, mentioned below; a third is a handsome dark skin, with the back almost infuscate, the flanks ochreous-buff, the belly buff, the pattern bold, with the neck and shoulder-stripes broad, the rosettes large and sometimes completely surrounded with black. A fourth skin, reddish all over, even on the belly and backs of the ears, may be artificially stained. Another with broad stripes and pantherine rosettes was captured at Thayetmyo, Upper Burma (Mackenzie). A series from Toungoo in Lower Burma (Mackenzie) closely matches the Southern Indian skins, the rosettes in one coalescing to form rusty-ochreous, black-bordered bands. The co-types of Gray's *Felis wagati* from Moulmein are very like his type of *ellioti* from Bombay. If faded, as is not unlikely, they probably originally resembled the brighter-tinted skins from Coorg. The type of *tenasserimensis* Gray is a little richer in tint than the Moulmein skins and has the pattern much bolder, the rosettes being large, few in number, and diluted with ochreous-brown, and the broad shoulder-stripes join posteriorly to form a nearly symmetrical pattern of two V's, with ochreous-brown between the arms, Finally, two examples from Mergui Town (Shortridge) differ from the Moulmein skins, and still more from the type of *tenasserimensis*, in having narrower, more broken stripes and smaller, more numerous spots. Not surprisingly they approach in these respects some skins from the Malay Peninsula and the Javan and Sumatran races of *bengalensis*.

As stated above, Assamese skins are of doubtful racial reference, but in coat they seem to agree better with typical *bengalensis* than with the Himalayan race. One from Tura

in the Garo Hills, 1,450 ft., is dull buffy-white, like the typical Himalayan form and several skins of *bengalensis*, and one from Mokokchung in the Naga Hills, 4,500 ft., though not so pale, also fits the Himalayan race; a skin from Shillong, 5,200 ft., is rich-coloured, and one from Lakhimpur is similar, but not so bright. Nevertheless the available skulls seem to agree better in size with those of *horsfieldi* from the Himalayas than with those from S. India assigned to *bengalensis*, although there are very few of the latter to judge from (see table of measurements, p. 275).

Of the distribution of this cat in India Blanford said that it is "common in Lower Bengal" and "is also found in the Syhádri Range or Western Ghâts, Coorg, Wynaad, Travancore, etc., and in some, perhaps all, of the other forest-regions of the Peninsula, though not very abundantly. I have never seen a specimen during several years' wandering in the Central Provinces and the northern part of the Bombay Presidency. There is, however, a skin said to be from the neighbourhood of the Coromandel coast in the Calcutta Museum; and a living specimen from Jeypore, west of Vizagapatam, was quite recently sent to the Zoological Gardens in London." So far as the western and central portions of Peninsular India are concerned, this account was confirmed by the collectors for the Bombay Mammal Survey; but no specimens were secured either in Lower Bengal or in the Eastern Ghats. Clearly the race is now, at all events, rare over the whole of the eastern portion of the Peninsula.

Habits.—According to Shortridge it is fairly plentiful in Coorg, more so than the Jungle-Cat, and is particularly numerous around villages, destroying large numbers of fowls. This confirms the account given by Jerdon, who adds that it shelters in hollow trees and in May produces three or four kittens in caves or beneath masses of rock. It is essentially a forest animal, preying upon small mammals and birds.

28 *b*. **Prionailurus bengalensis horsfieldi** Gray. Horsfield's Leopard-Cat.

Felis nipalensis, Hodgson, Journ. As. Soc. Bengal, i, p. 341, 1832 (not *nipalensis*, Horsf. & Vigors, 1829).
Leopardus horsfieldi, Gray, Ann. Mag. Nat. Hist. x, p. 260, 1842.
Felis pardochrous, Hodgson, Calc. Journ. Nat. Hist. iv, p. 286, 1844*.

* Hodgson originally identified and described Nepalese examples of this cat as *nipalensis* Horsf. & Vig.; but subsequently, discovering his mistake, substituted *pardochrous*, which, being assigned to a described form, is not a "*nomen nudum*," as Blanford stated. But in the meantime Gray had proposed *horsfieldi* for a skin believed to have come from Bhutan, but possibly from Upper Assam (McClelland). Since the types

Vernacular.—Bandaris ♂, *Biralu* ♀ (Hindi).

Locality of the *type* of *horsfieldi*, Bhotan; of *pardochrous*, Nepal.

Distribution.—KASHMIR, KUMAUN, NEPAL, BHUTAN; northern and eastern range uncertain.

Distinguished from the typical race by its apparently larger skull and by the more luxuriant coat and more bushy tail in the winter months. There is some evidence too that on the average the ground-colour is paler and not so richly ochreous, but the colour and the pattern vary as in typical *bengalensis*, and specimens belonging to the two may be closely matched.

Excluding some old skins from Simla, Nepal, and the types of *horsfieldi* and *pardochrous* from Bhutan and Nepal respectively, the British Museum has several collected by the Survey from Sikkim up to 8,800 ft. (Crump), from Satthar Hill, Gorkha in Nepal (Baptista), January, from various localities in Kumaun, including Naini Tal, 5,000 to 6,000 ft. (Crump), and a rather bright-coloured, immature skin from Sardalla, Kashmir, 8,700 ft. (Stockley), the most western known locality for the race.

The possibility of the existence of another race in the north-eastern area of British India is suggested by several skins noticeably darker and more richly tinted than those assigned to *horsfieldi*. Some of them are certainly native skins, and may have been traded over the border and not captured at the localities entered on their labels. One of these was from Nani Tisang, 2,500 ft., near the Tibetan border (Lord Cranbrook). It appears to resemble very closely the type of *Felis scripta* Milne-Edwards (Nouv. Arch. Mus. vii, Bull. p. 92, 1870, and Rech. Mamm. p. 341, pl. 57, 1872)

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of *horsfieldi* and *pardochrous* are scarcely distinguishable, *horsfieldi* comes in as the older name.

Two additional names given to Himalayan, or alleged Himalayan, skins by Hodgson and Gray must here be referred to, since they were cited by Blanford as synonyms of his "var. *pardichroa*" of *bengalensis*. The first is *Felis ogilbii*, given by Hodgson (Calc. Journ. Nat. Hist. viii, p. 44, 1847) to a skin from Sikkim. Blanford identified as the type of *ogilbii* one of Hodgson's skins in the British Museum from Sikkim. It is an artificially dyed native skin, with the tail less than half the length of the head and body; but it is not the type of *ogilbii*, since the tail in the latter considerably exceeded two-thirds the length of the head and body. No doubt it was a specimen of the Marbled Cat (*Pardofelis marmorata*) (see p. 256). The second is *Felis herschelii*, given by Gray (Cat. Carn. Brit. Mus. p. 28, 1869) to a skin labelled "Gangootri," which is in Tehri Garhwal. But since this skin, both in coat and colour, differs from the skins of *horsfieldi* from the Himalayas, and is, on the contrary, absolutely indistinguishable from richly tinted skins of the Sumatran and Bornean race (*P. bengalensis sumatrana*), I have no doubt its alleged locality is erroneous, owing to substitution of labels.

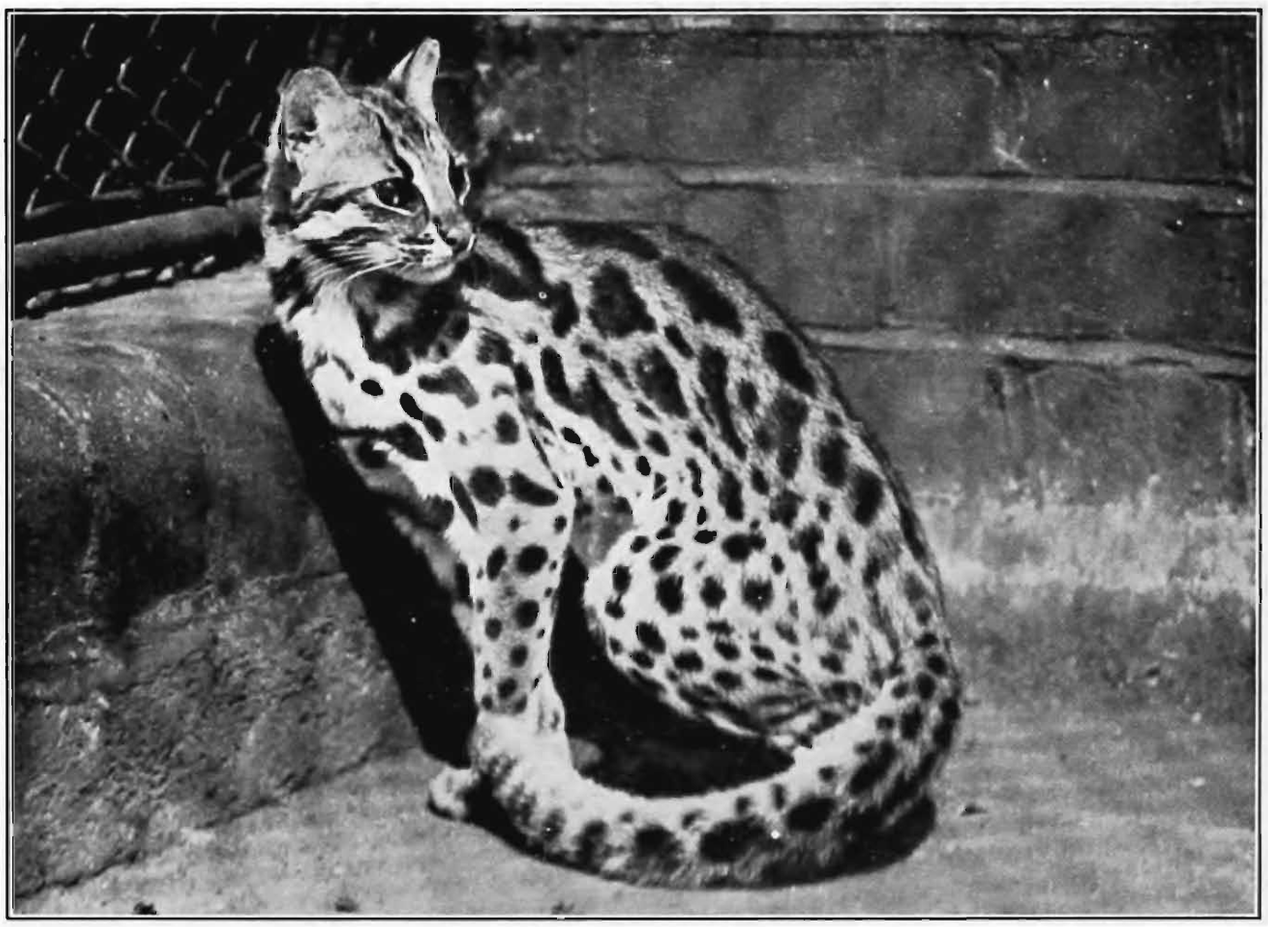


Photo F. W. Bond.

Leopard-Cat (*Prionailurus bengalensis*).

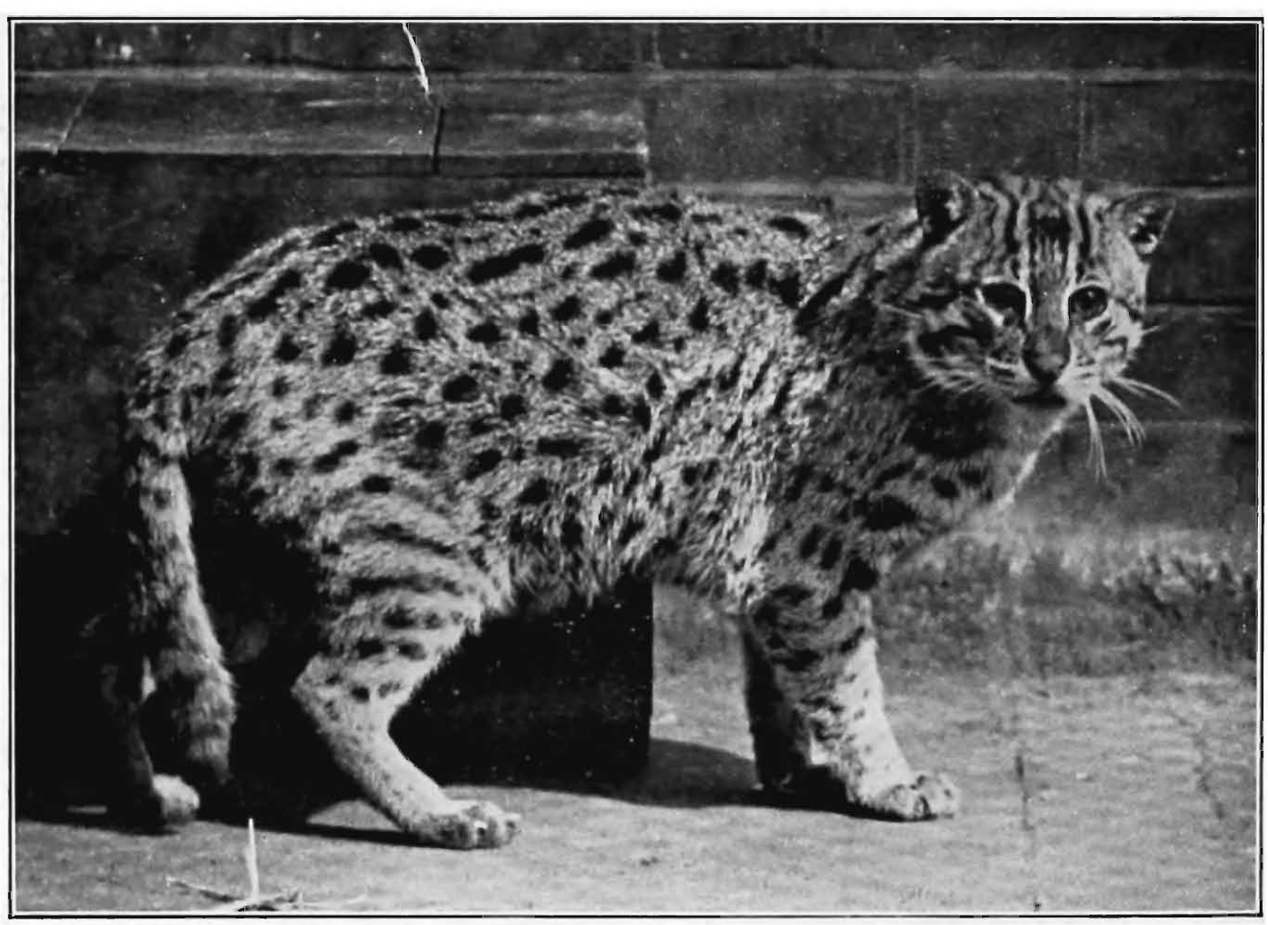


Photo F. W. Bond.

Fishing-Cat (*Prionailurus viverrinus*).

from Szechwan, and has similar large, dark, normally separated rosettes. It is also like the type of *P. ingrami* Bonhote (Ann. Mag. Nat. Hist. (7) xi, p. 474, 1903) from Kwei Chow, China, a synonym of *scriptus*, except that the coat is not so thick. The others are from Nepal (Hodgson) and Sikkim (Crump). One of Hodgson's is certainly a native skin and the other may be, but the evidence of this has been destroyed by the thoughtless " make-up " of the skin in the conventional style in the British Museum. The pattern in both shows a tendency to run into chains of rusty and black spots. The Sikkim skin was picked up in Darjeeling, already dressed, and, as Crump supposed, may not have been locally caught. In any case it is much brighter than normal skins of *horsfieldi*. Admittedly these skins may be exceptionally well-coloured skins of *horsfieldi*. In that case this race will be represented by " bright "- and " dull "-tinted specimens, like *bengalensis* in Southern India and Burma. If they belong to the more northern race, then *P. bengalensis scriptus* Milne-Edw., with *ingrami* and, I think, *anastasiæ* Satunin (Ann. Mus. Zool. St. Petersb. ix, p. 528, 1904), from Kansu, as synonyms, which appears to differ from *horsfieldi* by its shorter tail and brighter colour, will come in as an element in the British Indian fauna.

The habits of this race are no doubt the same as those of typical *bengalensis*. According to a note by Crump the specimens he procured at Naini Tal in Kumaun were trapped in dense jungles near a stream. It is probably fairly common, he thinks, in the hills where there is heavy forest, but it is not often seen owing to its liking for dense cover.

28 *c*. **Prionailurus bengalensis trevelyani,** subsp. nov. Trevelyan's Leopard-Cat.

Locality of the *type*, near Gilgit, 5,000 ft.

Distribution.—Northern Kashmir and the Upper Punjab in the drainage area of the Indus and Jhelum, approximately long. 74° E.; also S. Baluchistan.

Distinguished from *P. bengalensis horsfieldi* by its rather fuller longer coat, from 36 to 40 mm. long, and by the typically paler, greyer, sometimes nearly silvery ground-colour of the upper side, due to the absence of buff or at most to a faint wash of that hue, but low down on the flanks and on the outside of the limbs there is a faint buff tinge; the " pantherine " spots may be invaded by tawny or buffish-tawny hairs in front.

All the known skins of this race were collected comparatively recently, and their pale colour is not attributable to fading from a long period of preservation. Three from Gilgit (Col. W R. F Trevelyan) show slight variation in tint which is probably seasonal, one collected in March being a trifle brighter than a skin, bought in the bazaar, of a specimen

killed at Ishkoman in June, which, like the undated type, is greyish-white in the ground-colour. An undated skin from Chilas, a few miles nearly due south of Gilgit (Capt. L. W Wooldridge), and a ♂ skin from Kotli, Murree, 5,800 ft. (Wells), June 17, with the moult in progress, are also whitish-grey. Closely resembling these skins is one from the Las Belas Territory, 80 miles north-west of Karachi, which is of interest as the only representative of the Leopard-Cat ever recorded from Baluchistan.

The dimensions and weights recorded below are about the same as in the other races. The skull, too, is similar both in size and shape, as shown in the table of measurements.

The occurrence of this Leopard-Cat at Gilgit and in south-eastern Baluchistan suggests that it extends in suitable localities over the intervening area to the west of the Indus. In Kashmir it no doubt intergrades with Horsfield's Leopard-Cat (*P. b. horsfieldi*), since Col. Stockley's specimen of the latter from Sardallu attests its westward extension into that country. But in the southern part of its range Trevelyan's Leopard-Cat is widely separated from typical *bengalensis*, which is unknown apparently in Sind, Cutch, and Rajputana.

Of its habits nothing has been recorded; but possibly it is less addicted to dense jungle and forest than the other British Indian races. Its generally pale colour, recalling that of the Snow-Leopard, suggests that its habitat may be rocky situations, and that it breeds and takes shelter in crevices or small caves.

Comparatively few flesh-measurements of adult British Indian skins of this species are available. The following indicate general similarity in size of the three races described :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.
trevelyani.			
Murree; ad. ♂	21⅜	12	4½
horsfieldi.			
Naini Tal, Kumaun; ad. ♂	21⅕	12	4⅜
Gorkha, Nepal; ad. ♂.	21⅘	12⅕	5
Gorkha, Nepal; ad. ♂.			
Gorkha, Nepal; ad. ♀.	19⅕	11⅜	4⅖
bengalensis.			
Palni Hills: just ad. ♂	20	9½	4⅜
S. Coorg; ad. ♀ ..	20⅘	11	4⅕
Garo Hills, Assam; ad. ♂ ..	20⅘	11⅘	4⅘
Toungoo, Burma; ad. ♂	24⅕	12⅕	4⅘
Toungoo, Burma; ad. ♂	21⅕	11⅜	4⅘
Toungoo, Burma; ad. ♀	19⅜	11⅜	4⅕

The weights of the ♂ from Murree, Gorkha, and the Palni Hills was 6 lb., from the Garo Hills 6¾ lb., from Naini Tal 7 lb., and from Gorkha, the larger of the two, 8 lb. The ♀ from S. Coorg was 6¼ lb. and from Gorkha 6 lb.

Skull-measurements (in mm.) of the British Indian races of *Prionailurus bengalensis*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. b. trevelyani.									
Gilgit (type); yg. ad. ♂	89	81	59	29	15	23	56	10½	8
P. b. horsfieldi.									
Almora, Kumaun,; ad. ♂	100	93	67	27	17	24	—	11	—
Kumaun; ad. ♂.	92	83	63½	27	16	24	59	11	9
Nepal (*pardochrous* type); ad. ♂	97	91	69	21	15	25	66	10½	8
Bhotan (*horsfieldi* type); ad. ♂.	97	(91±)	67	25	16	24½	—	11	—
Tura, Garo Hills; ad. ♂	95	90	64	25	15	24	—	11	9
Mokokchung, Naga Hills; ad. ♂	95	88	66	25+	14	24½	63	10½	9
Kumaun; ad. ♀.	93	84	60	24½	14−	21	57+	10	8
Tons Valley, United Provinces; ad. ♀	88	82	60	28	15½	21	57½	11	8½
P. b. bengalensis.									
N. of Toungoo, Burma; ad. ♂	102	94	66	24	16	25	65	10½	8
N. of Toungoo, Burma; ad. ♂	91	85	63	28	16	21	60	10	8
Chin Hills, Burma; ad. ♀	86	81	58	26	13	—	—	10	—
Palni Hills, S. India; subad. ♂.	—	—	60	28	15	21	58	11−	8+
S. Coorg, S. India; yg. ad. ♂	87½	79	59	27	14	22	55	10½	8
S. Coorg, S. India; ad. ♀.	86	78	59	30	14	22	—	10	—

When discussing the size of the " varieties " of the Leopard-Cat Blanford quoted McMaster's statement that Burmese specimens are smaller than South Indian specimens, and this conclusion he accepted when he wrote of Gray's specimens of *wagati* as representing a small race. But from the table of flesh-measurements it is quite clear that specimens from Burma are not smaller. One of the specimens from Toungoo, indeed, is the largest Leopard-Cat recorded. Blanford's opinion about the small size of *wagati* rested on his examination of the skulls of Gray's specimens, which he apparently thought were mature. They are obviously immature, as shown by the skulls, and consequently undersized.

In the table of skull-measurements (p. 275), Assamese skulls from the Garo and Naga Hills have been included under *horsfieldi* because of their size, which comes between the two ♂ skulls from Kumaun, the largest and smallest respectively from that district. From the evidence it appears that these northern skulls are bigger than those from S. India, and on the average bigger than those from Burma.

The mastoid width in the skulls from Gilgit, Almora, Kumaun, Garo Hills, and S. Coorg is respectively 37, 40, 39, and 35 mm., noticeably less than half the condylobasal length. In all skulls of the species the proportion is about the same.

29. **Prionailurus rubiginosus** Geoffroy. The Rusty-spotted Cat.

Felis rubiginosa, I. Geoffroy, in Bélanger's Voy. Ind. Or. p. 140, pl., 1834 ; and of nearly all subsequent writers on the Indian fauna, including Blyth, Jerdon, and Blanford.

Prionailurus rubiginosus, Pocock, Ann. Mag. Nat. Hist. (8) xx, p. 339, 1917.

Locality of the *type* and only known species, Pondicherry, S. India.

Distribution.—SOUTHERN INDIA and CEYLON.

Distinguished from the British Indian races of *P. bengalensis* by its smaller size, by the tail being uniformly coloured or at most with very indistinct pattern, and by the pattern on the body being less bold, consisting of small, tolerably widely separated solid spots, often lanceolate, frequently brown on the sides, and exhibiting a longitudinally lineal arrangement on the back ; but on the head and shoulders it forms definite stripes, a pair on the shoulders above being noticeably distinct ; the ground-colour varies according to the race.

Apart from its smaller size, the skull of *P. rubiginosus* differs from that of *P. bengalensis* in several particulars, principally in the shortening of the upper jaw, accompanied by the downward curve of the end of the nasals and the nearly vertical plane of the anterior nares and of the maxillo-premaxillary

suture ; also the maxillæ are greatly expanded above and the nasals strongly constricted in their posterior portion ; the orbits in the adult are completely surrounded, and there is never a sagittal crest, the temporal ridges forming a lyriform area ; in the teeth the inner lobe of the upper carnassial is more reduced, and as an accompaniment of the shortening of the muzzle the area behind the upper canine is also short and has lost the normal small premolar in front.

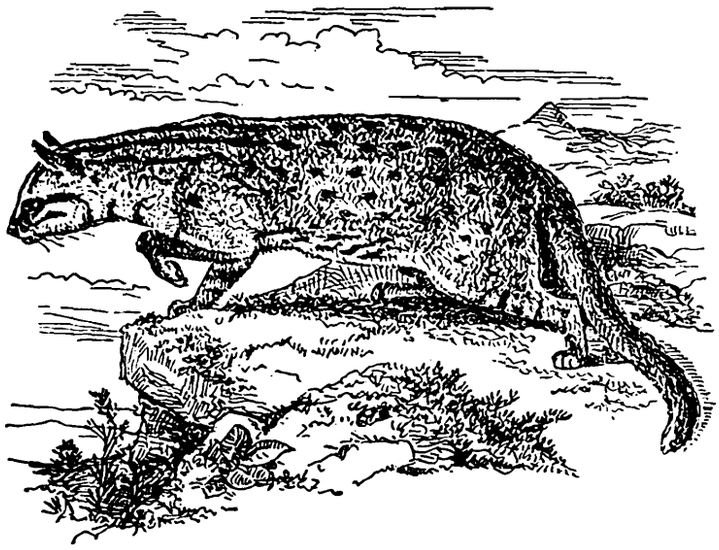


Fig. 71.—Rusty-spotted Cat, *Prionailurus rubiginosus*.
(From Blanford.)

29 *a*. **Prionailurus rubiginosus rubiginosus** Geoffroy.

Felis rubiginosa, Geoffroy, in Bélanger's Voy. Ind. Or. p. 140, 1834 ; and of Jerdon, Blanford, and others (in part).

Vernacular.—Namali pilli (Tamil, Madras) ; *Ark-philli* (Waddars) ; *Kiraba-bekku* (Kanarese).

Locality of the *type*, Pondicherry.

Distribution.—Southern India.

Colour above from the head to the tail-tip and on the outside of the limbs grey, but darker and more drabby on the back, and the limbs paler than the flanks, the hind limbs whitish distally, and the pale areas on the head white ; the pattern varying from black above and below, brownish-black on the flanks to entirely brown, the spots on the flanks sometimes quite faint.

This description is taken from three skins in the British Museum : one from Madras (Jerdon), one from Nellore (Bartlett), and one from Khandala, between Bombay and Poona, 1,700 ft. (P. Gosse), April 22. The last is an unfaded skin, with the coat fresh and soft and the pattern dominantly black or blackish. The others, undated, with the pattern brown and much less distinct, are old skins and may be faded, but

they agree very closely in general appearance with Geoffroy's original figure of the type shipped from Pondicherry.

The flesh-dimensions (in English inches) of the only skin so measured are :—Khandala, adult ♂ : head and body $16\frac{1}{5}$; tail $9\frac{1}{5}$; hind foot $3\frac{3}{5}$.

29 *b*. **Prionailurus rubiginosus phillipsi**, subsp. nov.

Felis rubiginosa, Kelaart, Prod. Faun. Zeyl. p. 47, 1852 ; Phillips, Man. Mamm. Ceylon, p. 158, 1935.

Vernacular.—Wal balala, Kula diya (Sinhalese) ; *Kadu-poona, Verewa puni* (Tamil) ; *Kardup-poonai* (Tamil at Jaffra).

Locality of the *type*, Mousakanda, Gammaduwa, C.P., 3,000 ft.

Distribution.—CEYLON.

Distinguished from the typical Indian race by being, on the average at least, darker, richer, and less grey in tint.

The type, March 16 (W W A. Phillips), is warm brown above from the head to the end of the tail, the tail being

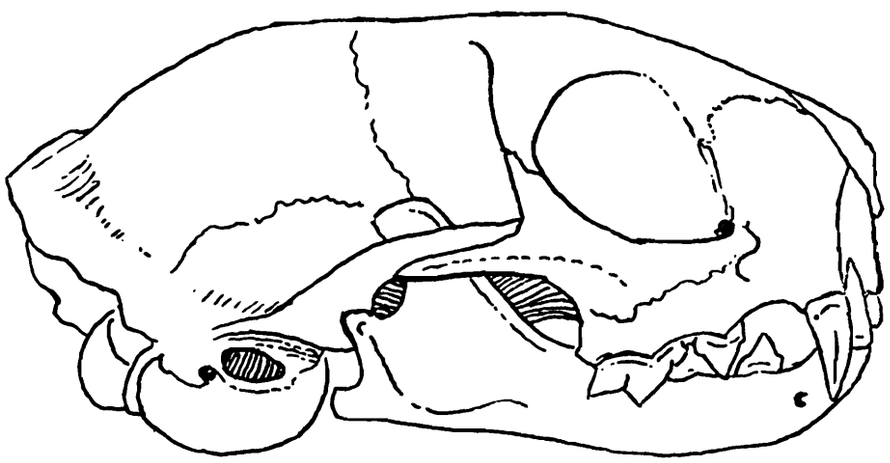


Fig. 72.—Skull of type of Phillips's Rusty-spotted Cat, *Prionailurus rubiginosus phillipsi*, from Gammaduwa.

obscurely marked with darker transverse stripes ; the flanks are a little paler, but the white of the underside is bordered by an ochreous wash ; the fore legs are rich ochreous externally, the hind a little paler, and the pale areas on the face are tinted with buff.

Another specimen from Gammaduwa, undated, is very like the type ; others from Kandy, 4,500 ft., Ambawela, 5,600 ft., March 24, Hakgalla in Uva, 5,000 ft., April 6 (E. W Mayor), and some labelled merely " Ceylon," although varying somewhat in depth of hue, are all darker than the Indian skins referred to above. One skin, however, from Weligatta (E. W Mayor), June 28, is greyer and scarcely distinguishable from the skin of typical *rubiginosus* from Khandala, except that the head is darker, not so grey. Comparison between

this skin and others dated suggests seasonal change in colour between the beginning of April and the end of June.

Flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Phillips's largest ; ad. ♂	18⅘	10	3⅗
Ambawela ; ad. ♂	17	8	3⅖
Gammaduwa (type) ; ad. ♂	16	9⅘	3½
Weligatta ; ad. ♂	15⅕	9⅕	3⅗
Phillips's average of 5 ; ad. ♂	16½	8½	3½
Hakgalla, Uva ; ad. ♀	16	7⅗	3⅕
Phillips's largest ; ad. ♀ . .	16⅖	8⅖	3½
Phillips's average of 3 ; ad. ♀	15	8+	3½

The weight of the ♂ from Ambawela was 3 lb., of those from Gammaduwa and Weligatta 3½ lb., these agreeing with Phillips's largest ♂. Phillips's largest ♀ was 2¾ lb., and the average of 3 ♀♀ 2½ lb.

The mastoid width in the two skulls from Gammaduwa and the one from Weligatta is 34, 31, 33 mm., less than half the condylobasal length. In all the skulls the proportion is about the same.

Habits.—The two races of *P. rubiginosus* differ in habitat. According to Jerdon's observations at Madras the Indian race frequents grass in the dry beds of tanks, brushwood, and occasionally drains in open country and near villages, and was said to be not a denizen of the jungles. The specimen from Khandala was trapped in a ravine below the cemetery, not far, apparently, from the village.

Shortridge's remark that this cat is "apparently rare" in Dharwar seems to apply to it everywhere in India, judging from the few specimens preserved in the British Museum and from the failure by the collectors of the Mammal Survey to shoot or trap it, apart from two secured by Gosse and Shortridge. Its most northern recorded locality is Seoni in the Central Provinces (Sterndale).

Phillips states that the Ceylon race "occurs in the jungles throughout the whole island from the highest mountain-peaks to the sea-shore, but is nowhere very common. The type was killed in "heavy forest." It is mainly nocturnal, usually lying up during the hours of sunshine in a hollow log, tree or thicket in small woods of heavy timber or in thick scrub-jungles, only rarely being found away from the jungles. It is an excellent climber, often seen in trees, but probably feeds mainly on the ground, preying upon small mammals and birds, possibly on lizards and frogs as well, and not infrequently it breaks into hen-houses near the jungle and slaughters the fowls. The litter consists of two or three kittens born in a hollow log or small jungle-cave.

Skull-measurements (in mm.) of the two races of *Prionailurus rubiginosus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. r. rubiginosus.									
Nellore ; ad.	—	—	50	25	12	20	49	8	$6\frac{1}{2}+$
Khandala, W. Ghats ; just ad. ♂	73	70	47	25	12	19	46	8	6
P. r. phillipsi.									
Gammaduwa (type) ; ad. ♂	79	71	51	$23\frac{1}{2}$	13	20	49	9	6
Gammaduwa (type) ; ad. ♂	75	70	51	23	11	18	48	8	7
Weligatta ; ad. ♂.	78	71+	55	23	13	20	50	$8\frac{1}{2}$	7
Hakgalla, Uva ; ad. ♀	73	66	48	26	12	17—	45	8+	$6\frac{1}{2}$

30. Prionailurus viverrinus Bennett. The Fishing-Cat.

Felis viverrinus, Bennett, Proc. Zool. Soc. 1833, p. 68; and of most recent authors, including Jerdon and Blanford.
Felis himalayanus, Jardine, Nat. Libr., Felinæ, p. 230, pl., 1834.
Felis viverriceps, Hodgson, Journ. As. Soc. Beng. v, p. 232, 1836.
Viverriceps bennettii, Gray, Proc. Zool. Soc. 1867, p. 268.

Locality of the *type* of *viverrinus*, "India," probably the Malabar coast; of *himalayana* the Himalayas; of *viverriceps*, Nepal; of *bennettii*, "India."

Distribution.—INDIA, precise range unknown; CEYLON, and east of the Bay of Bengal to Cochin China and Java.

Distinguished in external characters from *P. bengalensis* by its much larger size, shorter tail—which is a good deal less than half the length of the head and body—less completely webbed feet, and incompletely sheathed claws, the points of which normally project beyond the hairs of the paws; the coat also is on the average harsher, and the pattern, although exhibiting the same general arrangement, is subject to much less variation. The marked differences in the skull between the two species are described below.

The general colour varies from deep olivaceous-tawny above and greyish on the flanks to tolerably uniformly yellower tawny or nearly ashy-grey, without any bright hue. In the pattern the stripes may be comparatively broad, especially on the shoulders, or narrow, and the spots on the flanks may be roundish, ovate or lineate. The tail is the same tint above as the back, spotted at the base and banded distally; the limbs are about the same tint as the flanks, and the pattern extends to the wrist and hock. The underside is white, with heavy pattern forming two collars on the throat and transverse bars behind the fore legs on the chest.

Despite the extensive geographical range of the species, there appear to be no distinguishable local races. Skins resembling each other occur in widely separated areas, and skins from the same district may differ considerably from one another. For instance the type, probably from the Western Ghats*, is a dark skin, with bold pattern, and is indistinguishable from three skins collected near Batavia in Java. Equally dark, but with rather finer pattern, is a skin from Barkot, Dehra Dun, 5,000 ft. (Capt. F S. Tuker), and one probably from North India (Lord Ripon). But two skins from Nepal (Hodgson) are paler and tawnier, one being paler and greyer tawny than the other. One skin from Sehwan, Sind (Capt. Watson), is decidedly tawny, rather richer than the tawnier of the two from Nepal, but another from Mirpur, Sind

* This is inferred from its being received by Bennett with a specimen of John's Langur from the same donor, both being recorded as from "India."

(Commander J. J. Walker, R.N.), is pale olivaceous-grey, with no tawny tint. Nearest to this comes a skin from Kanthalai, E.P., Ceylon (W W. A. Phillips), which has, however, a slight tawny wash on the back. Another skin from Kandy (Whyte) is still tawnier, very like the tawny skin from Sind. From countries outside British Indian limits there are two skins from Nhatrang, Annam (Dr. Vassall), one matching the tawnier of the Nepalese skins, the other being tawnier than the tawny Sind skin, but a skin from Cochin China is dark olivaceous tawny, like the type and the Javan skins.

Of the above-mentioned skins two only are dated, the one from Kanthalai, July 30, and the one from Mirpur, Sind, Dec. 24. Both are pale, despite the difference in the time of the year. Hence there are no data justifying the conclusion that the differences in tint are seasonal.

It is noticeable that apart from the type, which, like the Javanese skins, has a bold pattern, the skins from British India have on the average a finer pattern of narrower stripes dorsally and streak-like, lineate spots on the flanks.

The only measurements of this species certainly taken in the flesh are those recorded by Phillips from Ceylonese specimens. These, however, agree very closely with some dimensions given by Jardine and Hodgson of unsexed Himalayan specimens :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Himalayas (Jardine) ; ad. ♂ ?	28½	9½	—
Nepal (Hodgson) ; ad. ♂ ? ..	30	10½	—
Ceylon, Phillips's largest ; ad. ♂ .	30½	12⅕	7⅗
Ceylon, Phillips's average of 3 ; ad. ♂.	28½	11	6¾
Ceylon, Phillips's average of 3 ; ad. ♀.	26	10	5⅕

In addition to its larger size, the skull of *viverrinus* differs from that of *bengalensis* mainly in characters resulting from the greater development of the masticatory muscles, which has produced a high sagittal crest and a long, narrow, post-orbital "waist," always narrower than the width of the muzzle above the canines. These differences are naturally particularly well marked in the adult ♂, the skull of which is considerably larger than in the adult ♀.

The mastoid width of the ♂ skulls from Sind, Ceylon, and of the second ♀ skull from Nepal is respectively 60, 55, and 43 mm., much less than half the condylobasal length. A similar proportion obtains in all the skulls of the species.

Several additional skulls labelled "India," and others from Indo-China and Java agree, apart from minor details, with those entered in the table, and, like the skins, bear out the view that the species is not susceptible, on the available evidence, of division into local races.

Skull-measurements (in mm.) of some British Indian specimens of *Prionailurus viverrinus*.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Sehwan, Sind ; ad. ♂	151	136	96	30	24	38	98	16	11
Nepal ; ad. ♂	145	133	88	28	18	35	—	15	—
Nepal ; ad. ♂	140	128	—	31	20	35	—	15½	—
Kanthalai, E.P., Ceylon ; ad. ♂	143	129	98	29	23	37	93	15	11
Nepal ; ad. ♀	128	118	75	27	17—	31	84	14	10
Nepal ; ad. ♀	123	114	78	30	18	31	81	14	10
Ceylon ; ad. ♀	—	(100+)	78	27	18	29	78	14½	10

Habits.—Although occurring occasionally at comparatively high altitudes, *e. g.*, 5,000 ft. at Dehra Dun, this cat is mainly a lowland species partial to reed-beds and marshy districts. Hodgson recorded its habitat in Nepal "as the open lowlands of the lower regions," and Jerdon wrote of it as inhabiting the "edge of swampy thickets in Purneah," "marshy regions at the foot of the Himalayas," and "reed-beds" near Calcutta. This habitat is not restricted to British India, two Javan skins in the British Museum being labelled as killed in "swamps bordering the coast near Batavia." The species does not, however, appear to be common anywhere; its distribution in India is very imperfectly known, and there appears to be no record of its occurrence in Burma, although its existence in that country may be inferred from its being found in Indo-China and Java.

The popular name "Fishing Cat" reflects the testimony of several observers that it feeds on fish. According to Buchanan-Hamilton it even eats hard-shelled freshwater molluscs, a gastropod (*Ampullaria*), and a mussel (*Unio*). The name, nevertheless, is somewhat misleading*. The teeth are not especially adapted in any way for catching and eating fish or for crushing shells of molluscs; they are fitted, as is the whole organization of the species, for preying upon any terrestrial vertebrate animals it can overcome, and there are recorded cases of calves, sheep, dogs, and large snakes being killed by it. It has also been known to carry off human babies.

According to Phillips this cat in Ceylon is found "sparingly in the jungles all over the island except, perhaps, in the dry northern zone, Tirripane, 365 ft., near Anaradhapura, N.C.P., being the most northern point whence it has been recorded. It is usually found in or near the heavier or larger jungles, but may be met with in scrub or in reed-beds and long grass beside rivers and in swamps† It may be seen at any hour of the day, and although it can climb well it seldom takes to trees, and feeds mainly on the ground. Phillips confirms the reports of observers in India that the Fishing Cat puts up a desperate and generally successful fight when attacked by dogs.

Nothing seems to be known about the breeding habits, but there is no reason to suppose they differ from those of other wild cats.

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* Specimens I observed in the Zoological Gardens, London, showed no greater liking for fish than wild cats of other species.

† The specimen from Kanthalai, sent by Phillips to the British Museum, had entered a tank from which it was unable to get out.

Genus **FELIS** Linnæus*.

Felis, Linnæus, Syst. Nat. ed. 10, i, p. 41, 1758.
Chaus, Gray, List Spec. Mamm. Brit. Mus. pp. 44–5, 1843.

Type of *Felis*, *catus* Linn. (the Marbled or Blotched Tabby Domestic Cat) ; of *Chaus*, *chaus*, Güld.

Distribution.—Central and Southern Europe, Central and Southern Asia as far east as Kansu and Annam ; the whole of Africa except the Congo Forest area ; everywhere for the most part in more or less open country—not in thick forest.

Distinguished from the other genera of Felinæ by a well-marked combination of external and cranial characters. The ears are high, triangular, narrowed at the summit, and never have a white patch at the back ; the pattern, when retained in the adult, consists on the side of the body, at least in front behind the shoulder, of vertical lines of spots or of stripes due to the linear confluence of spots, and the paws are narrow, with comparatively weakly developed claw-sheaths and interdigital webs.

The skull has the cranial portion short as compared with the facial, the frontal postorbital process, which is broad, ligulate, and blunt, being about in the middle of the total length ; the nasal branch of the premaxilla is broad, especially on a level with the tip of the nasal, then somewhat abruptly narrowed to a point ; the mesopterygoid fossa is wide in front, its anterior palatine edge typically has a median backwardly projecting point, never a notch, the external pterygoid crest is reduced to a triangular point just above the hamular process, the posterior edge of the palate has a well-developed emargination inside the last upper tooth, and the partition of the bulla at its summit is remote from the internal crest of the tympanic bone, so that the outer chamber of the bulla is comparatively or very large.

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* This name is here used in the sense adopted in my paper on the "Classification of the Felidæ" (Ann. Mag. Nat. Hist. (8) xx, p. 333, 1917). In addition to *Chaus* I there cited as synonyms of *Felis* :—*Catus* Fitz., *Catolynx* Severtz., both based on *F. catus* Linn., and *Otailurus* Severtz., based on *F. megalotis*, a Feral Domestic Cat from Timor. Since then several generic or subgeneric names have been introduced :—*Poliailurus* Lönnb. for a Central Asiatic Cat, *pallida* Büchn., *Eremælurus* Ognev for a Transcaspian Desert Cat, *thinobius*, and *Microfelis* Roberts for the little S. African species, *nigripes*, the distinctive characters of which I described in 1907. I regard these names as merely connoting well-defined species. The four species I have seen as living animals, namely, the European Wild Cat (*silvestris*), the typical African Wild Cat of various races (*constantina*), the Jungle-Cat (*chaus*), and the Black-footed Cat (*nigripes*), exhibiting the extremes in size and other features, all have an unmistakable, if undefinable, "facies," distinguishing them at once from such species as the Leopard-Cat (*Prionailurus*) and its allies ; and Ognev's figure of the living *Eremælurus* clearly shows that it belongs to the same group.

The two British Indian species of this genus may be distinguished as follows :—

a. Size as in the Domestic Cat, tail more than half the length of the head and body and over twice the length of the hind foot ; pattern of dorsal stripes and of lateral spots conspicuous ; spinal crest and stripe hardly noticeably differentiated ; skull shorter, with broader zygomatic arches . . . [Gray, p. 287. *constantina ornata*

a'. Size larger, tail less than half the head and body, and less than twice the length of the foot ; pattern in adult obsolete dorsally, at most faint on the flanks ; spinal crest and stripe clearly differentiated ; skull longer, with narrower zygomatic arches *chaus* Güld., p. 290.

31. **Felis constantina** Forster*.

Felis constantina, Forster, Uebers. Buffon's Naturg. vierfuss. Tiere, vi, p. 313, 1780.

Felis lybica, Forster, *loc. cit.* ; Meyer, Syst. Zool. Entol., etc., p. 101, 1793.

Felis ocreata, Gmelin, Suppl. to Cuhn's Bruce, Reisen Abyss. ii, p. 27, 1791 ; Schwann, Ann. Mag. Nat. Hist. (7) xiii, p. 421, 1904.

Locality of the *type* of *constantina*, Constantine in Algeria ; of *lybica*, Gafsa or Kafsa in Tunis ; of *ocreata*, Ras el Feel in Abyssinia.

Distribution.—Southern, Eastern, and Northern Africa, Sardinia, South-Western to Central Asia and NORTHERN INDIA, agreeing closely with that of the Caracal and Hunting Leopard.

Size typically about that of the Domestic Cat, some of the African races smaller ; the tail more than half the length of the head and body and more than twice the length of the hind foot. Typically there is a small hair-tuft on the tip of the ear and a crest of longer hair on the spine behind the shoulder. General colour very variable racially, from more or less sandy to ashy or stone-grey, deep blackish-grey or brown above, with the crest darker ; the underhair of the back usually ochreous or buffy, sometimes without bright tint ; lower side from white with a faint buff collar on the hind throat

* Formerly this cat was for the most part cited as *Felis lybica*, Meyer being regarded as the author of the name, although he admitted its adoption from Forster. But in 1904 Schwann showed that *ocreata* Gmelin, based on Bruce's "Booted Lynx," antedated Meyer's *lybica* ; and since 1904 the species has been mostly known as *ocreata*. But Matschie discovered (SB. Ges. Nat. Fr. Berl. 1912, no. 2 *a*, p. 59, and 1918, no. 3, p. 102) that in 1780 Forster gave the names *constantina* and *lybica* to two cats described by Buffon from Constantine in Algeria and Gafsa in Tunis respectively. Both these names apply to the common African Wild Cat, for which *cafra* and *caligata* are also familiar terms. I adopt *constantina* because it has line-priority over *lybica* in Forster's work.

to paler or darker buff almost throughout; ears typically ochreous or rusty-brown externally, sometimes blackish at the tip. Except that the distal end of the tail is always banded black and white or grey, with a black tip, the pattern is very variable in distinctness, sometimes practically obsolete, but usually when absent from the body represented at least by the brachial bands on the fore legs, by faint stripes on the hind legs above the hocks, and a few spots on the chest. At its best in African races it consists of longitudinal stripes on the head, nape, and back, vertical stripes on the fore flanks, spots usually tending to run more or less into stripes on the hind flanks, stronger, more numerous stripes on the legs and spots below, and two stripes on the cheeks.

The skull is short and broad, with the zygomatic arches strongly salient in the adult, especially in the orbital region, the width across the middle of the orbits being much more than half the total length of the skull. At least in all the larger races, including the Indian, the upper carnassial has a large inner lobe with a well-developed cusp.

31 *a*. **Felis constantina ornata** Gray. The Indian Desert-Cat.

Felis ornata, Gray, Illustr. Ind. Zool. i, pl. 2, 1832; and of most subsequent authors, including Blanford.

Felis servalina, Jardine, Nat. Libr., Felinæ, p. 232 (*F. ornata* on pl. 25), 1834.

Felis torquata, Blyth, Proc. Zool. Soc. 1863, p. 185 (in part; not of Cuvier *).

Vernacular.—Jhang-Meno (Cutch).

Localities of the *types* of *ornata* and *servalina*, India.

Distribution.—The deserts of CENTRAL and WESTERN INDIA; range to the west of Sind unknown.

Distinguished from the African races of *constantina*, at least on the average, by the more distinct pattern of spots, more stony-white or grey superficial colour, less ochreous underhair, greyer, less ochreous backs to the ears, and less differentiated spinal crest.

In the winter coat, which is soft and tolerably full, and from about 35 to 40 mm. long, the general ground-colour above is greyish, owing to a silvery band near the tip of the contour hairs, with the back somewhat darker, but the creamy-buff summit of the underwool, exposed when the coat is disturbed, may give a cast of that tint to the pelage. There is some richer buff on the upper cheek and on the muzzle in front of the eyes, except on the lips below the rhinarium, which are white like the lower cheek; there is also some white below the eye and a good deal on its inner side in front;

* For *F. torquata* see p. 305, under "Feral Domesticated Cats of India."

the limbs and the tail become gradually white distally, and the whole of the underside, nearly to the tip of the tail, and the inner sides of the legs are white. The pattern is pronounced, consisting on the body of solid black spots, which on the side behind the fore leg tend to form a couple of vertical stripes; the forehead is generally spotted, but the crown and nape have narrow dark stripes; there are two stripes on the cheek and on the base of the limbs, and on the tail the spots tend to run into transverse stripes, which at the distal end of the tail form complete rings and a black tip. Below there are some spots on the chest behind the fore legs. The soles of the feet are black, and on the hind foot the black sometimes extends nearly to the hock.

When the moult is in progress the contour hairs become harsh, lose their brightness, and, being less plentiful, expose the underlying hair, which, even when faded, gives a sandier hue to the pelage; the pattern at the same time becomes faint, and the spots may appear lanceolate.

Flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Khairpur, Sind; ad. ♂ .	23⅕	12⅕	5
Sambhar, Rajputana; ad. ♂	22	10	4½
Rhoda Motha, Cutch; ad. ♂	19⅗	11	5—
Sambhar, Rajputana; ad. ♂ . ..	18½	10½	5
Sambhar, Rajputana; just ad. ♀	18	10	4½

The average length of the ear is about 2½ in.

The weight of the adult ♂ from Cutch was 7¼ lb.

Hitherto this cat has been regarded as a distinct species restricted to south-western Asia, but its close kinship with the typically African form *constantina* is beyond doubt. Its generally paler hues are adaptations to desert life, precisely comparable to those of the Persian race of the leopard. The ears may, however, have a decidedly ochreous tinge. The spinal crest is usually not so noticeable as in many African skins, but it is very pronounced in the skin of an adult ♀ collected in June at Persepolis by Sir J. E. B. Hotson. This skin is in moult, has only a little underwool and the pattern somewhat obscured, but the ears are ochreous-tinted. I am doubtful if this skin is racially distinguishable from typical *ornata*, but provisionally it may be given that rank and identified as *F ocreata nesterovi* Birula (Ann. Mus. Zool. St. Petersb. xxi, Suppl. pp. i–ii, 1916) from Lower Mesopotamia. Birula assigned this race to *F ornata*. In the Persepolis skin the head and body are 19¾ in., the tail 12 in., and the foot 5 in.

A closely related northern race, distinguished by its thicker and longer winter coat, from about 45 to 50 mm. long, and perhaps by its slightly larger size, is *F constantina caudata* Gray

Skull-measurements (in mm.) of *Felis constantina ornata*.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Rhoda Motha, Cutch; ad. ♂	(97+)	91	—	—	19	25	66	11	8½
Salt Range, ad. ♂.	94	90	65	34	17	23	63	12	9½
Sambhar, Rajputana; ad. ♂	96	89	69	32	18	24	63	11	9
Sind; ad. ♂	89	82	65	34	17	23	59	11	8—
Sambhar, Rajputana; ad. ♀	84	78	60	31	16	21	56	10	7½

(Proc. Zool. Soc. p. 31, 1874). In addition to the type from Khokand, Ferghana, the British Museum has specimens from Transcaspia, Djarkent, Meshed in N.E. Persia, and Bala Murghab in Afghanistan. Possibly this race may extend into Baluchistan.

In the retention of the spotted pattern and its average less differentiation into transverse stripes, a specialized arrangement in all species of Felidæ, where it occurs, *ornata* and *caudata* are more primitive than typical *constantina*. From this it may be inferred that Asia was the "home" of *constantina*, which, like *F chaus*, migrated thence into Africa.

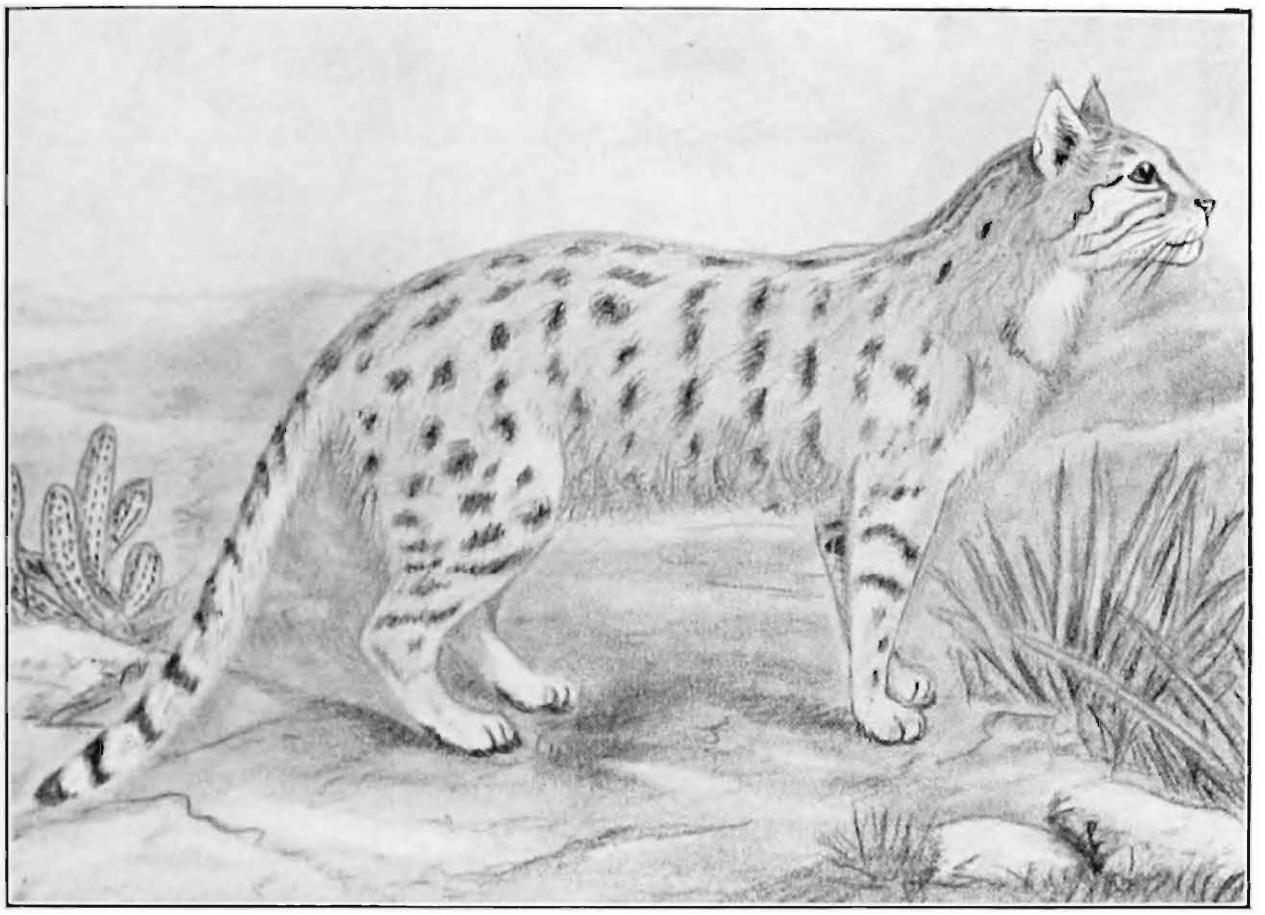
According to Blanford this cat ranges from Sind and the Punjab to Saugor and Nagpur, about 80° E. long., but is very rare south of the Narbada. I have seen specimens from Jacobabad (Prater) and Thar Parker (Priestley) in Sind; Gambat in Khairpur (Prater); Rhoda Motha in Cutch, 100 ft. (Crump); Kishimgala and Sambhar in Rajputana (Adam); Rohtas in the Salt Range, 1,100 ft. (Wells); and Sehore in Bhopal, C.I., 1,600 ft. (Whitehead).

Habits.—Very little is known. Crump remarked that it is probably commoner in Cutch than is usually supposed, judging from the numerous tracks observed in quite open country round the burrows of gerbils. One he shot was feeding on the fresh carcase of a sheep, but it was not suggested that the cat killed it. At Rajkot in Kathiawar the cat was also not often observed. One shot in a patch of grass near a tank had the remains of a rat and some vegetable matter in its stomach. No doubt the cat feeds on small desert mammals, especially gerbils, and on birds. Since the specimen from Sehore was killed by dogs in scrub-jungle, the habitat appears to overlap that of the Jungle-Cat.

32. **Felis chaus** Güldenstädt. The Jungle-Cat.

Felis chaus, Güldenstädt, Nov. Com. Acad. Petrop. xx, p. 483, pls., 1776; Schreber, Säug. iii, p. 414, pl., 1777; and of subsequent authors, including Blanford, Mamm. Brit. Ind. p. 86, 1881.
Felis catolynx, Pallas, Zoogr. Ross. As. i, p. 23, pl., 1811.
Felis shawiana, Blanford, Journ. As. Soc. Beng. xlv, p. 49, 1876*.

* *Felis shawiana*, described by Blanford as distinguished from *F. ornata* by its apparently larger size, judging from the skull, and by its shorter tail, judging from two native skins, has been accepted as a valid species by all students of the Asiatic Felidæ except W. L. Sclater, who examined the specimens in Calcutta and came to the conclusion that the tails were imperfect and that *shawiana* is a synonym of *ornata* (Cat. Mamm. Ind. Mus. Calc.). I am indebted to Col. R. B. Seymour Sewell, F.R.S., for the chance to examine Blanford's material. The species is composite. The skins are those of young *F. constantina caudata* (see above, p. 288) with the tails imperfect, as Sclater detected, and the skull is the skull of *Felis chaus*; and since the skull is marked "type," I have added *shawiana* to the synonymy of this species.



Indian Desert-Cat (*Felis constantina ornata*).

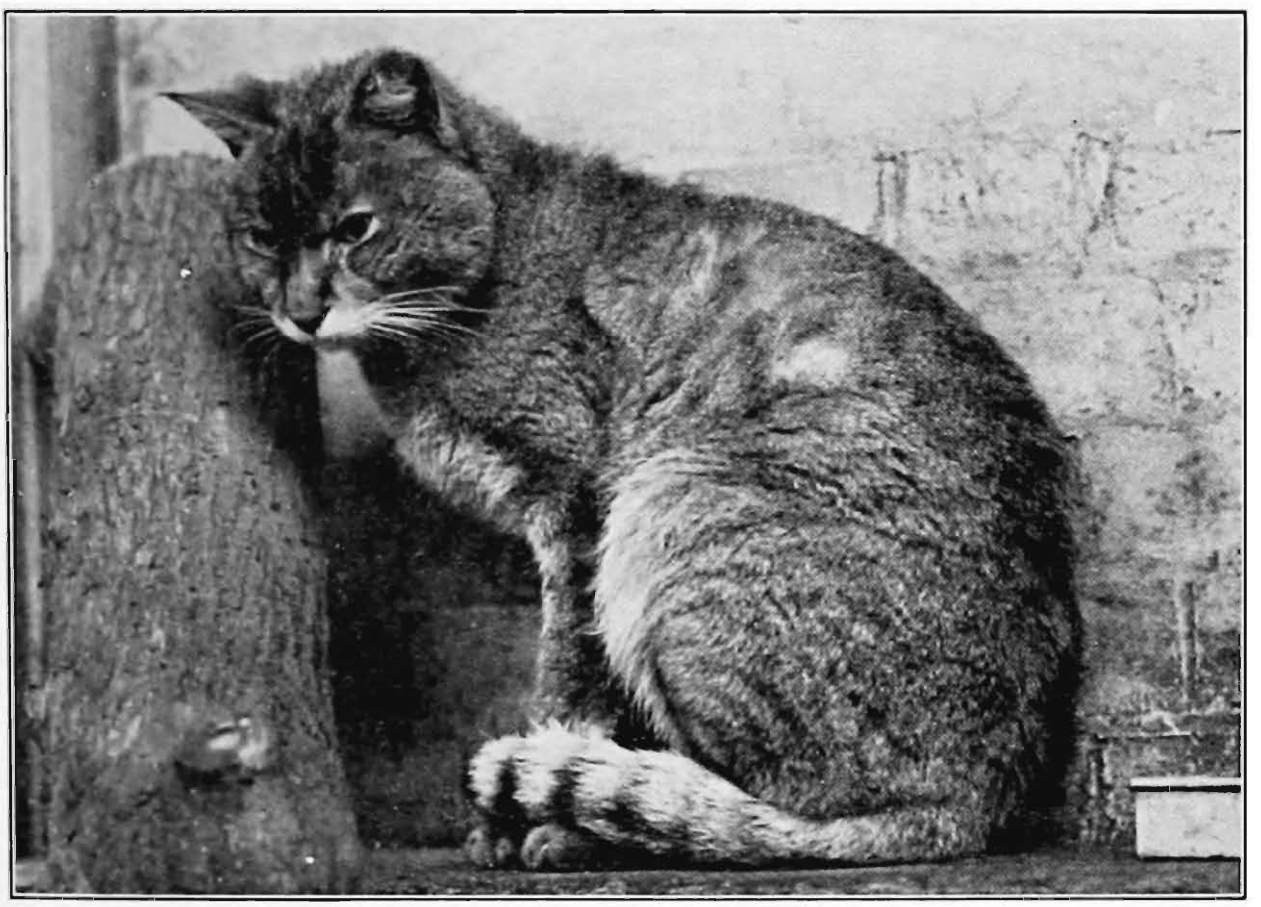


Photo F. W. Bond.

Jungle-Cat (*Felis chaus*).

Locality of the *type* of *chaus* and of *catolynx* (here selected), Terek River, north of the Caucasus ; of *shawiana*, Yarkand.

Distribution.—From the Caucasian and Caspian areas, Turkestan, and Mesopotamia, thence westwards through Syria to N. Africa and eastwards through Persia into INDIA, CEYLON, BURMA, and Indo-China.

The largest of the existing species of *Felis*, with the tail comparatively short, almost invariably less than half the length of the head and body and less than twice the length of the hind foot.

A distinct spinal crest and a small tuft on the ears. General colour above varying from clear grey to tawny or deep brownish, dependent on the tint of the speckling of the pelage, which is black and white or buff or ochreous ; spinal crest richer and darker ; backs of the ears varying from nearly uniformly ochreous with at most a small black tip, including the "pencil," or extensively black at the tip and base and ochreous in the middle ; the underside sometimes almost entirely white,



Fig. 73.—Skull of adult ♂ Jungle-Cat (*Felis chaus prateri*) from Sind. × ½.

except for a broad buffish collar on the hind throat, but usually the chest behind the fore legs is invaded by buff, and sometimes most of the underside is rich ochreous-buff with only the fore throat and chin, the axillæ, and the inguinal region whitish ; cheeks, muzzle, and outside of limbs greyish or ochreous ; tail typically paler than the body. Pattern on the head and back absent, on the flanks at most faintly traceable ; some spots on the chest below and an indistinct stripe on the throat-collar ; two brachial stripes, varying in distinctness, on the fore leg. Similar stripes on the hind leg above the hock ; tail with an irregular blackish stripe above in its proximal portion, its distal end conspicuously striped black and white, with tip black. Kitten with pronounced pattern.

The only external character by which skins of this species can always be distinguished from *F constantina* is the comparative

shortness of the tail. The skull, too, is similar in all its essential features, but when fully mature may be distinguished by being a little more elongated in the muzzle and by being narrower across the orbital portion of the zygomata, with the cheek lower, both features due to the less developed lower rim of the orbit.

There is little need, in my opinion, for separating this species from *Felis* as a distinct genus, *Chaus*, as has recently been done by Ognev.

32 *a*. **Felis chaus chaus** Güldenstädt.

Synonymy as above, under the species, with the addition of *Felis chaus typica*, De Winton, Ann. Mag. Nat. Hist. (7) ii, p. 291, 1898.

Locality of the *type*, Terek River, north of the Caucasus.

Distribution.—Turkestan, western and southern shores of the Caspian Sea, Persia, and BALUCHISTAN.

Coat in winter thick and long, the contour hairs of the flanks up to 47 mm., of the crest 69 mm., the average of four specimens being 44 and 66 mm. Colour of the upper side varying from pale grey when the speckling is black and white to tawny or greyish-tawny when the pale speckling is ochreous-buff or greyish-buff; the underhair of the back buff or grey; the spinal stripe darker, dull or brightish ochreous.

The winter coat in this race is rather thicker and longer than in the Himalayan race, *affinis*, and the skull differs from that of the four Indian races recorded below in having on the average larger teeth. The two large upper premolars (pm^3 and pm^4) measure from 21 to 23½ mm., and the three lower cheek-teeth (pm_3, pm_4, m_1) from 26 to 29 mm., as opposed to an average of about 20 and 25 mm. respectively in the Indian races. But the difference is only an average one, some individuals of the Indian races having teeth nearly or quite as large as in smaller-toothed forms of the typical race.

Güldenstädt recorded this race from the Persian provinces of Gilan and Masanderan. In the British Museum there is a nearly topotypical example from the Caucasus (Warsaw Museum); four from Persia, one labelled "Persia" (K. Loftus), without further particulars, and one from Seistan (Indian Museum, Calcutta) agree tolerably closely in colour with the skin from the Caucasus, and the skull and teeth of Loftus's specimen almost exactly match those of the Caucasus specimen.

These three skins have a decided tawny tone, but one from 9 miles south of Shiraz (Sir J. E. B. Hotson) is much greyer. Still greyer and paler is one from Gursala, Jimft, 2,000 ft. (H. R. Sykes). An almost exact match of the last is a clear ashy-grey "native" skin procured by P. M. Sykes 100 miles east of Bampur in Baluchistan, 1,400 ft. It is on the evidence

Skull-measurements (in mm.) of *Felis chaus chaus* Güld.

Locality and sex.	Total length.	Cond.-basal length.	Zygo-matic width.	Post-orbital width.	Inter-orbital width.	Maxil-lary width.	Mandi-bular length.	pm^4.	m_1.
Caucasus ; yg. ad. ♂	—	(107±)	76	35	21	28½	80	15	10
"Persia" (Loftus) ; yg. ad. ♂	119	108	78	—	—	29	80	14½	11
Seistan ; ad. ♂	132	(120±)	79	35	26	33	89	14	11
Seistan ; yg. ad. ♀.	113	100	73	34	18	26	73	13	10
Gursala ; yg. ad. ♀	109	99	70	33	18	25	71	13	10

of this skin, which has no skull, that the typical race of *F chaus* is included in the fauna of British India.

Only two of the above-mentioned skins were measured in the flesh :—

Locality and sex.	Head and body.	Tail.	Hind foot.
S. of Shiraz ; ad. ♂	27⅜	11⅕	6⅕
Gursala ; yg. ad. ♀	24	10⅕	5⅘

To the west of Persia this cat is represented in the British Museum by specimens from Baghdad, Ramadi, and Mosul, in which the two carnassial teeth (pm^4, m_1) are 16 and 11½ mm. respectively. These connect typical *chaus* with *furax* de Winton from Jericho, in which these two teeth are respectively 18 mm. and 12 mm. The skull from Ramadi, an adult ♂, with the total, condylobasal, and mandibular lengths 137, 122, and 93 mm. respectively, is the largest skull of *F chaus* I have measured, and slightly exceeds the skull of the adult ♂ from Seistan entered in the table above.

32 *b*. **Felis chaus affinis** Gray.

Felis affinis, Gray, Illustr. Ind. Zool. i, pl. 3, 1830.
Lynchus erythrotus, Hodgson, Journ. As. Soc. Beng. v, p. 233, 1836.
Felis jacquemonti, Geoffroy, Jacquemont's Voy. iv, p. 58, pls. 2 & 3, 1844.

Locality of the *type* of *affinis*, Gangootri in Tehri Garhwal ; of *erythrotus*, Nepal ; of *jacquemonti*, Kursali, 8,500 ft., near Dehra Dun.

Distribution.—HIMALAYAS, from KASHMIR at least to SIKKIM.

Distinguished from typical *F chaus* by the slightly shorter and less woolly winter coat and by the skull and teeth being on the average smaller sex for sex.

In the winter coat the hairs of the flanks range from about 36 to 42 mm., of the crest from 58 to 60 mm., the average in six skins from Kumaun, September to March, and six from Gorkha, Nepal, December to March, being 39 and 59 mm. respectively. There are two extreme, but intergrading, colour-phases, the " grey " and the " tawny." In the former the grey of the flanks is paler or darker, in accordance with the dominance of the black or white speckling in the pelage, the spinal stripe is speckled black and dull ochreous or buff ; the cheeks, muzzle, and legs externally are greyish, and the underside, except for the pale buff on the collar and generally some on the chest, is dominantly white. In the tawny phase the speckling of the flanks is black and buffy or pale ochreous, of the spinal stripe black and rusty ; the ears, cheeks, muzzle, and sometimes the whole of the underside, except the chin, are brighter or duller ochreous.

A handsome blackish variety of this cat, represented by three skins, was collected by St. G. Burke in the United Provinces. They differ a little individually, but the finest of them has the muzzle, crown, backs of the ears, and the spinal area behind the shoulders jet-black, and the legs and tail mostly black; but the neck and sides of the body are thickly spangled with silvery-white, and the underhair is mostly ashy-grey, smoke-grey on the crest. They resemble the similar variety from Karachi described below (p. 300).

In addition to the co-types of *affinis* from Gangootri and Hodgson's specimens of *erythrotus* from Nepal, old and soiled skins, the British Museum has many specimens, recently collected, mainly by the Mammal Survey, from the following localities :—

Kashmir, Arapul, 6,300 ft., Trol, 6,000 ft. (Col. Stockley), two exceptionally dark, blackish-grey skins; Dharmsala, 4,000 ft. (H. Whistler); Kangra, 2,000 to 5,000 ft. (Wells); Kumaun, Ramnagar, 1,140 to 1,500 ft., Almora, 5,600 ft., Khati, 7,600 ft. (Crump); Dehra Dun (Capt. Tuker), nearly a topotype of *jacquemonti*, but very pale grey, and further differing from it in having black ear-tips; Nepal, many localities, mostly in Gorkha (Baptista), Darjeeling, 4,500 ft. (Crump), and Kuivi in the Naga Hills, 6,000 ft. (J. P. Mills), a July skin probably belonging to this race.

Flesh-measurements (in English inches) of *F chaus affinis* are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Kashmir, Trol.; ad. ♂	27⅕	11⅗	6¼	19
Kangra, Damtal; ad. ♂	26⅖	8⅖	6	—
Kangra, Gopalpur; ad. ♂.	24⅖	9⅗	5	12
Kumaun, Almora; ad. ♂ .	25⅗	11⅖	6⅕	12¼
Kumaun, Ramnagar; ad. ♂	25	11⅗	6⅕	16
Nepal, Gorkha; ad. ♂	28⅖	13⅕	6½	16
Nepal, Gorkha; ad. ♂ . .	26	11⅗	6⅖	12
Kashmir, Hraful; ad. ♀	25⅗	10⅘	6⅓	14
Kangra, Gopalpur; ad. ♀.	24	9	5⅖	—
Kumaun, Almora; ad. ♀	23⅘	11⅕	5⅘	11½
Nepal, Gorkha; ad. ♀	24⅖	10	6	10½
Nepal, Hathiban; ad. ♀	22⅘	11⅕	5⅗	11
Darjeeling; ad. ♀	25⅖	10⅘	6	—

The average length of the ear is a trifle under 3 in.

The following table of skull-measurements shows considerable individual variation in size both in the skull and the teeth, especially in the ♀. As suggested by the large skull, without a skin, from Kashmir (Radcliffe), the Jungle-Cat of that area may prove to be on the average larger than those occurring farther east in the Himalayas; but the difference between the two skulls from Garhwal (B. B. Osmaston), which also have no skins, is only a trifle less than the difference between the

Skull-measurements (in mm.) of *Felis chaus affinis*.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Kashmir; ad. ♂	126	113	83	35	22	31	—	12½	—
Kashmir, Trol; ad. ♂	118	107	80	35	22	30	78	12	10
Garhwal; ad. ♂	121	107	75	35	22	27	78	12	10
Garhwal; ad. ♂	111	103	74	34	19	27	75	12½	10
Kumaun, Almora; ad. ♂	115	108	76	37	20	27½	78	13—	10
Nepal, Bankulwa Morang; ad. ♂	116	106	79	34	20	27	79	12	10
Kashmir, Arapul; ad. ♀	109	100	74	35	20	27	73	12	10
Kangra; ad. ♀.	101	93	69	31	17½	24	67½	13—	10—
Dharmsala; ad. ♀	101	92	69	36	18	23	—	11½	8½
Kumaun; ad. ♀	105	96	70	34	18	25	69	12	10
Khatmandu, Nepal; ad. ♀	109	99	70	33	18	25	73	10	9
Bhaber Tract, Nepal; ad. ♀	96	88	65	32	16	22½	63	11½	9—

larger and the smaller Kashmir skulls ; and the ♀ skull from Khatmandu (Dr. Oldfield) is about the same size as the ♀ skull from Arapul, Kashmir (Stockley), and is much larger than the ♀ from the Bhaber Tract, Nepal (Dr. T Longstaff).

32 *c*. **Felis chaus kutas** Pearson.

Felis kutas, Pearson, Journ. As. Soc. Beng. i, p. 75, 1832.

Vernacular.—Berka (Rajmahal Hill tribe) ; *Khatas*, *Jangli billi* (Hind.) ; *Banberal* (Beng.) ; *Mungra* (Kathiawar) ; *Jhang Meno* (Cutch).

Locality of the *type*, Midnapore in Bengal, about 70 miles west of Calcutta.

Distribution.—The northern part of PENINSULAR INDIA from Cutch to Bengal.

Distinguished from the Himalayan race, *affinis*, by being a little smaller, shorter in the tail, lighter in weight, and by its shorter and less luxuriant winter coat, but the seasonal difference in the coat in those respects is well marked. In six adult examples from Hoshangabad in full winter coat the average length of the hair on the flanks is 37 mm., on the spinal stripe 50 mm.

The type of *kutas* was a dark-coloured Jungle-Cat ; and a topotype of it from Salbani, Midnapore, 200 ft. (Crump), September 19, in new coat, is also very dark, blackish, speckled with buffy-grey above, with the spinal stripe rusty, the ears ochreous-brown, with black at the tip and base, the underside reddish-buff, with the fore throat, axillæ, and groins white ; the stripes on the legs and spots below are blackish. A skin from Chaibasa in Singbum, 800 ft., August 11, and one from Jagodib, Hazaribagh, 600 ft., April 20, are rather paler than the Midnapore specimen, but like each other ; but one from Nimia Ghat, Hazaribagh, 1,000 ft., June 26, is not so grey owing to the shedding of many of the contour hairs with the moult. A series of seven skins from Bahgownie in Darbhanga, 1,500 ft., north of the Ganges, July to September, is inseparable from skins from Lower Bengal, two only being tawnier. All are short-coated with little underwool, but possibly the winter coat may show them to be transitional to *affinis*. Many from various spots near Hoshangabad, in Central India, on the same parallel of latitude as Midnapore, and collected in January, February, March, and April, are in full winter coat, and this is appreciably less luxuriant than in winter skins of *affinis*. It is needless to mention all the localities in the central districts of northern Peninsular India where this cat was collected by the Survey. But the extension of the race as far west as Cutch is attested by skins collected by Crump at Chitrod, 150 ft., Charwa, 200 ft., Bhuj, 350 ft.

and Nokania, 450 ft., in July, August, and September. Apart from the Nokania skin, July 7, which is in poor coat and tawnier, the others closely match the skin from Chaibasa in their dark grey hue. Four skins from Rajputana are interesting as transitional between this race and the next, described from Sind. One from Kishangarh (Adam), December 26, although grey in colour, is larger and heavier than any of the Bengal specimens of *kutas*. A second from Sambhar (Adam), February 2, although not measured in the flesh, has a larger skull than the last, and would possibly have been longer in the head and body, and its colour is tawny as in the Sind race. A skin from Bhoria (Adams), October 3, of normal size, is also tawny; and a fourth from Mt. Abu (Crump), May 22, although comparatively small and grey in tint, is a little heavier than the first described from Rajputana.

Flesh-measurements (in English inches) and weights (in lb.) of *F chaus kutas* are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Midnapore; youngish ♂	22⅖	10⅘	6	8½
Chaibasa; ad. ♂	22⅗	9⅗	5⅗	11
Hazaribagh; ad. ♂ . ..	23⅖	10⅗	5⅘	9
Dain, Hoshangabad; ad. ♂ ..	25⅘	10¼	6	8½
Pachmarhi, Hoshangabad; ad. ♂ . ..	23⅕	10⅖	5⅗	—
Nokania, Cutch; ad. ♂	25⅕	9⅘	6	11½
Kishangarh, Rajputana; ad. ♂	28	11	6¼	12½
Bhoria, Rajputana; ad. ♂	24	10	6	—
Mt. Abu, Rajputana; ad. ♂.	23½	10	6	13
Hazaribagh; ad. ♀ .	21⅘	9⅘	5⅖	6¼
Bori, Hoshangabad; ad. ♀	22⅘	9⅕	5¼	7¼
Bhuj, Cutch; ad. ♀ . .	23⅖	10	5½	8
Charwa, Cutch; ad. ♀.	22	10⅕	—	5¾

The average length of the head and body and the weights are decidedly less than in *affinis*; but the length of the ear, up to 3 in., is about the same.

32 *d*. **Felis chaus prateri**, subsp. nov.

Locality of the *type*, Jacobabad, on the Upper Sind Frontier.

Distribution.—SIND, between the Indus and the Kirthar Range.

Distinguished from typical *F chaus kutas* by its more uniformly tawny or sandy hue at all seasons of the year and by its larger size, at least of the ♂.

This race is based upon a series of six skins from Sind, three adult ♂♂ from Jacobabad, February 22–28, an adult ♀ and a young ♂ from Naundero, Larkana, May 7 and 8 (S. H. Prater), and an adult ♀ from Gholam, October 20 (C. McCann).

Skull-measurements (in mm.) of *Felis chaus kutas* and *Felis chaus prateri*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
F. c. kutas.									
Chaibasa ; ad. ♂	117	100	76	36	19	26	72	12½	10
Hazaribagh ; ad. ♂ ..	112	101	75	34	20	25	79	12½	10
Dain, Hoshangabad ; ad. ♂	116	104	76	34	22	29	77	12	9½
Charwa, Cutch ; ad. ♂	118	105	78	33	20	29	79	14	11
Nokania, Cutch ; ad. ♂	113	101	76	33	21	29	74	12+	10—
Rajputana, Sambhar ; ad.	119	108	74	34	19	27	80	13	10
Rajputana, Kishangarh ; ad. ♂	116	106	75½	34	20	28	77	11	10
Rajputana, Mt. Abu ; ad. ♂ .	111	100	76	35	20	26	75	12	9
Hazaribagh ; ad. ♀ . ..	102	92	67	33	18	25	69	11	9
Bori, Hoshangabad ; ad. ♀	100	90	66	35	18	23	—	11½	—
F. c. prateri.									
Jacobadad (type) ; ad. ♂ ..	118	108	78	34	23	29	79	12	10
Jacobabad ; ad. ♂ ..	116	104	81	34	23	28	79½	12½	10
Naundero ; ad. ♀	106	96	69	34	18	24	70	12	9

Despite the difference of the season, they are all of the general sandy tint indicated above, although differing to a slight extent individually, but none of them shows the black and white speckling, resulting in the darker or lighter grey hue dominant in unfaded skins of the other Indian races. The ears on the average also are more uniformly ochreous, with the black at the tip and base less in evidence.

The coat is not nearly so full and soft as in the Himalayan race *affinis* in winter, but is about the same as in the Central Indian race *kutas*, the hairs of the flanks in adult skins from Jacobabad and Naundero ranging from 30 to 34 mm. and of the crest from 50 to 55 mm. In the skin from Gholam, October, the coat is very nearly the same ; but in the young ♂ specimen from Naundero, May 8, the coat is in full moult, and in the adult ♀ from that locality, May 7, it is thinner and coarser than in the Jacobabad series.

Representing an interesting variety, but no doubt assignable to this race, is a very beautiful silver and black skin from Karachi, without further history. It is unmeasured and undated, but is obviously in full winter coat, the hairs on the flanks being 40 mm., on the crest 52, and there is abundance of underwool. The backs of the ears, the crown, part of the spinal area, most of the tail, the feet, and the backs of the legs are jet-black, but the cheeks, forehead, neck, shoulders, flanks, and lower side are conspicuously speckled with silver, and there is some silvery speckling on the front of the fore leg and on the root of the tail; the chin is whitish and the underhair is everywhere clear whitish-grey. Apart from this last character the skin recalls that of a " silver " or " silver-tip " fox of the furriers.

The flesh-measurements (in English inches) of the adult specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Jacobabad (type); ad. ♂ .	29	10	6
Jacobabad ; ad. ♂	27⅕	12⅖	6
Jacobabad ; ad. ♂ .. .	27⅕	10⅕	5⅘
Naundero, Larkana ; ad. ♀	23	10⅕	5⅘
Gholam ; ad. ♀	23	9⅗	5⅖

The weight of the largest ♂ was 20 lb., the heaviest, so far as I am aware, recorded for *Felis chaus*. The third on the list was 14 lb.

32 *e*. **Felis chaus kelaarti**, subsp. nov.

Felis chaus, Kelaart, Prodr. Faun. Zeyl. p. 48, 1852.
Felis affinis, Phillips, Man. Mamm. Ceylon, p. 160, 1935 (not of Gray).

Vernacular.—Kadubekku, Mantbekku, Adaribekku (Kanarese)

Kadabek, *Bellabek* (Wadari); *Jungli Mámar* (Marathi); *Baul*, *Bháoga* (Mahr.); *Burakatchki* (Haran Shikaris); *Kebbali* (Coorg); *Jungli-billi* (Dekhani); *Junka pilli* (Telegu); *Walabalala*, *Hindun diviya* (Sinhalese); *Kadu poona* and *Kardup-poonai* (Tamil).

Locality of the *type*, Cheddikulam, N.P., Ceylon.

Distribution.—CEYLON and SOUTHERN INDIA.

Distinguished from the more northern Peninsular Indian race, *F chaus kutas*, by the coat, at its best, being shorter and less luxuriant and exhibiting very little seasonal difference in those respects, and by the speckling of the hairs, as a result of the shorter coat, being finer. In a series of seven adult skins collected between December and March the average length of the flank-hairs is 26 mm. of the crest 40 mm., both being about 10 mm. shorter than the average of *kutas* in the same months of the year.

Many skins representing this race and collected by the Mammal Survey—on the western side of Southern India mainly by G. C. Shortridge and on the eastern by N. A. Baptista—are very uniformly coloured dorsally. The colour of the upper side is dominantly grey, black, and white-speckled, with the spinal stripe ochreous, the backs of the ears rusty or paler ochreous, with a very variable amount of black at the tip and base, the legs typically rich ochreous, the underside with a varying amount of buff on the chest behind the fore legs. The pattern is just traceable high up on the flanks, stronger lower down, there are blackish or buff spots on the chest, and the upper portions of the legs are more or less distinctly striped.

The skins were obtained at the following localities and dates:—Dharwar, 2,500 ft., October, December, January, April (Shortridge); N. Coorg, 3,555 ft., January (Graham); Nilgiri Hills (Phythian Adams); Travancore (Pillay); Palni Hills, 5,000 ft., March (McCann); Vontimitta Range, 325 ft. August, Kurnool, April, May (Baptista).

Of these one skin only, from Dharwar, October, exhibits buff and black speckling on the flanks, and two from Kurnool, April and May, have the legs greyish-buff. The darkest grey of all, with most black on the ears, is a skin from Haleri, North Coorg. The skin from Travancore, collected at Bheemanagari, is a kitten exhibiting pronounced pattern on the flanks.

The type, a subadult ♂ from Cheddikulam, N.P., Ceylon (E. W Mayor), is indistinguishable from examples from Dharwar and elsewhere in Southern India. Ceylon has been chosen as the typical locality for the race as being the most southern country where *F chaus* occurs.

Skull-measurements (in mm.) of *Felis chaus kelaarti*.

Locality and sex.	Total length.	Cond.-basal length.	Zygo-matic width.	Post-orbital width.	Inter-orbital width.	Maxil-lary width.	Mandi-bular length.	pm^4.	m_1.
Kurnool ; ad. ♂ .. .	116	105	75	33	20	28	76	13	11
Dharwar ; subad. ♂ .	110	100	71	33	19	26	72	12	9
Kurnool ; ad. ♀ .	103	90	67	34	18	24	67	12	9
Palni Hills ; ad. ♀ .	105	98	66	33	17	23	70	11½	9
N. Coorg ; ad. ♀ .	101	93	70	33	18	24	67	12	9
Dhawar ; ad. ♀ .	98	90	66	34	18	23	64	11	9—

Flesh-measurements (in English inches) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Kurnool ; ad. ♂	25⅕	10⅘	6⅕
Vontimitta Range ; subad. ♂	24⅘	10⅘	6
Dharwar ; subad. ♂	24⅖	11⅕	6
Cheddikulam (type) ; yg. ♂	23	7⅓	5⅘
N. Coorg ; ad. ♀	25	9	—
Palni Hills ; ad. ♀ .	24⅖	10	5⅗
Dharwar ; ad. ♀	24	10⅕	5½

The weights of the ♂ specimens from Kurnool and the Vontimitta Range were 12 and 11 lb. respectively, of the young ♂ from Cheddikulam and the ♀ from the Palni Hills 8 lb.

32*f*. ? **Felis chaus fulvidina** Thomas.

Felis affinis fulvidina, Thomas, Proc. Zool. Soc. 1928, p. 834.

Vernacular.—Kyaung-ba (Burmese) ; *Kyung tset-kun* (Arakanese).

Locality of the *type*, Kampong Tomb, Annam.

Distribution.—Annam, Siam, BURMA.

Specimens of the Jungle-Cat from Burma are of doubtful identity. A good many skins from Lower Chindwin (District Commissioner), Mt. Popa (Shortridge), and Toungoo (Mackenzie), collected between the middle of August and the end of October, are short-coated and on the average tawnier in hue than *kutas*, none exhibiting the grey tint observable in so many skins of that race. The teeth, too, are on the average a little larger. There are also a couple of skins from Siam. I suspect they will prove to be identical with *F. chaus fulvidina* Thomas, based on a single unmeasured skin, without skull, from Kampong Tomb, Annam (Delacour and Lowe), and distinguished from Indian specimens by the richer ochreous hue of the upper side. It is also richer-tinted than the Burmese and Siamese skins, but this may be only an individual peculiarity.

The flesh-measurements (in English inches) and weights (in lb.) of some specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Mt. Popa ; ad. ♂	29½	10⅘	6⅕	13
Toungoo ; ad. ♂ .	26⅕	10⅘	6⅖	—
Mt. Popa ; ad. ♀ ..	23⅘	11⅗	5⅘	8
Toungoo ; ad. ♀	23⅕	10⅕	5⅘	—

The skull of the large ♂ from Mt. Popa is mislaid ; but the condylobasal length of the ♂ from Toungoo is 108 mm., of the adult ♀ 105 mm., and of the ♀ from Mt. Popa 102 mm. The

upper carnassial (pm^4) in the ♂ from Toungoo is 15 mm., and in a skull from Lower Chindwin (14±) ; in ♀ skulls it is from 13 to 13½ mm., and the lower carnassial (m_1) is from 10 to 10½ mm. Hence these teeth are as large as in typical *F chaus chaus*. But in a specimen from Koh Lak, Siam (Malcolm Smith), these same teeth are 12 and 10 mm.

Habits.—The habits of the Jungle-Cat seem everywhere to be the same. It is the most familiar of the wild cats of India, and is found in bush-jungle, long grass, and reed-beds near rivers, lakes, and marshes, mostly in comparatively dry zones, but in Kashmir, according to Col. Ward, it also occurs among rocks and in old buildings, nearly every old building about Srinigar, where it is plentiful, being occupied by it. The Mammal Survey collectors recorded it as plentiful in suitable localities all over the country, and testified to the frequency with which it was to be seen hunting by daylight. According to Shortridge its long legs give it a very distinctive appearance, its movements in the open recalling those of a small panther. He added that it is very swift and exceedingly strong for its size, and is probably capable of pulling down quite large game. It seems, however, to prey mostly upon smallish mammals and on birds up to the size of pea-fowl, and may be a great pest to poultry owners. The discovery of quills in the feet of specimens in Kumaun led Crump to believe that it may prey upon porcupines; at all events it seems that it may attempt to do so. But it also eats frogs when pressed by hunger, according to Ward, and Pallas long ago stated that it is a fish-eater.

There are no good reasons for doubting Blanford's statement that the Jungle-Cat breeds twice a year, but his authority is unknown.

In Ceylon, according to Phillips, it is restricted to the dry zone of the northern part of the island, but is comparatively rare *.

The Feral Domesticated Cats of British India.

Under the genus *Felis* notice must be taken of the domesticated cats which have run wild in all parts of British India, have established themselves in some localities as obtrusive elements in the fauna, and have been described as representing valid species.

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* There is, however, a skin in the British Museum, collected by Whyte between Kandy and Colombo. It was always regarded as *F. chaus*, but from its dark hue and unusually distinct pattern I think it is probably a hybrid between *chaus* and a Domestic Cat. But, even so, if the locality is correct, an example of *chaus* was probably there.

The dominant type is the cat I called " the Striped Tabby," which is a common house-cat in England and has run wild in nearly all the warmer parts of the world (Proc. Zool. Soc. 1907, p. 143). It was described from Nepal as *F. torquata* by Cuvier (Hist. Nat. Mamm. pl. 126, 1826), as *F. inconspicua*, also probably from Nepal, by Gray (Charlesw. Mag. Nat. Hist. i, p. 577, 1837), as *huttoni*, from Kandahar, by Blyth (Journ. As. Soc. Beng. xv, p. 169, 1846) *, and Blanford treated it provisionally as a valid species under the name *torquata*. The colour is typically darker or lighter grey, sometimes with a tawny, more rarely a " bluish " tinge, often with white patches on the paws, and the pattern is usually distinct, consisting of narrow longitudinal dorsal stripes and of vertical lateral stripes commonly running into spots posteriorly, with bands on the legs and the end of the tail. These are obviously similar to the Desert-Cat, but not so pale. Col. Ward wrote of them, under the name *torquata*, as plentiful in Kashmir and unmistakable for any other species. The British Museum has skins from Srinagar in Kashmir, Kangra, 5,000 ft., Gangootri in the United Provinces, Nepal, Sambhar in Rajputana, Karachi, Junagadh in Kathiawar, N. Coorg, S. Mysore, Ambawela, Ceylon, 5,090 ft., and Maymyo, 3,500 ft., the N. Shan States, 2,795 ft., and Toungoo, 100 ft., in Burma.

A red cat with the same style of pattern also occurs, as attested by skins from Sind, the United Provinces, and Pilibhit, 800 ft. There are also red skins showing scarcely any body-pattern, except very small faint spots on the flanks, from Nepal, Kumaun, and Mogul Sarai.

A different style of feral cat, called the " *Chaus*-type " by Blyth, who believed it to be a hybrid between tame cats and Jungle-Cats, represents what English cat-fanciers call the "Abyssinian breed." It is " pepper and salt " in colour, without trace of pattern except stronger or weaker stripes on the base of the legs and tail-tip. It recalls *F. chaus* in colour, except that the spinal stripe is not so differentiated, but it is smaller, and has the tail much longer. It may sometimes be seen in the streets of London and elsewhere in England, and since the skulls of the Indian specimens I have seen are those of typical tame cats, the evidence that the coloration is due to an infusion of *F chaus* amounts to very little. There are skins of this type in the British Museum from Darjeeling, Bhutan, Hazaribagh, the Vontimitta Range, the Mishmi Hills, 2,250 ft., and Toungoo, 500 ft.

Finally, a black feral cat from Victoria Point, Tenasserim, has a very short tail like many Domestic Cats from Malaya.

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* Blyth later thought *huttoni* was the same as *ornata* (Cat. Mamm. As. Soc. 1863, p. 63).

Genus **CARACAL** Gray.

Caracal, Gray, List Mamm. Brit. Mus. p. 46, 1843 ; Proc. Zool. Soc. 1867, p. 27 ; Fitzinger, SB. Akad. Wiss. Wien, lx, p. 24, 1869. (*Felis*, *Lynx* or *Caracal* of other authors.)

Type of the genus, *melanotis** Gray (=*Felis caracal* of earlier authors).

Distribution.—The whole of Africa, except the forested area, from Morocco to the Cape, S.W Asia, and the northern part of PENINSULAR INDIA, coinciding very closely with that of the Lion.

Distinguished from *Felis* externally by the presence of a long tuft on the tip of the ear, typically exceeding in length half the height of the ear, by the shallower interdigital webs, especially of the hind feet, which are very similar to those of the Hunting Leopard or Cheetah, except for the presence of the claw-sheaths. Also there is no trace of pattern, except a few spots on the underside and inside the fore legs, even in newly-born kittens. In the skull the nasal branch of the premaxilla is narrower, longer, more attenuated, and passes further between the nasal and the maxilla, so that the junction between those two bones is much shorter ; also there is no abrupt notch on the posterior edge of the palate on the inner side of the last upper molar, the postcanine space in the jaws is relatively shorter, and only very occasionally is the minute upper premolar retained.

33. **Caracal caracal** Müller. The Caracal.

Felis caracal, P. L. S. Müller, Syst. Nat., Suppl. p. 30, 1776 ; Guldenstädt, Nov. Comm. Acad. Petrop. xx, pp. 499–500, 1776 ; Schreber, Säugth. iii, pl. 110, 1776 ; p. 413, 1778 †.

General form like that of *Felis*, but the hindquarters better developed and the tail shorter, though only a little, than in *F chaus*, reaching to the hocks, and about one-third the length of the head and body or a little more. Coat and colour varying greatly in accordance with distribution and habitat, and also seasonally, in the same locality. The coat sometimes smooth

* It seems expedient to follow Matschie, 1912, and Thomas, 1926, in considering that Gray substituted *melanotis* for the older specific name *caracal* because he disliked identity between generic and specific names, and did not intend to restrict the name *melanotis* to the specimen described by Schreber, which came from the Cape of Good Hope. Schreber also did not restrict the name *caracal* to the S. African race which in 1926 Thomas described as *coloniæ*.

† Although Müller, Güldenstädt, and Schreber published this name in the same year, I adopt Matschie's decision to give priority to Müller, who cited Arabia as the type-locality two years before Schreber described the animal from the Cape of Good Hope. Güldenstädt mentioned no locality, and some authors question the "binominal" status of his text.

and sleek, with no wool, sometimes long, very furry, with abundance of wool. Colour varying from pale sandy fawn to reddish, deep brown or dark grey, but always tolerably uniform above and on the outside of the limbs and on the tail, except that the tail-tip may be darker than the rest. The colouring of the head is characteristic, the ears are typically black, frosted with white externally, with white hairs internally, and the "pencil" or tuft is composed of black and grey hairs; but the lower eyelid is white, and there is a whitish patch on the inner side of the eye in front; the chin and the upper lip below the rhinarium are white, but there is some black above the corner of the mouth where the mystacial vibrissæ rise. The underside, except for a buff collar on the hind throat, and the inside of the limbs are whitish, but the chest at least is marked with spots and the inside of the fore legs with stripes which may be pale buff in light skins or deep brown, nearly black, in dark skins.

33 *a*. **Caracal caracal caracal** Müller.

Felis caracal, P. L. S. Müller, Syst. Nat., Suppl. p. 30, 1776.
Felis caracal bengalensis, Fischer, Syn. Mamm. 1829, p. 210 (nom. preocc. in *Felis*).
Caracal caracal schmitzi, Matschie, SB. Ges. Nat. Fr. Berlin, 1912, p. 64.
Caracal caracal aharonii, Matschie, *tom. cit.* p. 66*.

Vernacular.—*Siyeh Gush* (Pers. and Hindi); ? *Tsogde* (Little Tibet); ? *Ech* (Ladak).

Locality of the *type* of *caracal*, Arabia; of *bengalensis*, Bengal; of *schmitzi*, the Dead Sea; of *aharonii*, mouth of the Chabur River on the Upper Euphrates.

Distribution.—Central India, the Punjab, Sind, Baluchistan, and thence westwards at least to Arabia and Palestine.

As native names for the Caracal in Little Tibet and Ladakh, respectively, Blanford cited the two queried above. These were taken from Blyth (Journ. As. Soc. Beng. xi, p. 759, 1842) on information supplied by Vigne, who had a good drawing of a trained Caracal he had seen in Little Tibet. Blanford suggested that Vigne's specimens were tamed animals, presumably meaning that they were imported. In my opinion that supposition was correct. But Col. Ward (Journ. Bomb. Nat. Hist. Soc. xxix, p. 28, 1923) said Vigne

* The names *schmitzi* and *aharonii*, given to Caracals from the Dead Sea and Upper Euphrates respectively, are entered as synonyms of typical *caracal* because I am unable to distinguish racially skins and skulls of British Indian specimens from Persian, Sinaitic, and Arabian specimens, Arabia being the type-locality of *caracal* Müller.

was most likely right in saying that the Caracal was found on the Upper Indus in Baltistan, adding that he knew of a skin in Srinagar, alleged to have come from Ladakh, which the Balti men called the "Ech." On the other hand, Col. C. H Stockley wrote to me :—"I am quite sure that the Caracal does not exist in Kashmir proper. I have been on the look-out for a skin for over thirty years, and have never seen one in the Srinagar skin-shops. It is essentially an animal of hot, dry country, and probably exists in the low ground round Jammu, which is under the same rule as Kashmir proper. I have seen and shot it in the Salt Range west of Jhelum." If the Caracal occurs in Ladakh, it will surely prove to be a race distinct from the Caracal of the plains of India. But it must be remembered that the Lynx in its short, reddish, summer coat (see p. 312) is decidedly Caracal-like, and that its native name "Ec" (Ward) is apparently a variant of "Ech."

Coat in winter with a considerable amount of underwool and tolerably long, from 30 to 35 mm. ; in summer short and sleek, about 10 mm. long, and with little, if any, wool. General colour variable seasonally. An undated winter skin from Sind, apparently in fresh coat, is rich reddish-fawn above, the hairs paler at the base, but with the extreme tip blackish, and a whitish subterminal band, giving a slightly grey cast to the back ; ear with hardly any white frosting ; outer side of limbs and upper side of tail about the same colour as the body ; the underside and inner side of the limbs whitish except for the pale fawn hind throat ; a few pale spots on the chest and some similar marks on the fore leg, one representing the normal stripe ; head like the back, with the typical dark and light patches, the cheeks blending with the dark crown and light throat. A skin from 100 miles east of Bampur, Baluchistan (P. M. Sykes), March 10, in faded winter coat, is much paler sandy fawn above, with the underwool of the middle of the back slightly darker than the surface colour. A ♂ skin in summer coat from Dhonsa, Cutch, 200 ft. (Crump), July 20, is pinkish-grey at a little distance, darker down the middle line of the back, the grey cast being much more evident owing to the pale band of the flat-lying coat concealing to a greater extent the fawn of the hair, and the ear is extensively frosted with white.

A skin from Dizful, Persia (K. Loftus) is like the Baluchistan skin, but a shade browner and less red. One from the mountains north of Tor, Sinai (Anderson), and one from El Arish, N. Sinai (Col. Stirling), differ in almost precisely the same way as the skins from Sind and Cutch, and are merely trivially distinguished from them. One collected near Mecca (H. Philby) and one from Aden (Percival and Dodson), September skins, are like the paler, greyish sandy skin from El Arish, Sinai, the Aden skin being a trifle the darker of the two.

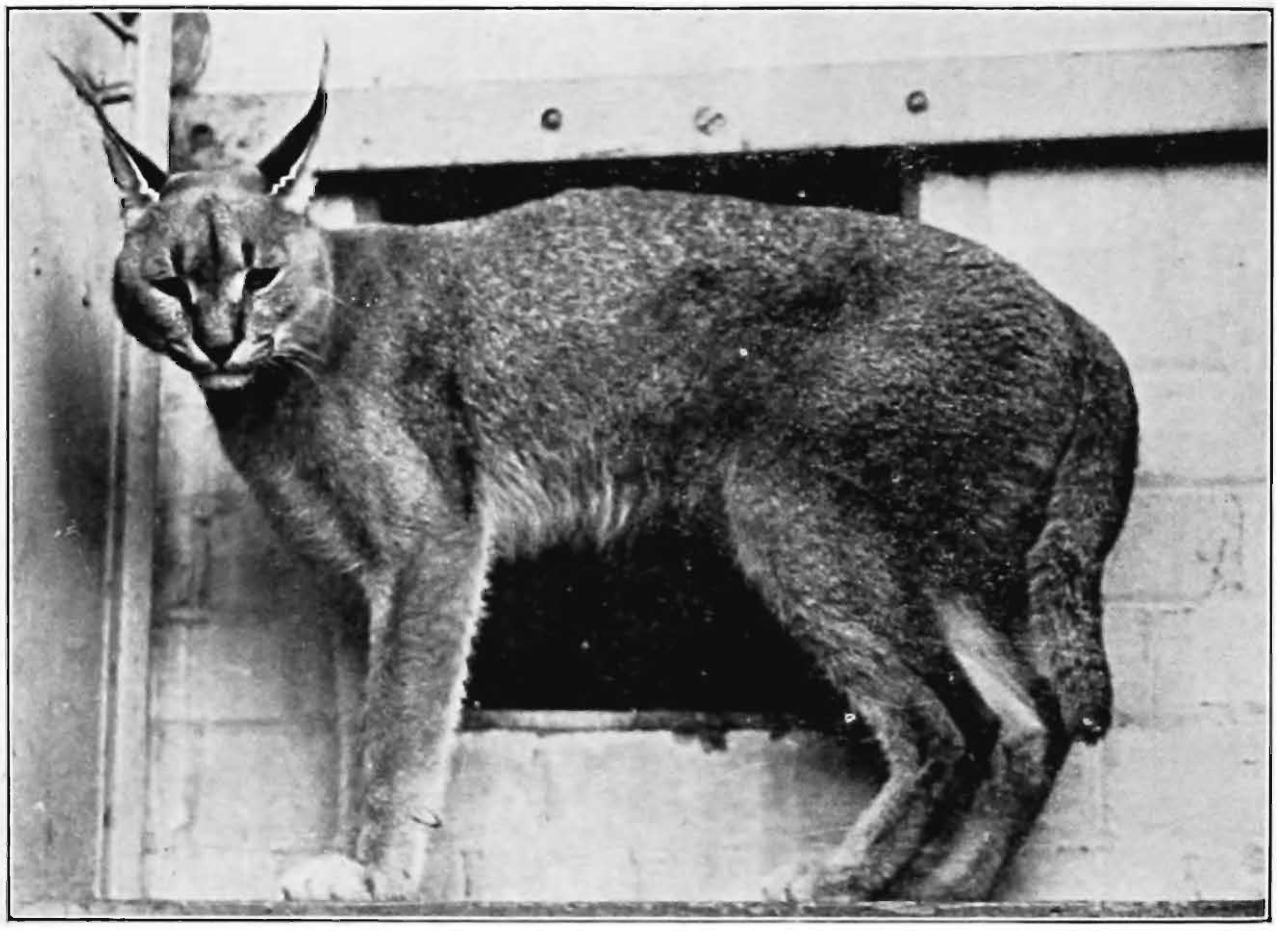


Photo F. W. Bond.

Caracal (*Caracal caracal*).

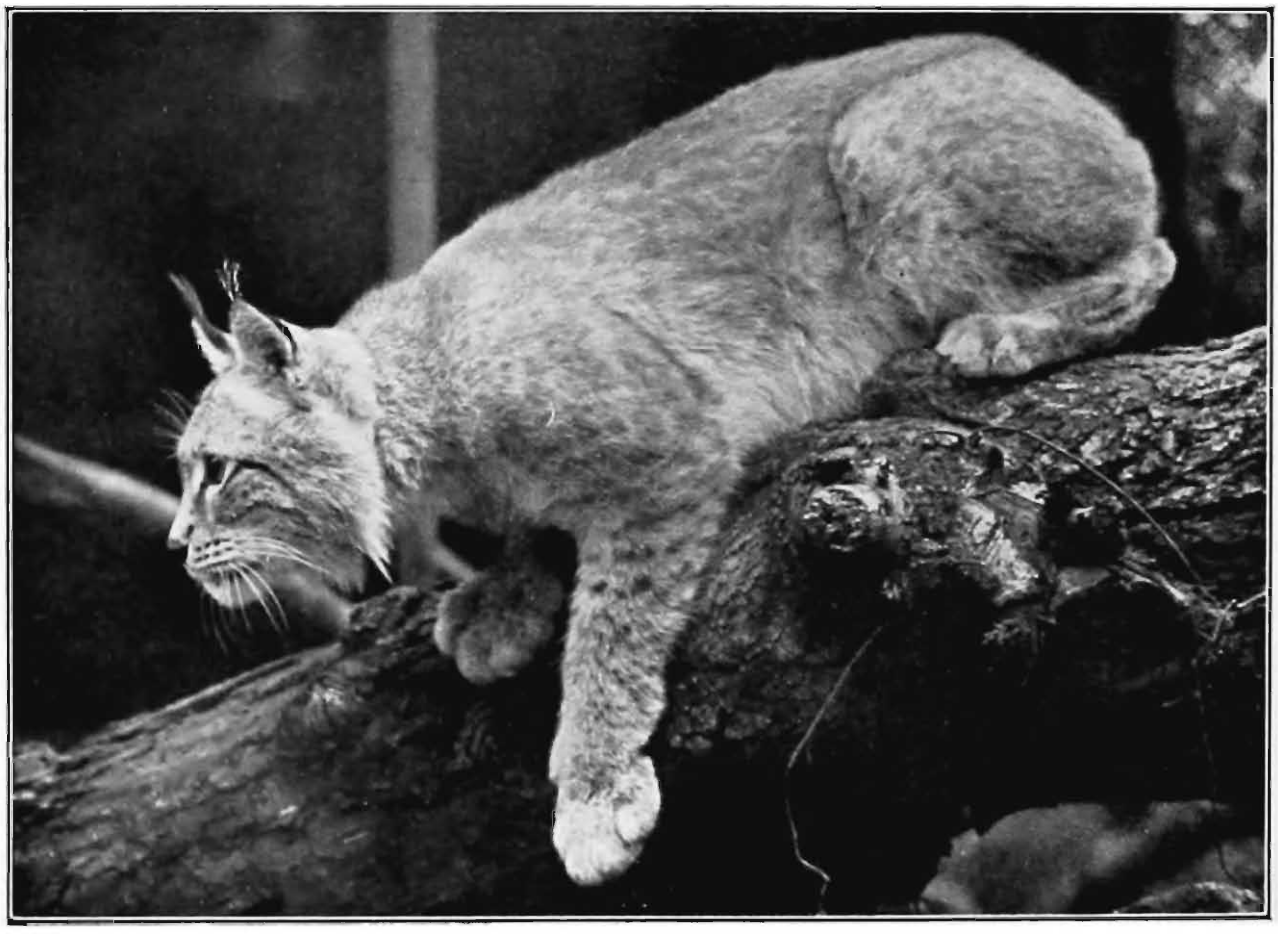


Photo F. W. Bond.

Lynx (*Lynx lynx isabellinus*).

The following are the flesh-measurements (in English inches) of some specimens assigned to this race :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Ear.
Punjab (Col. Ward) ; ♂....	29	9	—	—
Western Dun, U.P. (Col. Ward) ; ♂	27½	9	—	—
Cutch (Crump) ; ad. ♂	27⅖	10⅘	7½	3⅖
Mirzapore (G. O. Allen) ; ? sex .	27	7	—	—
Near Mecca (Philby) ; subad. ♀	25⅕	9	6⅕	3

The Mirzapore specimen is interesting for the shortness of the tail, which disproves the contention of Fischer and Matschie that the Indian race is characterized by its long tail*.

The measurements of the just adult skull, the only one available from British India, are entered in the table (p. 314). They are very nearly the same as those of an adult ♂ from El Arish in Sinai.

Habits.—Since Crump, who was collecting for the Mammal Survey in many localities in the plains of Northern and North-Western India, where the Caracal might be expected to occur, secured only one specimen, the species is clearly very rare at the present time. This is borne out by the testimony of others, who report the killing of a Caracal as an unusual event. Although there seems to be no evidence that it was ever plentiful in the past, it will in all probability follow the fate of the Hunting Leopard or Cheetah and cease to be a member of the British Indian fauna unless strict measures can be enforced for its protection. It is essentially an inhabitant of more or less open or bush-country, and preys upon any mammals or birds it can overcome and capture. It is one of the most active of the wild cats both in running and leaping, and, although a savage and desperate fighter when cornered, is capable of being tamed if captured sufficiently young. Taking advantage of these qualities, Indian potentates formerly trained the Caracal for hunting small game of all kinds in much the same way that they make use of the Hunting Leopard for chasing antelope. It must not, however, be supposed that the speed of the Caracal, although surpassing that of most cats of its size, is comparable to that of the Hunting Leopard, or that it pursues running prey for a long distance. Its methods of capturing prey are essentially the same as those of ordinary cats, and it is possibly not more active than the Jungle-Cat, making allowance for its superior strength.

* Buffon's "Caracal of Bengal," upon which Fischer's *F. caracal bengalensis* is supposed to have been based, was described from a drawing sent to the French naturalist by Edwards. The ears depicted are those of a Caracal, but the tail, "reaching the ground" (Desmarest), is as long as that of the Indian Desert-Cat.

The cubs, two or three, possibly occasionally more in number, resemble their parents in colour. The spots on the underside are typically a little more distinct, but there is no trace of pattern on the body as there is in the kittens of the Jungle-Cat, which may be almost " self-coloured " when adult, and in the cubs of lions and pumas.

Genus **LYNX** Kerr.

Lynx, Kerr, Anim. Kingd. Cat., between pp. 32–3, and p. 155, 1792; Miller, Cat. Mamm. West. Europe, p. 470, 1912 (with several generic synonyms).

Type of the genus, *vulgaris* Kerr (=*Felis lynx* Linn.).

Distribution.—Europe, and Northern Asia to the limit of tree-growth, Central Asia as far south as about lat. 30° N.; N. America as far south as Mexico*.

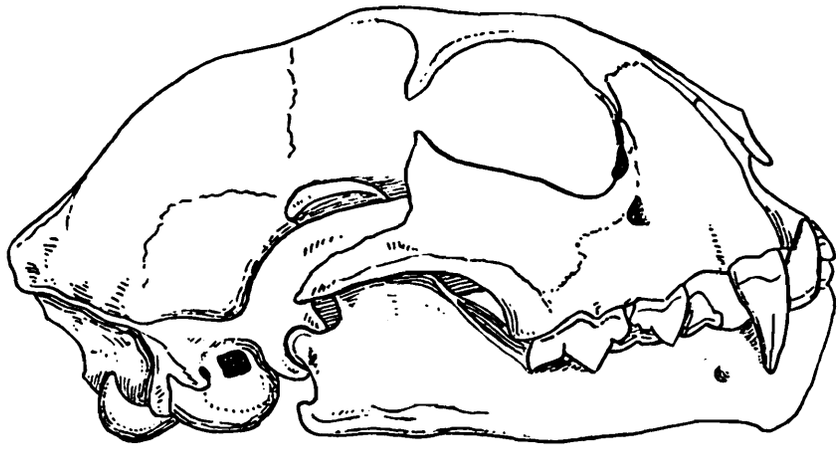


Fig. 74.—Skull of adult ♂ of the Tibetan Lynx (*Lynx lynx isabellinus*) from Gilgit. × ½.

Distinguished from *Caracal* by its much shorter tail, about one-seventh the length of the head and body, by the presence of a bushy ruff or fringe passing over the cheek from the ear to the throat and by the retention of the white patch on the back of the ear and typically of the pattern on some part of the upper surface, legs or tail, the pattern, when well defined, consisting of narrow stripes on the head and back, rounded or lanceolate spots on the flanks, spots on the legs, and stripes on the terminal part of the tail. The skull and teeth are essentially the same as in *Caracal*, but the external pterygoid crest, which may be strong in well-developed skulls of *Caracal*, is apparently only represented by an inconspicuous ridge.

* There are two well-defined species in the Old World, *L. lynx* of Northern and Central Europe and Asia and *L. pardellus* of Spain, Sardinia, and ? Asia Minor, and two in the New World, a northern, *L. canadensis*, and a southern, *L. rufus*. But *L. canadensis* is probably only a subspecies of *L. lynx*.

In the shortness of the tail *Lynx* is more specialized than *Caracal*, but in the retention of the pattern and the colour of the outside of the ear it departs less from the normal feline type.

34. **Lynx lynx** Linnæus.

Felis lynx, Linn., Syst. Nat. 10th ed. i, p. 43 ; Miller, Cat. Mamm. West. Europe, p. 471, 1912.

Locality of the *type*, near Upsala, Sweden.

Distribution.—Northern and Central Europe and Asia, Asia Minor.

As may be seen from the synonymy cited by Miller, a large number of names, based to a great extent upon seasonal differences in colour, have been given to the Lynx of Northern and Central Europe. In the typical race, *Lynx lynx lynx*, from Scandinavia, the colour varies from greyish-white, either with distinct black spots or hardly any pattern, to brownish with only a few white-tipped contour hairs, and the pattern definite or obscure. The colour of the underhair is deep rusty-ochraceous or reddish-brown, darker on the back than on the sides, and in winter the hairs on the soles of the feet are long and completely conceal the pads.

34 *a*. **Lynx lynx isabellinus** Blyth. The Tibetan Lynx.

Felis isabellina, Blyth, Journ. As. Soc. Beng. xvi, p. 1178, 1847 ; id., Proc. Zool. Soc. 1863, p. 186.
Felis lynx, Scully, Proc. Zool. Soc. 1881, p. 201 ; Blanford, Mamm. Brit. Ind. p. 89, 1888.
Lynx lynx wardi, Lydekker, The Field, civ, p. 576, 1904.
Lynchus isabellinus kamensis, Satunin, Ann. Mus. Zool. Acad. Sci. St. Petersb. ix, p. 13, 1904 *.

Vernacular.—*Patsalan* (Kashmir) ; *Phiauku* (Lahul) ; *Ec* (Baltistan) ; *Jungle Billi* (Dun).

Locality of the *type* of *isabellinus*, Tibet ; of *wardi*, Altai Mts. ; of *kamensis*, Kam, S.E. Tibet.

Distribution.—Tibet ; Kashmir ; Kuen Lun Mts. ; Turkestan, Thian Shan, and Altai Mts.

* Scully and, following him, Blanford quite correctly considered the characters upon which Blyth separated this Lynx from the typical Scandinavian Lynx to be not of specific importance, as Blyth thought. But since they occur in the skins I have examined they are worth distinguishing as of subspecific significance. The type of *wardi*, a skin with no skull, in the British Museum, is indistinguishable from the skin of *isabellinus* from Ishkoman, Gilgit, both being copiously silvered, with bright buff or ochreous-buff wool, except that the obscure pattern is brownish or fuscous instead of blackish. This is a difference of no importance. Hence Rasewig (' Semja Ochoton,' Moscow, no. 5, p. 106, 1908) correctly recorded *isabellinus* from the Altai. I can find nothing in the description of *kamensis* to justify regarding it as racially distinct from *isabellinus*.

Distinguished from the typical Scandinavian race by its paler, more "isabelline" underhair on the average, by the exposure of the pads in the winter coat, and apparently by its rather smaller skull.

The colour is variable seasonally and independently of the season. In several specimens observed in the Zoological Gardens, two of them captured in the Dharmo Valley, 10,000 ft., the short summer coat was rufous-tawny, with the back rather darker than the flanks, whereas in the longer, fuller winter coat the exposed portions of the hairs were extensively white, giving a decidedly grey aspect to the pelage, especially on the flanks. The distinctness of the pattern varied individually at all seasons*.

The individual variation in the colour and pattern of the winter coat is well illustrated by four skins received from Col. W R. F Trevelyan from the Gilgit district. One from Rostan, 10,500 ft., November, and one from Nagar, January, have the upper side mostly silvery-grey, varied by buffy patches, where the hairs are parted, and the pattern, consisting of black stripes dorsally and of black spots on the flanks and legs, stands out in bold relief. Another, from Ishkoman, December, is like the preceding in its grey hue, but the pattern is not black, is scarcely traceable dorsally, and is fuscous or brown on the legs. A young specimen, Gilgit, 6,500 ft., December, is not nearly so silvery as the last three, tawnier on the back and the fore quarters, with the head tawny and the pattern everywhere obscure. Another, from Gilgit, 5,000 ft. (Major Biddulph), December, is very like the last in the tawny hue of the back and silvered flanks and limbs, but the pattern is everywhere distinct, though not so distinct as in the skins from Rostan and Nagar. An undated skin from Yassin (Dr. Scully) is speckled grey and black and is similar to the skin from Ishkoman, Gilgit, but is more ochreous everywhere owing to the exposure of the wool by the moulting of the contour hairs, and the pattern is nowhere appreciable. Major D. G. Lowndes (Journ. Bomb. Nat. Hist. Soc. xxxiv, p. 234, 1931) saw at Lahul two adult specimens, in summer coat (August), which he described as "bright orange-red" and three half-grown cubs which were grey-brown, one showing signs of turning red.

Two skins from Tibet (Hodgson) vary similarly. One is brownish above, due to a blend of the black and buff of the contour hairs, with some silvering only low down on the

* These observations bear out Blyth's description of the differences between the summer and winter coats. His skins, said to have come from Tibet, were sent to him by a Mr. Lushington, who lived at Almora in Kumaun. Possibly, therefore, they were from "Little Tibet," which is part of Kashmir.

flanks; the pattern is black, but rather confused and less conspicuous than in the skin from Rostan, Gilgit, owing to the darker ground-colour. The other is greyer, but has no pattern. A skin from Kuen Lun Mts. (Capt. Wellby), August, in short summer coat, is tolerably uniformly tawny-red, without pattern, and differs from the silvery spotted Gilgit skins exactly as the reddish European skins differ from the silvery spotted skins.

The seasonal variation in the length of the coat (in mm.) in three skins is as follows :—

Locality and season.	Back.	Belly.	Cheek-fringe.	Ear-tuft.
Rostan, Gilgit (Nov.).	40	76	75	73
Tibet (winter)	40	89	65	50
Kuen Lun (summer)	30	42	50	45

None of the skins examined was measured in the flesh, and I am not aware that any recorded dimensions were so taken. Blanford gave the head and body as 33 in. and the tail as $7\frac{3}{4}$ in., and Col. Ward recorded a ♂ from Changchemno with the head and body 34 in., the tail 8 in.; but according to him the length of the head and body may be 46 in. This dimension must, I think, have been taken from a stripped and stretched skin. The measurements (in English inches) of three skins in the British Museum are as follows :—

Locality.	Head and body.	Tail.
Rostan, Gilgit .	36	$5\frac{1}{4}$
Ishkoman, Gilgit	42	$6\frac{3}{4}$
Tibet	40	7 (nearly)

In Blanford's and Ward's records the tail is exceptionally long for the head and body, and probably included the terminal hairs. The three skins in the British Museum are all probably stretched more or less in the head and body. Col. Ward's other specimen, if measured in the flesh, was a huge Lynx, as long as some adult Panthers. If taken from a stripped skin the record has little value. I have seen many living adult examples of the Lynx; but none was nearly so long as a normal Leopard.

The weight, according to Blanford, may be 60 lb.

The immature skull of the specimen, no doubt a ♀, from Nagar, Gilgit, has smaller teeth than those measured, pm^4 being 17 and m_1 $12\frac{1}{2}$ mm. Two supposedly ♂ skulls of typical *Lynx lynx* from Sweden, recorded by Miller, had a condylo-basal length of 143 and 144 mm. and a mandibular length of 109 and $108\frac{1}{2}$ mm. respectively.

Habits.—Of the habits of this Lynx very little has been recorded except that it has been stated to inhabit more open

Measurements (in mm.) of some skulls of the typical race of *Caracal* and of the only available adult skulls of *Lynx lynx isabellinus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
C. c. caracal.									
Cutch ; just ad. ♂	125	115	82	27	24	31	83	15	11
El Arish, N. Sinai ; barely ad. ♂	121	111	86	31	25	30	81	15	11
Dizful, Persia ; yg. ad. ♂ ?.	119	110	80	—	—	30	79	15½	11
Taif, near Mecca ; yg. ♀.	110	101	76	29	19	27	75	15—	10½
Aden ; younger ♀	109	101	73	29	20	28	75	16	11
L. l. isabellinus.									
Gilgit (Biddulph) ; ad. ♂	145	130	107	42	33	41	99	20	15
Kuen Lun (Wellby) ; ad. ♂.	147	131	106	42	33	40	100	19	15

and rocky districts than the typical form from northern Europe. To this Blanford attributed the more naked soles of its feet. Col. C. H. Stockley, however, informs me (*in litt.*) that it is "nearly always found in country where cover of dense vegetation is available, such as the willow-scrub in the Shyok Valley and patches of Tibetan gorse and grass in Rupshu. I have seen it at 9,000 ft. in June and at 18,000 ft. in July and August, so its range in elevation is great. It was said by the local people not to exist in the Mahomedan country forty miles below the junction of the Nubra with the Shyok, where the river begins to flow through a big and steep gorge, and I do not think it is anywhere partial to rocks and steep ground." It no doubt preys upon all the mammals it can overcome, from wild goats and sheep, especially the females and young, to hares and mouse-hares, as well as upon pheasants, francolins, and other birds.

Lowndes's report that he saw three half-grown cubs in August suggests that the litter consists of from about two to four, and that the young are born early in the year. Stockley also saw a half-grown litter in early August.

Genus **OTOCOLOBUS** Brandt.

Otocolobus, Brandt, Bull. Acad. Sci. St. Petersb. ix, pp. 37–9, 1841 (1842); Severtzow, Rev. Mag. Zool. (2) x, pp. 286–90, 1858; Pocock, Proc. Zool. Soc. 1907, p. 299, figs.; Birula, Ann. Mus. Zool. St. Petersb. xxi, p. 155, 1916; Ognev, Mamm. of USSR, etc., iii, p. 174, 1935.

Trichælurus, Satunin, Ann. Mus. Zool. St. Petersb. ix, p. 1, 1905; Pocock, Ann. Mag. Nat. Hist. (8) xx, pp. 335 & 349, 1917 *.

Type and only species of the genus, *Felis manul* Pallas.

Distribution.—Central Asia from Transcaspia to Mongolia and Kansu and southwards to Afghanistan, N. Persia, BALUCHISTAN, KASHMIR, and Tibet.

Distinguished from other genera of the Felinæ in external characters by having the short, slightly-angled ears set very wide apart and low down on the sides of the head, so that their inner rim hardly rises above the transverse plain of the forehead, which is exceptionally wide; and also by the pattern on the body, when visible, being represented by a few narrow transverse stripes restricted to the loins. The skull also has many peculiarities. It is very wide in its cranial portion and has the muzzle very short and steeply sloped, so that the

* Satunin introduced this name under the impression that *Otocolobus* was preoccupied by Brandt for a Ground-Squirrel (*Citellus*). He was misled by Palmer (Index Gen. Mamm. i, p. 487, 1904). Brandt, in 1844, accidentally substituted *Otocolobus* for *Colobotis*, which he had applied to the Rodent in question.

upper margin of the anterior nares is about on a level with the inferior edge of the expanded orbits; there is no noticeable excrescence adjoining the infraorbital foramen, and the temporal ridges are widely separated; the outer chamber of the bulla is exceptionally large, as capacious as the inner, the line of the partition running from the stylomastoid

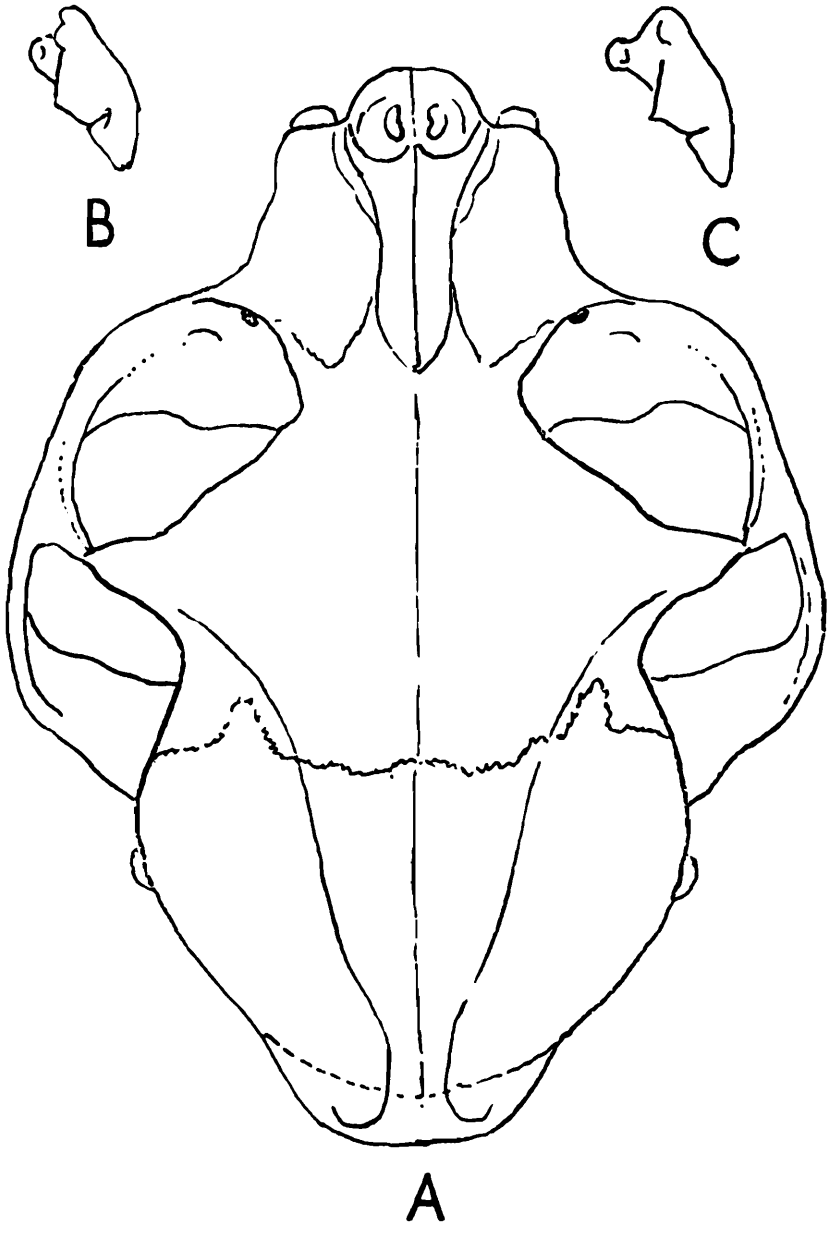


Fig. 75.—A. Upper view of skull of Pallas's Cat (*Otocolobus manul*) from Ladakh. B. Left upper carnassial (pm^4) of the same, showing reduction in size of the inner lobe. C. The same of the Indian Desert-Cat (*Felis constantina ornata*), showing the normal size of the inner lobe in *Felis*. A, nat size; B and C, enlarged.

foramen across the summit of the bulla to the occipital suture*. A peculiarity of the dentition is the reduction of the inner

* For the structure of the bulla in this and other genera of Felinæ see my paper in Ann. Mag. Nat. Hist. (8) xviii, p. 328, 1916.

lobe of the upper carnassial, hardly more than its root persisting ; also the normal small upper first premolar is absent.

From the general form and detailed structure of the skull it may be inferred that *Otocolobus* is a very specialized form of *Felis* exemplified by the European Wild Cat (*F sylvestris*) and by its near ally *F constantina*, of which *ornata* is the British Indian representative.

35. **Otocolobus manul** (Pallas). Pallas's Cat.

Felis manul, Pallas, Reise Russ. Reichs, iii, p. 692, 1776, id., Act. Acad. Sci. Petrop. pt. 1, p. 296, 1781 ; and of most subsequent authors till 1905, including Blanford, Mamm. Brit. India, p. 83, 1888.

Otocolobus or *Trichælurus manul* of most authors since 1905 or 1907.

Locality of the *type*, Dschida River, S. of Lake Baikal.

Distribution.—As recorded under the genus.

Size that of a small Domestic Cat, with the tail longish, nearly half the length of the head and body ; the coat long,

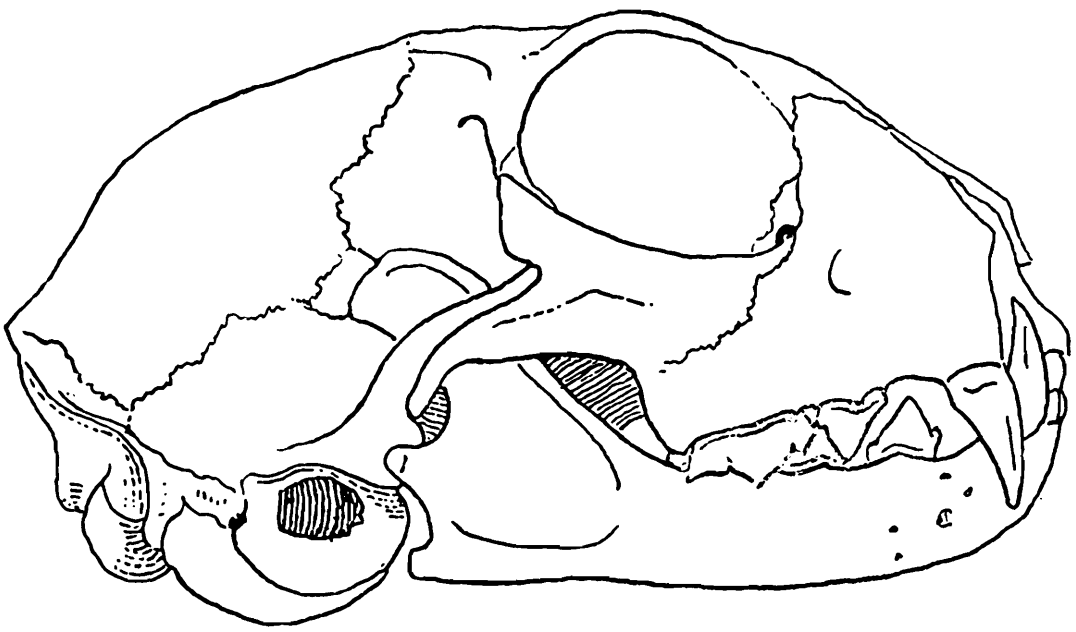


Fig. 76.—Side view of skull of Pallas's Cat (*O. manul*) from Ladakh. Nat. size.

full, and soft, and the tail bushy, hardly tapering at the point ; general colour above varying from silvery-grey to whitish-tawny or reddish, below with the chin, fore throat, and belly white, the hind throat and chest dusky or brownish ; tail, apart from its stripes, rather paler than the back ; the legs like the flanks above, but becoming buffy to ochreous on the paws, which are either black or buff beneath ; the pattern is very variable in its distinctness, at its best consisting of crowded black spots on the crown and a few, mostly short,

vertical stripes on the hind back and loins, the longest and most conspicuous being the first, set mid-way between the shoulders and the root of the tail ; there may be some indistinct spots on the thighs, but the stripe on the fore leg below the elbow is always conspicuous ; the tail may have about six stripes ; three in its proximal half are narrow and widely spaced above, but expand below, and three in its distal half are broad and closer together and expand and generally unite below, the last fusing with the black tip, so that the underside of the terminal part is mainly black ; the backs of the ears are greyish or fawn-grey, there is some buff on the muzzle, white round the eyes, surrounded by a narrow black rim, giving a " spectacled " appearance to the face, and two black stripes on the cheeks, with a whitish area between them, run back to fuse with the dusky patch on the fore throat. The pattern of the face is very clearly disruptive.

The typical northern race, according to Birula, has the winter coat " flavescent " white, with very little black in it, the wool " rufescent," the head greyish-white above and not densely spotted with black, the hind back marked with some more or less conspicuous or almost obsolete stripes, and the tail obsoletely striped. The only skin I have seen, from the Kirghiz Steppes (Brandt), has the head distinctly spotted, but there are hardly any stripes on the hind back.

Satunin admitted two species of *Trichælurus*, a northern, *T. manul*, ranging from Tartary through Siberia to the east of Lake Baikal, and a southern, *T. nigripectus*, found in Tibet and Kashmir. In 1907 I suggested that the latter was at most a subspecies of the former ; and that view was adopted in 1916 by Birula, who mentioned some particulars in the colour and pattern of the winter coat and some cranial characters by which the two might be distinguished. It does not seem that he had many specimens, if more than one, of *nigripectus* to judge from ; and the material of this cat at my disposal shows that the colour and pattern of *nigripectus* are more variable than he supposed, and that the alleged cranial differences, on which he and, following him, Ognev relied, do not exist*. Since, however, it is highly probable that the Pallas's Cats of two such widely separated areas are racially distinct, I have adopted that opinion.

* He claimed that in typical *manul* the nasal bones are gradually narrowed from front to back, and that the presphenoid is expanded in front, *i. e.*, not overlapped by the palatine bones forming the adjacent floor of the mesopterygoid fossa, whereas in *nigripectus* the nasals are strongly constricted a little behind the anterior nares and the presphenoid is narrow in front. In an adult skull of *nigripectus* in the British Museum the nasals are only slightly constricted and the presphenoid is expanded in front.

35 *a*. Otocolobus manul nigripectus (Hodgson).

Felis nigripectus, Hodgson, Journ. As. Soc. Beng. xi, p. 276, pl., 1842.
Otocolobus nigripectus, Satunin, Ann. Mus. Zool. St. Petersb. ix, p. 9, 1905.
Trichælurus manul nigripectus, Pocock, Proc. Zool. Soc. 1907, p. 302 ; Birula, Ann. Mus. Zool. St. Petersb. xxi, p. 133, 1916.

Locality of the *type*, Tibet.

Distribution.—Tibet and KASHMIR.

Distinguished, according to Birula, from the typical northern race by the winter coat being silvery-grey, with more black in it, the wool paler, the head thickly spotted with black, and the stripes on the hind back and tail more conspicuous.

The few skins in the British Museum show individual variation. One from the Yamdok Lake, Tibet, 15,000 ft. (Col. Waddell), September, is silvery-grey, the contour hairs being white distally, with a small black tip ; the underhair is ochreous and shows beneath the contours, especially on the flanks ; the hind back has a few widely spaced stripes, and the tail, which is not so silvery as the back, has six or seven black, annuliform stripes and a black tip ; the crown is darker than the back and covered with black spots ; the fore leg has the paw ochreous above, black below ; the hind leg is cream in front, ochreous behind below the hock, with the paws black below, and there are some indistinct stripes on the outside of the thigh.

One of Hodgson's Tibetan skins, with the head missing, is like the last, but the soles of the paws are buff. Another differs in having much less silvery speckling, owing to the moult of most of the contour hairs ; the nape and the top of the head are largely black and the wool is all darkish grey, with no bright colour. The differences are probably seasonal. A fourth skin, from Ladak (Capt. Strachey), apparently the only example of the race hitherto recorded from British Indian territory, differs from the skin from the Yamdok Lake in its fuller coat, deeper ochreous wool, absence of stripes on the loins, and the stripes on the tail not so strong, except at the end It clearly comes nearer the typical form as described by Birula, and in its richer-tinted wool connects typical *manul* with the next described race.

35 *b*. Otocolobus manul ferrugineus Ognev.

Felis manul, Radde & Walter, Zool. Jahrb. iv, p. 1013, 1889.
Otocolobus manul ferrugineus, Ognev, C. R. Acad. Sci. URSS, p. 308, 1928 ; id., Mamm. of USSR, etc., iii, p. 186, 1935.

Locality of the *type*, Transcaspia.

Distribution.—Transcaspia (Askhabad; Serachs according to Radde), N. Persia, Afghanistan, and BALUCHISTAN.

Distinguished from the more northern races of the species and from *O. manul nigripectus* by the rusty-reddish hue of the pelage.

This "red" form of *O. manul* has been known to me for many years from trade skins for which no definite localities were known. I regarded them as "erythristic mutants" of the normal form; but since the phase appears to have a definite distribution, it may be regarded as a subspecies, as Ognev claimed. There are two skins of it in the British Museum. One from Meshed in N. Persia (Major P. M. Sykes) has the wool bright red, only sparsely silvered by the contour hairs, and the pattern is everywhere obsolete, being red where it is faintly detectable. The other, from the Toba Plateau, on the southern Afghan–Baluchi border (Col. Wilson), has the wool not so red as the last, but much more rusty-ochreous than in *nigripectus* and less concealed by the silvery contours. It also has distinct blackish spots on the head and stripes on the cheeks, but those on the loins and tail are very faint. This skin is intermediate between the skin from Meshed and the skin of *nigripectus* from Ladakh. The evidence that *ferrugineus* comes into the British Indian fauna is supplied by a very red skin preserved in the McMahon Museum at Quetta and secured by Sir Henry McMahon, as he told me *in litt.*, in "the mountainous wooded tract between Ziarat and Hindubagh in the Zhob district of Baluchistan, 100 miles east of Quetta."

The following dimensions (in English inches) of the two races of *T. manul* here recorded are taken from skins, no flesh-measurements being available :—

Name, locality, and sex.	Head and body.	Tail.
nigripectus.		
Tibet (flat skin, Zool. Soc.); ad. ♂	20	9
Yam Lak, Tibet (made-up skin); imm. ♂	20	9½
Tibet (Hodgson); ? ad. ♂ .	18¾	8¼
ferrugineus.		
Toba Plateau (flat skin); ? ♂ .	26	11¼
Meshed; ♀ . . .	24	12

The measurements suggest that *ferrugineus* may be a larger form; but taken from preserved skins they are quite unreliable.

The weight of typical *manul*, according to Pallas, is from 6 to 7½ lb.

The following are the measurements (in mm.) of two skulls of *nigripectus* :—

Locality and sex.	Total length.	Condylo-basal length.	Zygomatic width.	Postorbital width.	Interorbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Ladakh ; ad. ♂ . .	93	85	71	39	19+	26	63	12	9
Tibet ; younger ♂ .	85	75	69	41	19	23	56	10	8½

The measurements of the skull from Tibet, which is no longer available, are taken from my paper published in 1907. Apart from its smaller size, it differs from the Ladakh skull in having the postorbital bar mesially incomplete and the forehead between the eyes not quite so flat, both, no doubt, a question of age.

Habits.—Col. C. H. Stockley tells me (*in litt.*) that he saw a fine specimen of this cat amongst the sand-hills at the south end of the Tso Moriri Lake in August 1911. It was basking on a little patch of sand just below an overhanging bush, and he watched it at close range for some minutes. Nothing else, however, has been recorded of the habits of the two races described above, but they probably differ in no important respects from those of the northern race, which inhabits rocky districts of Central Asia and preys on small mammals, especially picas or mouse-hares (*Ochotona*) and birds. Its pallid colour matches its surroundings, and the high-set eyes, short, low-set ears, and flat forehead are adaptations for peering at prey over the edge of a sheltering rock with the smallest possible area of the head exposed. A specimen kept in the Zoological Gardens carried its tail low, with the end, which was continually jerked up and down, upcurled, displaying the black of its underside. Its "spit" was a short, sharp "ts, ts, ts," projected through closed lips, and its sexual call was a combination of the bark of a small dog and the "hoot" of an owl.

Subfamily ACINONYCHINÆ.

Resembling the Felinæ in having a normal hyoidean apparatus, but differing in the structure of the feet, which have lost all trace of the cutaneous lobes constituting the projecting sheaths of the claws*. The claws of the four main

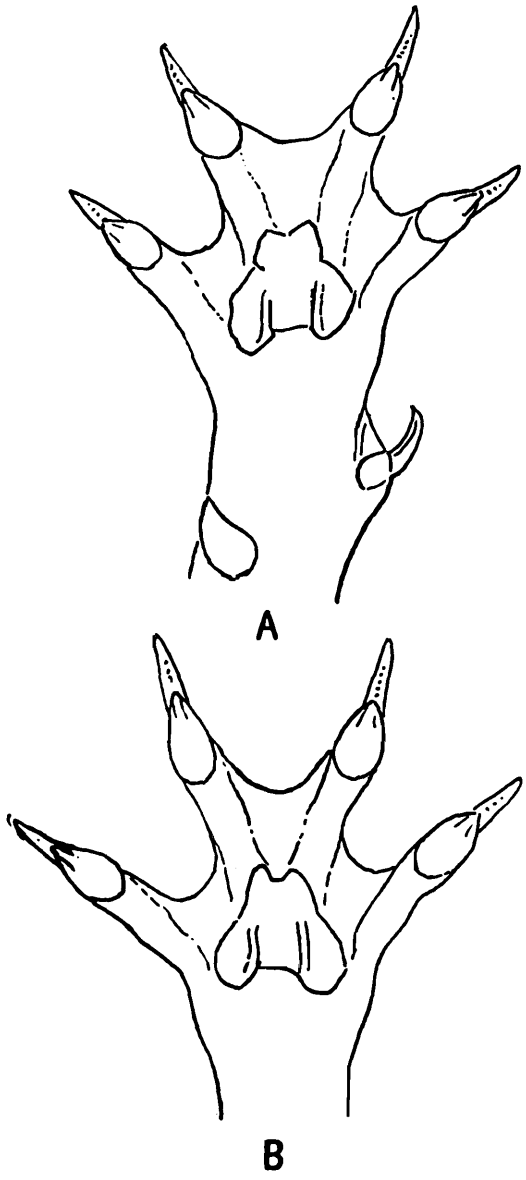


Fig. 77.—A. Lower side of fore paw of Hunting Leopard (*Acinonyx jubatus*), stripped of hair to show the absence of the cutaneous claw-sheaths, the pointed digital pads, the ridged plantar pad, and shallow webs. B. The same of the hind paw.
(For comparison with the paws of the Leopard, p. 195.)

* There has been a good deal of misapprehension about the retractability of the claws of the Cheetah; but J. G. Wood was not far wide of the truth when, about 70 years ago, he stated, after examining the paw of a living specimen, that "the claws were as retractile as those of a cat."

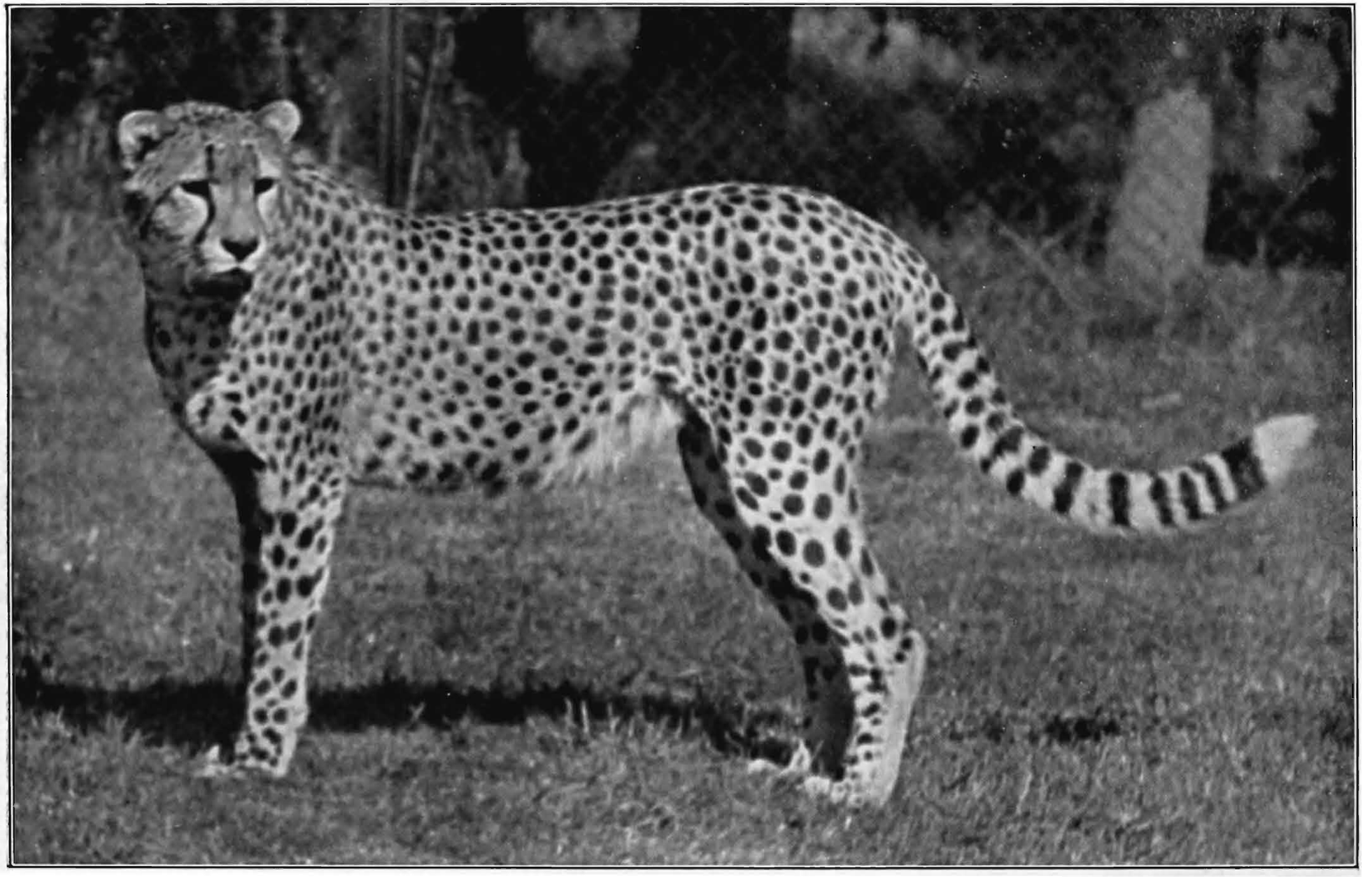


Photo D. Seth-Smith.

Cheetah or Hunting Leopard (*Acinonyx jubatus*).

digits of the front and hind paws are comparatively blunt and only slightly curved, but on the first digit, the "dew-claw," of the fore paw the claw is large, sharp, and strongly curved. The digits themselves can be considerably spread owing to the shallowness of the webs, the pads are hard, the digital pads being compressed at the tips, the plantar pads have a pair of low ridges, and the carpal pad is conical and pointed at the end. Other characters of the single representative of this subfamily, *Acinonyx jubatus*, are mentioned under the generic and specific descriptions.

Genus **ACINONYX** Brookes.

Acinonyx, Brookes, Cat. Mus. Joshua Brookes, p. 16, 1928*; Palmer, Index Gen. Mamm. p. 74, 1904; Hollister, Proc. Biol. Soc. Wash. xxiv, p. 226, 1911.

Cynailurus, Wagler, Syst. Amphib. p. 30, 1830 (*Cynælurus* of many subsequent authors).

Guepardus, Duvernoy, L'Inst. Paris, ii, p. 145, 1834.

Cynofelis, Lesson, Nouv. Tabl. Règne Anim. p. 49, 1842.

Type-species of *Acinonyx*, *venator* (=*venatica*); of *Cynailurus*, *jubatus*; of *Guepardus*, *guttatus*; of *Cynofelis*, *jubatus*.

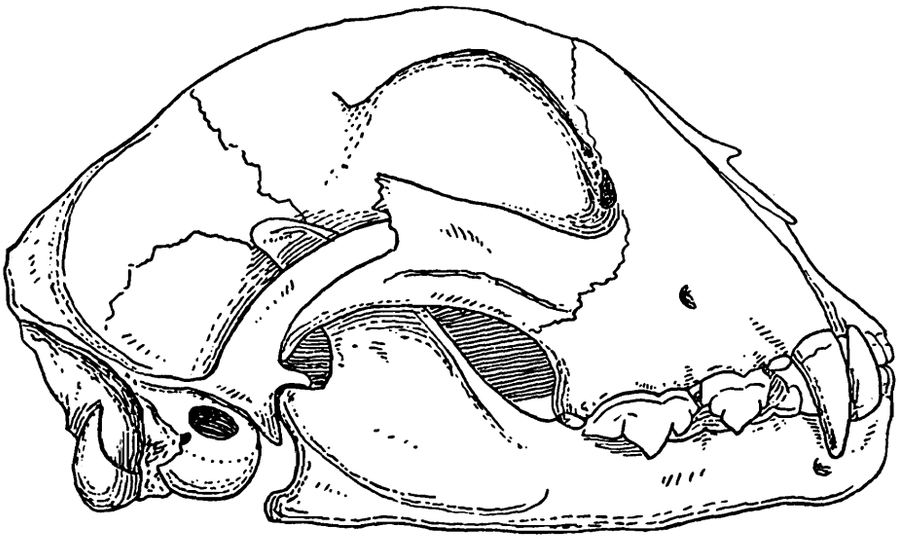


Fig. 78.—Side view of adult ♀ skull of Hunting Leopard (*Acinonyx jubatus*) from Nigeria, showing especially the domed crown and small post-canine space. × ½.

Distribution.—As under the species.

The best generic characters are supplied by the skull, which differs from that of other Felidæ in a combination of features, of which a few may be mentioned. It is short and dome-

* I am compelled to take this reference on trust, there being no available copy of this Catalogue of Brookes's collection to consult.

shaped, the facial and cranial portions sloping tolerably steeply and evenly from its highest point a little in front of the very short postorbital processes, which are situated near the middle of its length; and, in conformity with the downward slope of the crown, the basicranial axis is inclined upwards, not in the same plane as the basifacial axis. There is no trace of sagittal crest, and the suborbital portion of the zygomatic arch is hardly at all salient, and is in about the same plane as the outer surface of the maxilla, which has a very small, low-set, often divided infraorbital foramen. The nares, especially the posterior, are large. The mandible is weak, with a straightish inferior edge and a nearly vertical chin; its anterior dental area is not raised, the sockets of the front teeth being in line with those of the cheek-teeth behind. On account of this feature, combined with the close proximity of the upper and lower premolars to the small canines and the absence of the cusp on the small inner lobe of the upper carnassial permitting the anterior blade of the lower carnassial almost to reach the palate, there is no trace of post-canine space when the jaws are closed. The skull, as a whole, shows very little evidence of muscular development, and its bone is thin and light. In its general shape and the closure of the jaws it is the very opposite of the skull of the Clouded Leopard (see p. 247).

36. **Acinonyx jubatus** (Schreber). The Hunting Leopard or Cheetah.

Felis jubata, Schreber, Säug. iii, pl. 105, 1776, text p. 392, 1777.
Cynailurus or *Cynælurus jubatus* of most authors, including Blanford, from 1830 to 1911.
Acinonyx jubatus, Hollister, Proc. Biol. Soc. Wash. xxiv, p. 226, 1911.

Locality of the *type*, Cape of Good Hope.

Distribution.—The northern part of PENINSULAR INDIA, South-west Asia, and the greater part of Africa, except the central forested area.

Bodily size and length of tail very much as in the Panther (*P. pardus*), but the body not so robust, the head, with rounded ears, relatively considerably smaller and shorter, and the legs much longer and thinner, with small compact paws, adapted for swift running. The coat is short, with or without underwool, according to the season, and in the winter at least, usually at all seasons, is developed into a mat of longish hair up to 3 in. or more in length, the so-called "mane," which extends down the nape and over the summit of the shoulders. The mystacial vibrissæ are short, the others poorly developed, if present, but there is a row of rigid lashes on the upper eye-

lid. The general ground-colour of the upper side varies from tawny to pale buff or greyish-white, but the distal end of the tail is white above; there is some white about the eyes and on the muzzle below the rhinarium, and the whole of the underside is white from the chin to the tail-tip. A constant feature of the pattern is a conspicuous black stripe extending from the eye to the mouth on each side. For the rest the pattern consists normally* of tolerably closely-set solid spots, not "rosettes," showing lineal arrangement at most only on the head and nape, where they are smaller than on the body; small spots extend to the paws and large spots along the proximal two-thirds of the tail, but on the terminal third they form transverse black stripes, the tip being normally white.

The "mane" on the nape and shoulders of the adult, above described, is the remnant of an extensive mat-like growth of long hair which in cubs covers the whole of the upper side from the crown to the root of the tail. This gradually disappears as growth advances. In the cubs of all the other species of Felidæ the hair is of tolerably uniform length all over the body.

The first two specific names unquestionably given to Hunting Leopards were fortunately applied to specimens from districts at the extremes of the geographical range of the genus, namely, South Africa and India. These appear to be at most racially distinguishable. The South African form, *A. jubata jubata*, has a thicker, more woolly coat, at least in winter, a feature which suggested the name *laneus* given to a red-spotted variety of it from Beaufort West by P. L. Sclater. Other names have been used for this animal, some of doubtful application, but they are for the most part of later date than the name here taken for the Indian race, and it is probable that the Indian form extends into North Africa. There is no evidence, for example, that the Cheetah of Somaliland is distinct from it.

36 *a*. **Acinonyx jubatus venaticus** (Griffith).

Felis venatica, Griffith, Vert. Anim., Carnivora, p. 93, 1821; Gray (*nec* H. Smith), Griffith's Anim. Kingd. v, p. 166, 1827.
Acinonyx venator, Brookes, Cat. Mus. Joshua Brookes, p. 16, 1828.

* Except in the Rhodesian form that I named *Acinonyx rex*, in which the pattern consists of longitudinal bands down the back and large stripe-like blotches, often fusing, on the flanks. This is no doubt only a "mutant" of the ordinary African Cheetah, not a distinct species. In some abnormal Leopards a similar variation of pattern occurs.

Cynælurus or *Cynailurus jubatus*, Blyth, Blanford, and other writers on the fauna of India *.

Locality of the *type* of *venatica*, and *venator* also according to Hollister, India.

Distribution.—Formerly NORTHERN INDIA south of the Ganges from Bengal to Rajputana, the Punjab, and Sind; also CENTRAL INDIA and the northern part of the DECCAN, but now almost, if not quite, extinct in Hindustan. Probably the Persian and Mesopotamian Cheetah, also almost extinct, belongs to this race.

Distinguished from typical *jubatus* from Cape Colony by its thinner, less woolly winter coat and by the absence of the mane, according to Griffiths, probably in the summer coat.

Griffith described this Cheetah as "the maneless Hunting Leopard," and published a coloured plate of the example he saw, showing a perfectly smooth nape and a short, sleek, no doubt summer coat. The only Indian example I have seen † has a fairly long, soft coat, with a little underwool, but there is a decided mane, running down the nape and over the shoulder. It is probably in winter coat, the hair on the back and sides being about 25 mm., on the belly 90 mm., on the mane of the fore nape 55 mm., and over the shoulder 80 mm. The colour is buffish-tawny or sandy-fawn down the back, becoming gradually paler on the sides, the tint of which blends with the white of the belly. The entire underside from the chin to the tip of the tail and the inner sides of the legs are white, and there is some white on the front of the muzzle, below the eye, and above it in front, involving and emphasizing the upper end of the black stripe curving down from the eye to the mouth. The small spots on the head and nape are lineally arranged, but elsewhere on the body and legs they are irregularly scattered and black, extending to the paws and over the greater part of the tail, but the terminal 9 or 10 inches of the tail have transverse black stripes; the ear is tawny at the summit externally, black at the base, the black extending higher behind than in front. The pattern differs in no respect from that of typical African Cheetahs. No flesh-measurements

* Blanford's omission of *venaticus* from the synonymy of the Indian Hunting Leopard is curious. Hollister, who revived the name for the Indian form, to which he gave full specific rank, presumably solely because of its distribution, was unacquainted with the first description of 1821 and assigned it to Hamilton-Smith; but Gray wrote the accounts of all the Mammals, except the Ruminants, in vol. v of Griffith's 'Animal Kingdom' (Saunders, 'Gray's List of Memoirs,' etc., p. 6, 1875).

† This skin, from Jubbulpore, C.P., was kindly sent to me for the British Museum by Mr. J. A. Clough in response to my appeal for an Indian Hunting Leopard, which was not at the time represented in the National Collection.

are available, but the dressed skin, allowing for the loss of about half an inch at the tip of the tail, is :—Head and body 50 in. ; tail 27 in. ; hind foot 9½ in.

The skull of the Indian Hunting Leopard is unknown, but the measurements (in mm.) of two African skulls are as follows :—

Locality and sex.	Total length.	Condylo-basal length.	Zygomatic w dth.	Postorbital width.	Interorbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Brit. Somaliland ; just. ad. ♀ . . .	150	139	107	50	34	43	105	22	17
Zoutpansberg, S. Afr. ; ad. ♀.	193	172	131	54	42	53	133	24	19

These are the largest and smallest ♀ skulls available for measurement. They probably represent approximately the extremes in size for that sex. The one from S. Africa is typical *jubatus*. Hence, if the suggestion that the Indian Hunting Leopard is the same as the one inhabiting Somaliland is correct, the difference in dimensions between the two skulls probably indicates that *venaticus* is a smaller race than *jubatus*.

The other Asiatic race, the Transcaspian Hunting Leopard, *A. jubatus raddei* Hilzheimer (SB. Ges. Nat. Fr. Berlin, no. 5, p. 291, 1913), apparently differs from typical *venaticus* by its fuller winter coat. Hilzheimer divided the Hunting Leopards of Africa and Asia into several " species," *A. raddei* being one of them. Ognev (Mamm. USSR, iii, p. 309, 1935) cited *raddei* as a race of *venaticus*, accepting, apparently, Hollister's specific separation of the Asiatic from the African forms. In my opinion the differences between all Hunting Leopards are too trivial to be given more than subspecific status.

Habits.—The names *Cynailurus* and *Cynofelis* (Dog-like Cat) reflect the opinion, still apparently held by some sportsmen, that the Hunting Leopard serves to connect in a measure the Cat and Dog families. The resemblance to the Dog, however, is purely functional and superficial. The Hunting Leopard is in reality a highly specialized cat. Its structural peculiarities have been secondarily acquired in adaptation to its method of hunting. Instead of leaping on its prey from a point of vantage, at comparatively close quarters, like the majority of cats, this species, as a general rule at all events, runs down antelopes in the open by sheer speed of foot, after creeping as near its quarry

as possible under cover of low vegetation All its more obvious external characteristics are clearly modifications for insuring success in the enterprise. Its sandy hue, broken up by the black pattern, must favour concealment during the stealthy stalk and during the initial rush when cover is quitted. Similarly the small, light head, narrow body, powerful hind-quarters, long, sinewy legs, and paws with spreading digits, free claws, and hard pads, are all clearly fitted for traversing hard, open ground at topmost speed ; and the enlarged nasal passages are a provision for a plentiful supply of oxygen to the lungs in the event of the continuance of the chase over a distance of a quarter of a mile or more. Also the high dome-shaped skull, with uplifted orbits, enables the Cheetah to peer over the top of low bushes or other cover with the least possible exposure of the head when the quarry is being stalked.

The Cheetah, like the Lion, Hyæna, and some other species common to Africa and India, entered India by way of Persia and Baluchistan. It formerly had a wide distribution in Western and Central India south of the Ganges, and extended through the Deccan at least as far south as Coimbatore (R. C. Morris), its range agreeing tolerably closely with that of the Blackbuck. But it is now to all intents and purposes a thing of the past so far as the fauna of India is concerned. Being mainly diurnal, and frequenting comparatively open country, and defenceless as well, it was easily found and killed by native and English shikaris, the latter enjoying the sport of killing it on horseback with a spear, the greater endurance of the horse enabling it to overtake the quarry in the end.

The habitat was the open plains or the low hills bordering them, any kind of cover or rock-shelter being used to lie up in. Cheetahs climb when young, but very seldom do so when adult, unless treed by dogs.

At an early date Indian potentates took advantage of the Cheetah's quiet disposition, docility, and peculiar method of hunting to tame and employ it for coursing Blackbuck*. The Cheetahs, it is alleged, had to be caught full grown, after learning how to hunt from accompanying their parents. If taken as cubs and reared in captivity, training them was a tedious unsatisfactory task.

They were commonly caught in nooses set about trees which it was known they were in the habit of visiting to " sharpen " their claws. Taming them was not a long process. When taken out for the chase the Cheetah was hooded, after the manner of a hawk, and tethered on the top of a low bullock-

* Since the Indian Cheetah became rare, specimens have been regularly imported from Africa to replace it for this sport.

cart. The cart was then driven as near as possible to the antelope, which paid little heed to it. The Cheetah's hood was then taken off and the animal, on sighting the antelope, slipped from the cart and either went headlong at the herd, if near enough, or stalked it, making use of any cover nearby, until within rushing distance, perhaps of 100 yards or so. Traversing the ground with such speed that the species has been described as the fleetest of mammals, the Cheetah often overtakes the rearmost of the herd, which gets under way the moment it perceives the Cheetah approaching. The victim, perhaps one of the slower bucks, is usually apparently struck over by a blow of the Cheetah's fore paw, is then seized by the throat, to which the Cheetah holds on until enticed to let go by the offer of a ladle of blood taken by one of the men from the antelope's arteries. The hood is then slipped on again and the beast put back on the cart. If, however, the herd has sufficient start, the Cheetah, which is short-winded in comparison, and can only keep going at full speed for at most about 600 yards, may fail to get up to it and abandons the chase. So far as I am aware Dunbar Brander is the only authority to maintain that the speed of the Blackbuck, once fully under way, is faster even that the initial speed of the Cheetah ; and he makes the suggestion that the "incredible" speed of the Blackbuck and of the Chinkara, surpassing he says, but I know not on what authority, that of any African antelope, has been acquired as a means of escape from the Indian Cheetah.

His view that the speed of these antelopes exceeds that of the Cheetah is probably correct ; but it must be remembered that such African antelopes as the Springbuck, Grant's Gazelle, the Impala, and others have been chased for generations by Cheetahs, and have the same need of speed to escape them. They are probably as fleet as the Indian species. As regards the actual speed of the Cheetah, Mr. Gandar Dower, who recently imported trained specimens from E. Africa and tested them against a motor-car, found that they travelled at the rate of 45 miles per hour when apparently going at full speed, that is to say, they can cover a quarter of a mile, nearly the full distance they can keep it up, in 20 seconds, and 100 yards in about $4\frac{1}{2}$ seconds, faster than the best greyhound and twice the speed of the fastest human "sprinter."

It seems clear that this exceptional speed for a carnivorous mammal was acquired by the Cheetah, both in Africa and elsewhere, for the capture of fleet-footed antelopes, represented in India by the Blackbuck and Chinkara mentioned above. But they preyed upon other game as well. They have been known to attack Nylghaie and to take domesticated goats and sheep ; and no doubt they fed upon smaller mammals, like hares, and upon birds as well. It may be assumed,

moreover, that they frequently hunted in couples, as has been observed in the case of the African races.

As above stated, Cheetahs are timid animals, never known, apparently, to attack man unprovoked, and only rarely to charge when wounded.

The sounds they make are typically "feline." They growl, snarl, spit, mew, and purr like a domestic cat, sure evidence of close kinship, but in addition they have a whistling note like a bird's.

The period of gestation in an African Cheetah was stated to be about thirteen weeks (90 days), and the young, two or four to the litter, are born, with the eyes closed, in any convenient shelter.

Family VIVERRIDÆ.

Distinguished in external characters from the Felidæ by the hind foot being five-toed owing to the invariable presence of the first digit, by the retention of the interramal tuft of facial vibrissæ, and typically by the longer muzzle and shorter limbs. The skull differs by the position of the post-palatine foramina on the maxilla, almost always well in advance of the maxillo-palatine suture*, and usually about the level of the second premolar; by the distinct external division of the auditory bulla into its two elements either by a definite groove or, when rarely this is obliterated, by the depression of the tympanic bone in front of the swollen entotympanic. The dental formula is, typically, $i.\ \frac{3}{3}$, $c.\ \frac{1}{1}$, $pm.\ \frac{4}{4}$, $m.\ \frac{2}{2} = 40$, but the number may be reduced, although never to the same extent as in the Felidæ; and in all the British Indian representatives of the family the lower carnassial (m_1) differs from that of the Felidæ by retaining the inner cusp (metaconid) of the anterior part of the crown and by the presence of a definite "heel."

This family, which is clearly less specialized than the Felidæ, contains a great number of highly diversified genera, and is susceptible of division into several subfamilies, based mainly on the structure of the feet and of some highly specialized scent-glands, derived from the skin, which are present in most of the species and are situated in the region of the external generative organs. The feet vary in accordance with the terrestrial or arboreal habits of the animals. In those that live mainly on the ground, like the Civets, the feet

* In one skull of the Binturong (*Arctictis*), from Borneo, aberrant in this respect, the foramina are only about 1 mm. from the suture as far back as the upper carnassial (pm^4).

may resemble very closely those of the Felidæ, even to the possession of lobes of skin to protect the points of the retractile claws; but in the arboreal species like the Tree-Civets and Binturong the feet are very different, especially in the large size of the carpal and metatarsal pads, although the claws are usually sharp and curved and retractile to a certain extent. The scent-glands consist of an hypertrophied mass of sebaceous glands which, when the organ is highly developed, pour their secretion into an extensive pouch formed of two thick flaps of skin, the edges of which are capable of being tightly pressed together, closing the pouch and storing the secretion. These glands are usually found tolerably equally well developed in both sexes; and from observation on captive animals which have been seen to rub the secretion on the walls, bars or other parts of their cages, it seems that the perfume is used to scent a locality and enable the animals to find each other.

The Viverridæ are the most primitive of all the families of Æluroid Carnivora. They are found all over the Oriental Region and even beyond it across "Wallace's line," all over Africa, whence they pass into southern Europe, and they are the only indigenous Carnivora inhabiting Madagascar, unless the Fossa (*Cryptoprocta**) be granted family rank. Their occurrence in Madagascar and in Celebes, as well as some of the adjoining islands, shows them to be ancient inhabitants of the tropics of the Old World.

In his volume on British Indian Mammals, Blanford, following the custom of his day, included in the Viverridæ the Mongooses as a special subfamily, Herpestinæ. They are here regarded as a distinct family, the Viverridæ of this volume being equivalent to Blanford's Viverrinæ.

Key to the British Indian Subfamilies, based mainly on External Characters.

a. No scent-glands, perinæum short, prepuce close to scrotum and vulva to anus; feet terrestrial, digitigrade; m^1 small, m^2 absent, m_1 with small heel .. . . [p. 332. **Prionodontinæ,**

a'. Scent-glands present, at least in ♀, perinæum longer, prepuce always far in advance of scrotum in ♂; m^1 large, m^2 present, m_1 with large heel.

b. Scent-glands present in both sexes, in ♂ perinæal, between scrotum and prepuce, in ♀ behind the vulva or encircling it.

c. Feet terrestrial, digitigrade, carpal pad remote from plantar pad, single and conical; metatarsal pads absent, hind foot hairy from heel downwards; scent-glands opening into highly specialized pouches [p. 342. **Viverrinæ,**

* This genus has by some zoologists been classified with the Felidæ. It has nothing whatever to do with them.

c'. Feet scansorial, semiplantigrade, carpal and metatarsal pads double, touching, and as wide as the plantar pads inferiorly; glandular pouches less specialized.

d. Scent-glands large, in ♀ surrounding vulva, in ♂ extending to prepuce, penis not pendulous; carpal pads not narrowed above, the whole or greater part of the hind foot naked from the heel. . [p. 376. **Paradoxurinæ,**

d'. Scent-glands comparatively small, not extending to vulva in ♀ or to prepuce in ♂; distal end of penis pendulous; carpal and metatarsal pads narrowed above, greater part of hind foot hairy from heel .. .. . . [p. 450. **Hemigalinæ,**

b'. Scent-gland absent in ♂, present in ♀, but mainly in front of vulva; feet as in Paradoxurinæ [p. 439. **Arctogalidiinæ,**

Subfamily PRIONODONTINÆ.

Prionodontinæ, Gray, Proc. Zool. Soc. 1864, p. 519 (in part); Pocock, Proc. Zool. Soc. 1933, p. 970 (*sensu stricto*).

Linsanginæ, Pocock, Ann. Mag. Nat. Hist. (8) xvi, p. 350, 1915 (in part)*.

Distinguished from the other British Indian subfamilies of Viverridæ by the absence in both sexes of the perinæal scent-glands, coupled with the shortness of the perinæum itself, the vulva being close to the anus and the short penis to the scrotum as in the Felidæ. The teeth also are more highly specialized, and show an approach to those of the Felidæ, although more primitive. The dental formula is:— $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{4}{4}, m.\frac{1}{2} = 38$. The incisors form a transverse, not a curved, line; the first three upper and the four lower premolars are compressed and trenchant, with a high, sharp, median cusp and small subsidiary cusps in front and behind it; the upper carnassial (pm^4) has a small inner lobe (protocone) set far forwards, a small cusp (parastyle) in front of the main compressed, high, pointed cusp (paracone), and a compressed, blade-like posterior cusp (metacone); the upper molar (m^1) is much smaller than the upper carnassial, triangular, transversely set, and much wider than long, so that the upper carnassial is nearly at the posterior end of the upper cheek-teeth as in the Felidæ. The second molar, present in the other

* Following Gray, I originally affiliated the West African genus *Poiana* with *Prionodon*, but evidence since found on made-up skins of the existence of scent-glands in *Poiana* induces me provisionally to regard the latter as a specialized form of *Genetta*, its likeness to *Prionodon* being possibly adaptive. In the structure of the feet, as I showed in 1915, *Poiana* is more like *Genetta*, and the paroccipital bone does not form a thickened prominence as in *Prionodon*.

subfamilies, is undeveloped. In the lower jaw the fore part of the carnassial has two compressed blade-like cusps as in the Felidæ, but there is a small cuspidate metaconid on the inner side, and the heel, although small, is as wide as the fore part of the crown and about one-fourth of its length.

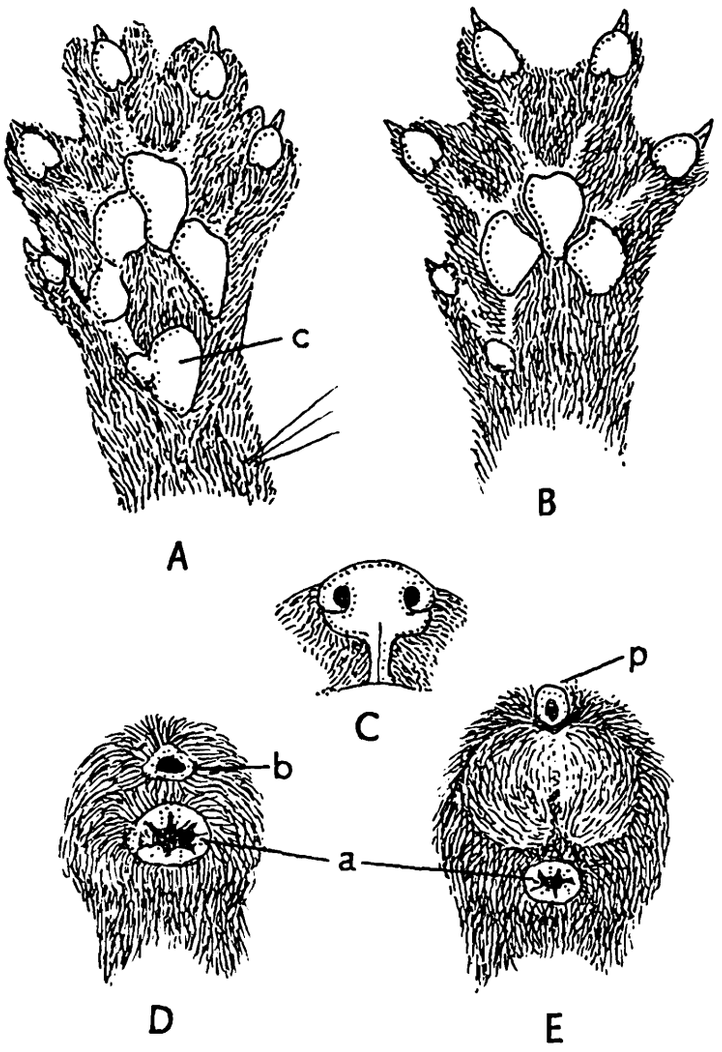


Fig. 79.

A. Left fore-paw of *Prionodon linsang*, showing the claw-sheaths, the four-lobed plantar pad, and the bilobed carpal pad (*c*).
B. Left hind paw of the same, showing reduced claw-sheaths and the three-lobed plantar pad, with its inner or hallucal lobe small and remote.
C. Rhinarium of the same from the front.
D. Anal and genital area of female of the same, showing the vulva (*b*) close to the anus (*a*), with no gland on the narrow perinæal region between them.
E. The same of male, showing the area between the penis (*p*) and the anus (*a*) occupied by the scrotum.

In the very small size of the first upper molar, the loss of the second, and the greatly reduced heel of the compressed lower carnassial this subfamily differs from the rest found in British India.

Genus **PRIONODON** Horsfield.

Linsangs.

Prionodon, Horsfield, Zool. Res. Java, no. 5 (under *Mangusta javanica*), 1822 (Sherborn); and of several subsequent authors, including Blanford; Pocock, Proc. Zool. Soc. 1933, p. 970 *.

Prionodontes, Lesson, Nouv. Tabl. R. Anim. p. 60, 1842.

Linsang, S. Muller, Verh. Nat. Gesch. Nederl. i, p. 28, 1839, and of some subsequent authors; Pocock, Ann. Mag. Nat. Hist. (8) xvi, p. 341, xvi, 1915.

Linsanga, Lydekker, Geogr. Hist. Mamm. p. 20, 1896; id., Cats, Civets, etc., in Lloyd's Nat. Hist. p. 221, 1896.

Pardictis, Thomas, Proc. Zool. Soc. 1925, p. 499.

Type of *Prionodon* and *Prionodontes*, *gracilis* Horsf. (both as subgenus of *Felis*); of *Linsang* and *Linsanga*, *gracilis* Horsf.; of *Pardictis*, *pardicolor* Hodgs.

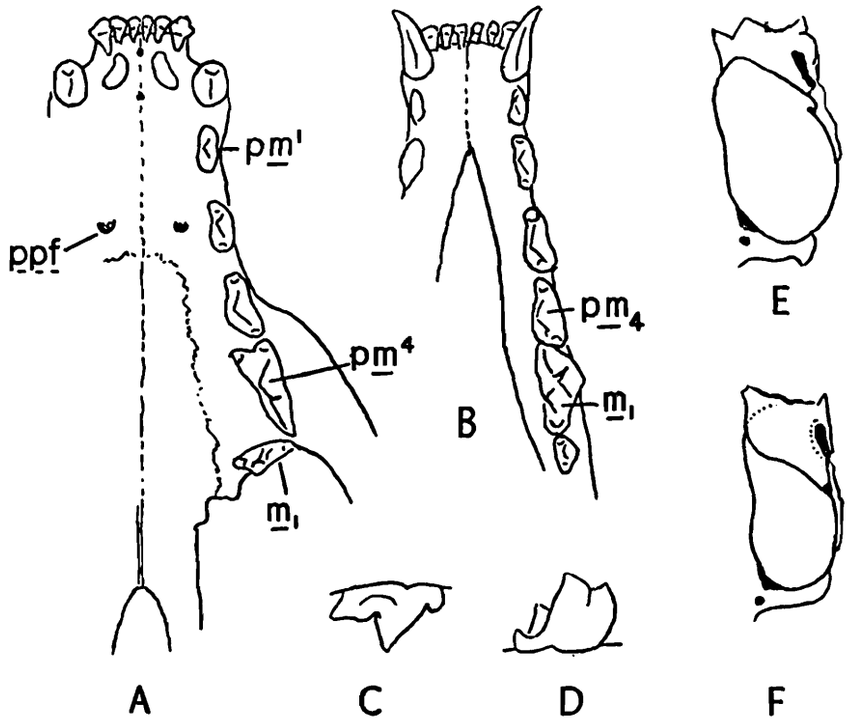


Fig. 80.

A. Left half of palate and teeth of *Prionodon linsang* from Tenasserim. pm^1 and pm^4 first and fourth premolars; m^1 small and transversely set first molar; *ppf*, posterior palatine foramen.

B. Right half of dental part of mandible of the same, with fourth premolar (pm_4) and first molar m_1, the latter with tricuspid anterior portion and small "heel."

C. Right upper carnassial (pm^4) from outer side.

D. Right lower carnassial (m_1) from outer side.

E. Left auditory bulla of the same, showing small anterior or tympanic chamber.

F. The same of a specimen of *P. pardicolor* from Nepal, with larger anterior and smaller posterior or entotympanic chamber.

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* Owing to its assumed preoccupation by *Priodontes*, given to the Giant Armadillo, *Prionodon* was for many years rejected, and *Linsang*, emended to *Linsanga* by Lydekker, used in its place.

Distribution.—Eastern Himalayas (Nepal, Sikkim), Upper Burma, Tenasserim, Laos, Tong-king, Siam, Malay Peninsula, Sumatra, Java, and Borneo.

Size small; tail long, nearly as long as the head and body, about five or six times as long as the hind foot. Pattern distinct, consisting of large spots, sometimes coalescing into broad bands on the sides of the body and of transverse bands on the tail. Head elongated with narrow muzzle, rhinarium evenly convex above, with wide internarial septum, shallow infranarial portion, and philtrum narrow and grooved, the groove extending only about to the level of the lower edge of the nostrils. The ridges of the basal portion of the ear are complicated. The antero-internal ridge has a valvular flap overhanging the anterior portion of the supratragus, on the postero-external ridge there is a deep groove surmounted by a crest running back below the bursa, and the bursa is well developed, its posterior semicircular flap rising behind the edge of the pinna, and its anterior flap is deeply emarginate.

The paws have the claws completely retractile. In the fore paw there is a pair of claw-sheaths on each of the four main digits; the plantar pad consists of four lobes defined by deep grooves and arranged in a strongly curved line, the external carpal pad is large and oval, and the internal is a small lobe attached to it; the area round the pads is covered with hair. In the hind paw there is at most a small protective lobe of skin on the outer side of the claws of the four main digits, the plantar pad consists of three lobes separated by deep clefts, the internal or hallucal lobe being small and set above the inner of the three main lobes. As in the front foot, the area round the pads is hairy and the rest of the underside of the foot is hairy from the heel to the plantar pad, there being no trace of metatarsal pads*. The paws, although resembling those of the typical Felidæ in the retractile claws and general hairiness of the underside, differ in the shape and sharp definition of the lobes of the plantar pads, in the presence on the fore paw of the internal lobe of this pad and of a small inner carpal pad, and on the hind foot of the first digit and of the reduced internal lobe of the plantar pad. There are two pairs of mammæ.

The delicate skull is long, low, and narrow, with the muzzle narrow and elongated, its general shape being very different from that of the Felidæ. The occipital area is well defined and has a strong crest, but there is no complete sagittal crest,

* The external characters of this genus were figured and described by Hodgson (Calc. J. Nat. ii, pl. i, 1842, and viii, pl. i, 1847), by Mivart (Proc. Zool. Soc. 1882, p. 158), and by myself in 1915 in the paper cited in the synonymy.

the temporal ridges not meeting, and usually defining a wider or narrower lyrate area; the postorbital area is constricted, about the same width as the interorbital area or a little narrower, and a little wider than the maxilla above the canines; the postorbital processes are prominent, but bluntly angular, and the mesopterygoid fossa is roofed in its anterior half by the posterior extension of the palate.

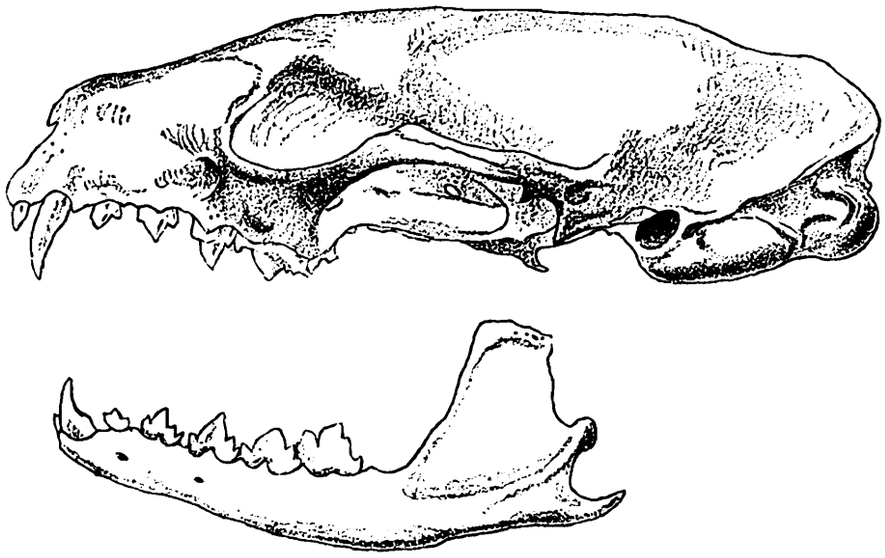


Fig. 81.—Side view of skull of *Prionodon linsang* (skull of type of *P. maculosus* Bl.).

The two well-marked species of this genus may be distinguished as follows :—

a. Pattern on sides of body consisting of large spots not coalescing to form broad transverse bands. Skull with the tympanic bone of bulla relatively large and swollen, the bullate portion (entotympanic) relatively small; external pterygoid crest less well developed . . . . [p. 337. *pardicolor* Hodgs.,

a'. Pattern on sides of body consisting of broad transverse bands due to the coalescence of spots; tympanic bone of bulla relatively small and but little swollen, the bullate portion (entotympanic) correspondingly larger; external pterygoid crest better developed [p. 339. *linsang* Hardw.,

The skull-characters mentioned under the diagnosis of *pardicolor*, associated with a shorter and more parallel-sided mesopterygoid fossa, were regarded by Thomas as of generic importance and formed the basis of his genus *Pardictis*, quoted in the synonymy above. The proportions of the two component bones of the auditory bulla are tolerably constant, but the mesopterygoid fossa and the external pterygoid crest are respectively inconstant in shape and development; and all three features are too variable in the family Viverridæ to be given, in my opinion, generic value.

37. **Prionodon pardicolor** Hodgson.

Prionodon pardicolor, Hodgson, Calc. Journ. Nat. Hist. ii, p. 57, pl. 1, figs. 3–6, 1842, and viii, p. 40, pl. i, 1847; and of subsequent writers on the Indian fauna, including Blanford, Mamm. Brit. Ind. p. 103, 1888.

Pardictis pardicolor pardicolor, Thomas, Proc. Zool. Soc. 1925, p. 499.

Prionodon pardicolor pardicolor, Pocock, Proc. Zool. Soc. 1933, p. 972.

Viverra perdicator, Schinz, Syn. Mamm. i, p. 366, 1844 (*errore* for *pardicolor*).

Vernacular.—*Zik-chúm* (Bhotia); *Súliyú* and *Silu* (Lepcha).

Locality of the *type*, Nepal.

Distribution.—Nepal, Sikkim, Assam, Upper Burma, Yunnan, Laos, and Tong-king.

Ground-colour varying from brownish on the dorsal surface and nape, paler buffy-olivaceous on the flanks, to bright,

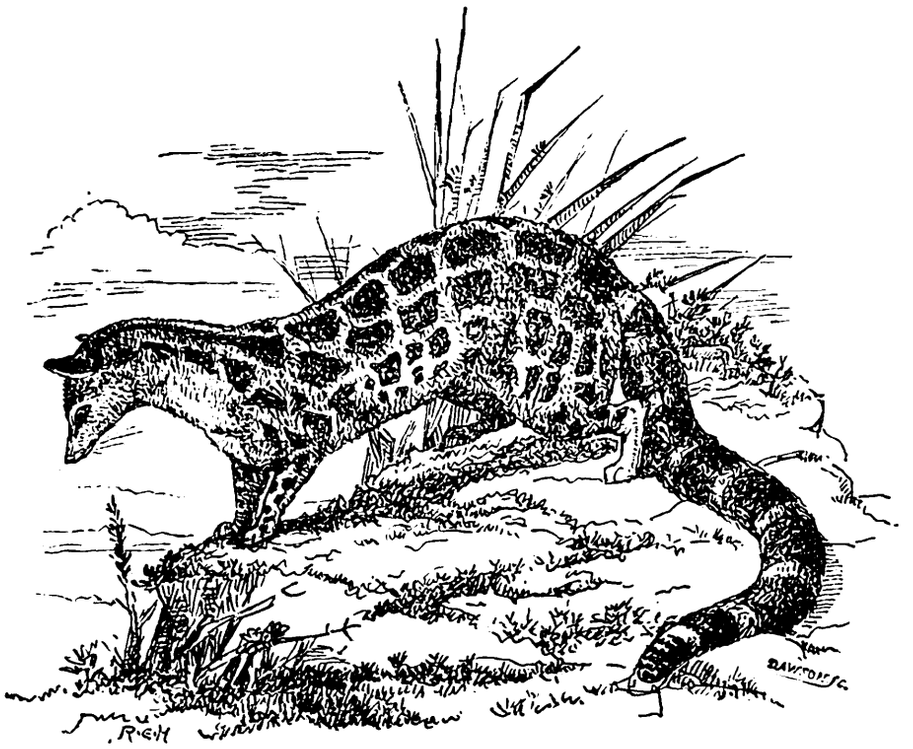


Fig. 82.—The Spotted Linsang (*Prionodon pardicolor*), from a drawing by Hodgson of a specimen from Nepal.

almost orange-buff. The dark pattern consists of two long nuchal stripes extending from the occiput to the shoulders, and of a stripe on each side of the neck; on the body there are two rows of small spots on the spine coalescing posteriorly to form a single stripe; externally and below these are three or four longitudinal rows of spots extending from the back to low down on the flanks, shoulders, and thighs; these spots decrease in size below, and those of the two uppermost rows are continuations respectively of the stripes on the neck;

the fore leg is spotted to the paw, the hind leg to the hock, and the tail has eight or nine complete broad dark rings separated by narrow white rings.

The British Indian examples of this species supplying the material for the above-given description came from Nepal (Hodgson), from Dikchu, 2,000 ft., Singhik, 4,600 ft., Chuntang 5,350 ft. (Crump), and Latchung in the Jellap Pass, 13,000 ft. (P. Morris) in Sikkim, from Dening in the Mishmi Hills, Upper Assam, 2,250 ft. (Wells), from Myitkyina (Capt. Abbay), and the Chin Hills, 50 miles west of Kindat, 5,000 ft. (J. M. D. Mackenzie) in Upper Burma.

The specimens from the Mishmi Hills and Upper Burma connect the typical form, *P. pardicolor pardicolor*, from Nepal and Assam with the race *P. p. presina*, described by Thomas in 1925 from Tong-king, the typical locality being Ngai-Tio, 4,800 ft. (Delacour and Lowe). Other localities for it are Bao-Ha, Tong-king, 2,500 ft., Backan, Tong-king, 500 ft., and Xien Quang Koo, Laos. Thomas restricted the name *presina* to specimens from high altitudes in Tong-king, and identified the lowland forms from the same country as typical *pardicolor*. But the characters on which he based the race are unreliable, as was detected by Osgood (Field Mus. Nat. Hist., Zool. xviii. p. 256, 1932), who identified the Indo-Chinese specimens as *Prionodon* (*Pardictis*) *pardicolor*. The type of *presina* was collected in June, when the moult was imminent, and its hue is naturally paler and more washed out than in the well-coloured winter skins with which Thomas compared it. But on the whole it appears to me that *presina* may be retained as a racial name for the Indo-Chinese specimens, which appear on the average to be lighter or brighter in tint and to have smaller, more oval, less symmetrically and less lineally arranged spots than in the Himalayan race.

The adult ♀ specimen from the Mishmi Hills is the only British Indian example of this race measured in the flesh. The examples of *presina* from Tong-king were measured by Willoughby Lowe.

Locality and sex.	Head and body.	Tail.	Hind foot.
Bao Ha, Tong-king; ad. ♂. .	15⅜	14⅘	2⅘
Ngai Tio, Tong-king (*presina* type); ad. ♂... . ..	15⅕	14	2⅘
Backan, Tong-king; ad. ♂	14⅖	13⅓	2⅖
Backan, Tong-king; ad. ♀	13⅘	12⅖	2⅕
Mishmi Hills, Assam; ad. ♀	14⅖	12	2¾

The weight of the specimen from the Mishmi Hills was 1¼ lb. Skull-measurements are entered on p. 341.

Habits.—This species is apparently nowhere common. The collectors employed by the Mammal Survey of British India secured only a few. Those sent by Crump from

Sikkim and from the Chin Hills by Mackenzie were evidently obtained from natives. The only available specimens from Nepal came from Hodgson, who reported the species as "equally at home on trees and on the ground; it breeds and dwells in the hollows of decayed trees. It is not gregarious at all, and preys chiefly on small birds, which it is wont to pounce upon from the cover of the grass. The times of breeding are said to be February and August, and the litter to consist of two young, there being two litters each year" A tame specimen he had was "wonderfully docile and tractable, very sensitive to cold, and very fond of being petted." It was fed upon raw meat, but refused fish, eggs, and fruits. It was perfectly free from all odour and was never heard to utter a sound.

Crump, who collected in Sikkim, said that the species is reported to be nocturnal; but his opinion that the animal is a vegetable feeder because he failed to trap it with flesh-bait is certainly erroneous, since its teeth are essentially adapted for a carnivorous diet.

38. **Prionodon linsang** Hardwicke.

Viverra ? *linsang*, Hardwicke, Tr. Linn. Soc. xiii, p. 236, pl. 24, 1821.

Prionodon maculosus, Blanford, Proc. As. Soc. Beng. 1878, p. 71; id., Journ. As. Soc. Beng. xlvii, pt. 2, p. 152, pls. 6 & 7, 1878; Mamm. Brit. Ind. p. 104, 1888.

Linsang linsang, Lyon, Proc. U.S. Nat. Mus. xxxiv, p. 657, 1908.

Prionodon linsang, Robinson & Kloss, Journ. Fed. Mal. St. Mus. vii, p. 262, 1919; Pocock, Proc. Zool. Soc. 1933, p. 974.

Vernacular.—*Musang Blang* (Malay).

Locality of the *type* of *linsang*, Malacca; of *maculosus*, Bankachon, S. Tenasserim.

Distribution.—From Sumatra and the Malay Peninsula northwards to MOULMEIN and, according to Müller, Siam.

Ground-colour paler and whiter than in *P. pardicolor*, throwing the black or deep brown pattern into greater relief. The pattern is fundamentally the same in the two species, but in *P. linsang* the nuchal stripes are much broader and the spots of the two upper rows on each side fuse with each other and with the median spinal spots to form five wide transverse bands across the back, the first just behind the shoulders, the last on the root of the tail and generally coalescing with the basal caudal stripe: the two nuchal stripes blend with the lower edges of at least the first of these bands. Low down on the flanks there is a row of elongated spots or short stripes in line with the spots on the side of the neck; still lower there are a few more spots, as well as some on the fore leg to the paw and on the hind leg to the hock.

The co-type of *maculosus* does not differ in any characters of importance from specimens from the Malay Peninsula, whence the type of *linsang* came. Blanford was misled into describing it as representing a distinct species by Horsfield's statement that *linsang* was a synonym of the smaller Javanese race, *gracilis*.

The ground-colour of *linsang* varies individually. In the co-type of *maculosus*, an adult ♂, it is whitish, with the dorsal surface and mid-line of the nape slightly darkened by the infuscate tips of the hairs ; the crown and muzzle are brownish, the forehead brownish buffy-grey, the cheeks, throat, and underside creamy-white, and the pale bands on the tail become



Fig. 83.—The Banded Linsang (*Prionodon linsang*), drawn from a skin from Bankachon, a co-type of Blanford's *maculosus*.

gradually buff posteriorly. Two skins from Malacca, including Hardwicke's type of *linsang*, and four from Perak (A. S. Vernay and Robinson and Kloss) are generally similar to it, but individually variable in the buffiness of the dorsal interspaces and of the underside and cheeks and of the pale rings on the tail.

Blanford assigned to *maculosus* a specimen collected by Mr. Limborg east of Moulmein in N. Tenasserim, and Lyon recorded two adult ♂ examples from the Siak River and Sungei Mandan in Sumatra, which from their flesh- and skull-measurements appear to belong to this form, and Robinson and Kloss secured one at Bencoolen.

Skull-measurements of *Prionodon pardicolor* and *P. linsang*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. pardicolor.									
Nepal; ad. ♂?	71	70	32	11	11	10	45	7	6—
Nepal; ad. ♀?	65	63	32	11	11	9	40	6	5
Mishmi Hills; ad. ♀	65	64	32	10	10	10—	41	7	6
Ngai Tio, Tong-king (*presina* type); ad. ♂	75	74	36	11½	12—	10	47	6½	6
Bao Ha, Tong-king; ad. ♂	70	69	37	11—	12	10	45	6½	5½
Chapa, Tong-king; ad. ♀.	68	67	32	10	10½	9	43	6+	6
P. linsang.									
Bankachon (*maculosus* co-type); ad. ♂	77	77	38	12	14	11	49	7	6
Ulu Ijok, Perak; ad. ♀	72	71	37	11	13	10½	46	7	6

The flesh-measurements (in English inches) of some specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Bankachon (*maculosus* co-type); ad. ♂.	16¾	16	2⅘
Siak River, Sumatra (Lyon); ad. ♂ .	16⅕	14⅕	2⅖
Bencoolen, Sumatra (Robinson and Kloss); ad. ♂ .	16⅗	14	2
Taiping, Perak; ad. ♀	15½	15	2½
Ulu Ijok, Perak; ad. ♀.	14⅘	13⅗	2⅗

The weight of the adult ♂ from Siak River was 1½ lb.

The skull-measurements of an adult ♂, the co-type of *maculosus* from Bankachon, and of an adult ♀ from Perak in the Malay Peninsula are entered on p. 341. The skull of the first is the largest of the species I have seen. That of the ♂ from Bencoolen, Sumatra (Robinson and Kloss), was 75 mm. in total length and 35½ in zygomatic width, and the two ♂ Sumatran skulls recorded by Lyon were respectively a little over and a little under 73½ mm. in total length, the zygomatic width of the larger being 36½ mm.

The Linsang above described represents the typical race of the species *P. linsang linsang*. In Java and Borneo it is replaced by *P. linsang gracilis*, described by Horsfield first as *Felis gracilis* and a year later as *Prionodon gracilis* (Zool. Res. Java, no. 1, 1821, and no. 5, 1822) from Blambangan, E. Java, and as *Viverra hardwickii* by Lesson (Mon. Mamm. p. 172, 1827), also from Java; Robinson and Kloss in 1919 made it a subspecies of *P. linsang*. Its colour and pattern are the same as in the Malayan and Tenasserim race, from which it only differs in its average smaller size and less well-developed skull.

Subfamily VIVERRINÆ.

In this subfamily, containing the typical Civets or Civet-Cats, which are mainly or wholly terrestrial, the feet, adapted for movement on the ground, are digitigrade, the cushion-like indistinctly subdivided plantar pad and the pads of digits 2 to 4 being alone applied to the ground, the first digit being small, set well above the plantar pad, and constituting a practically functionless "dew-claw"; the outer element of the carpal pads is typically (in all British Indian forms) alone retained, and forms a conical excrescence high above the plantar-pad and separated from it in the middle line by a hairy area continuous externally with the hairy skin on the back of the fore leg above; the hind foot is similarly continuously hairy behind from the heel to the plantar pad. the metatarsal pads being at most represented by small areas of naked skin; the claws are short, sharp, and sometimes

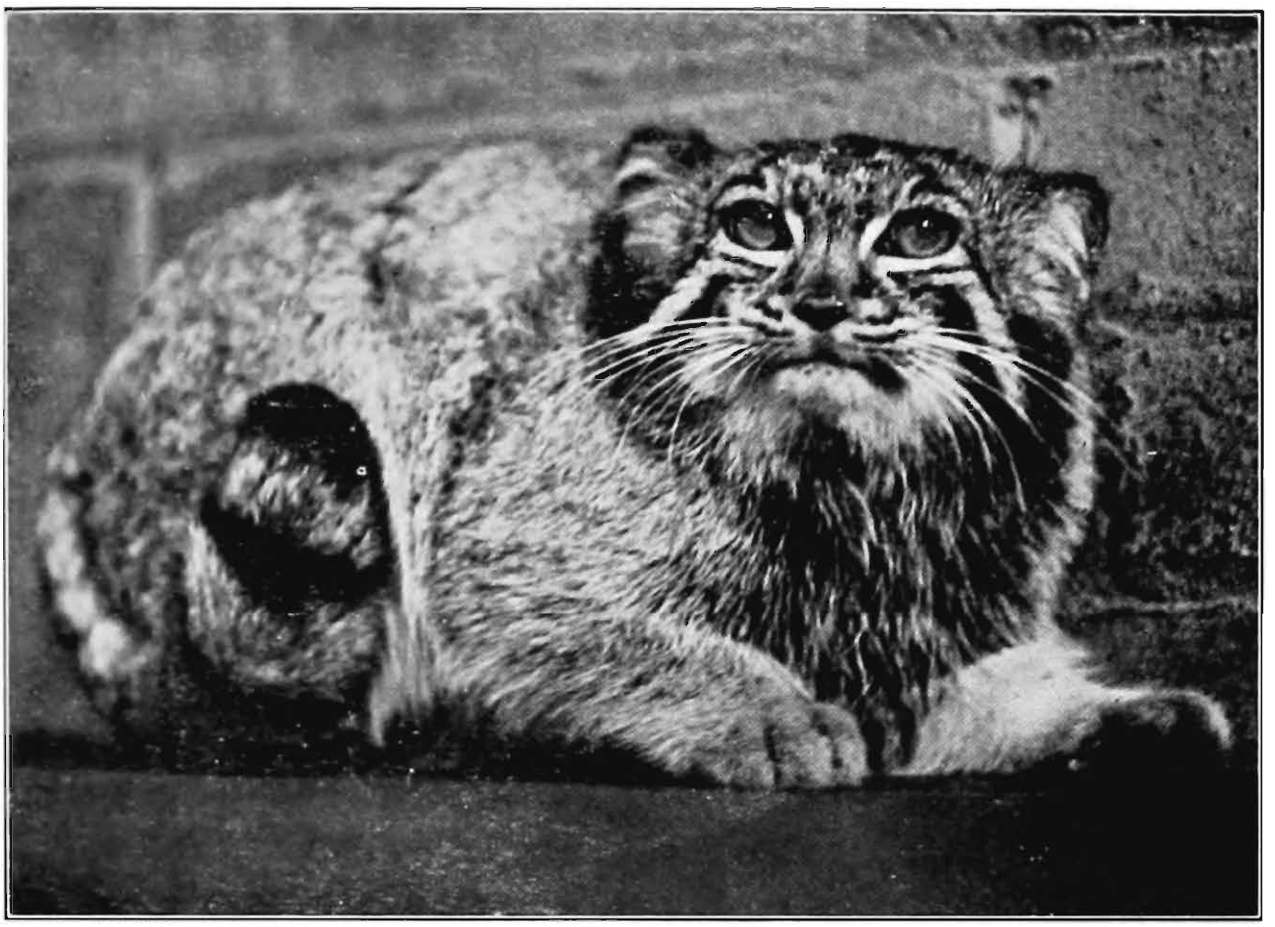


Photo W. S. Berridge.

Pallas's Cat (*Otocolobus manul*).

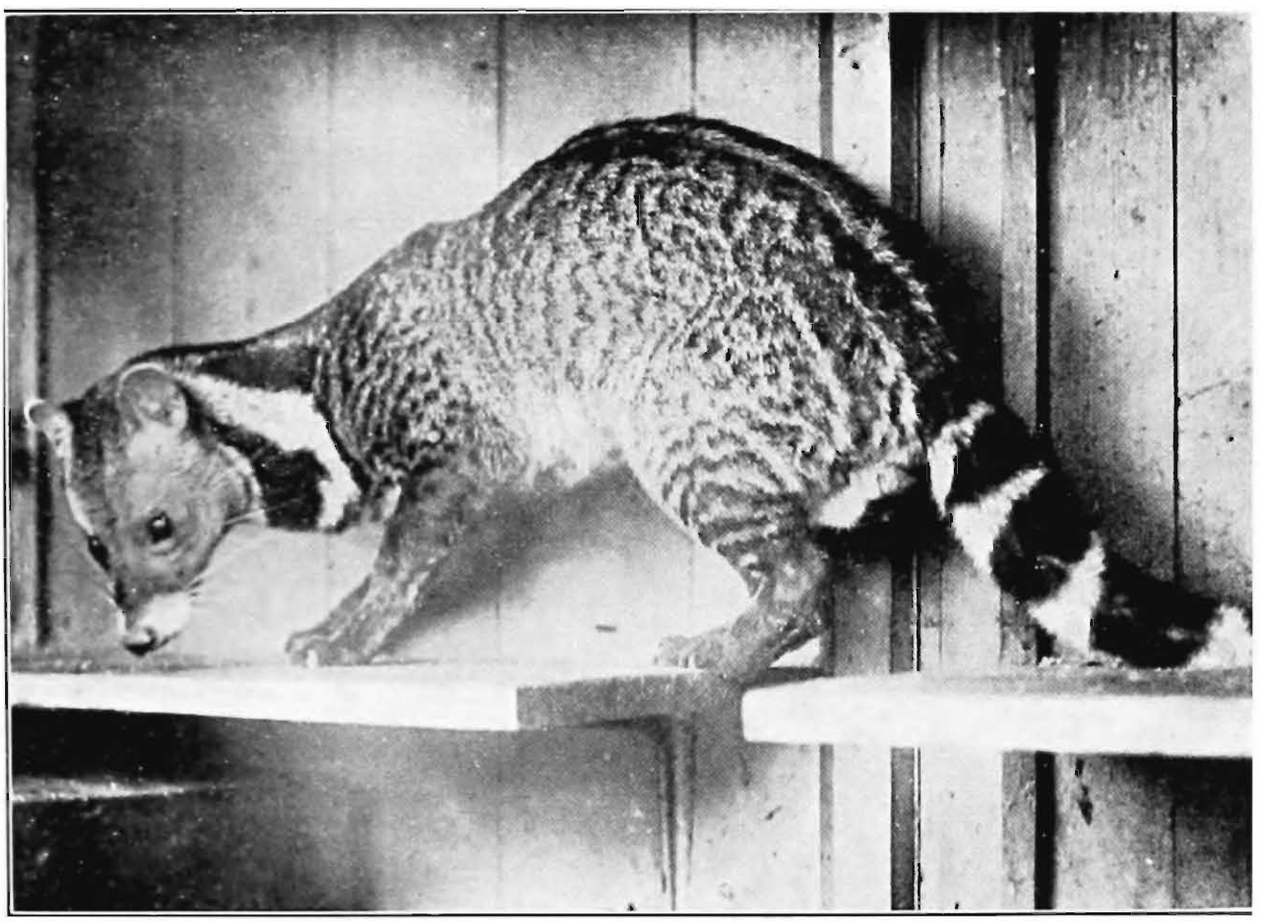


Photo W. S. Berridge

Large Indian Civet (*Viverra zibetha*).

protected by claw-sheaths and as retractile as in the Felidæ. The scent-glands are wholly perinæal and highly specialized; they are visible externally as a tolerably capacious pouch, with hairy, tumid labia by which the orifice can be opened or closed.

The skull is long, rather narrow, moderately well moulded muscularly, but varies in details according to the genus.

The dental formula is: $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{4}{4}$, $m.\frac{2}{2}$. The teeth are well developed, and both cutting and crushing in function; the upper carnassial (pm^4) has the inner lobe (protocone) set anteriorly and much shorter than the outer part of the crown, which has the main cusp (paracone) high

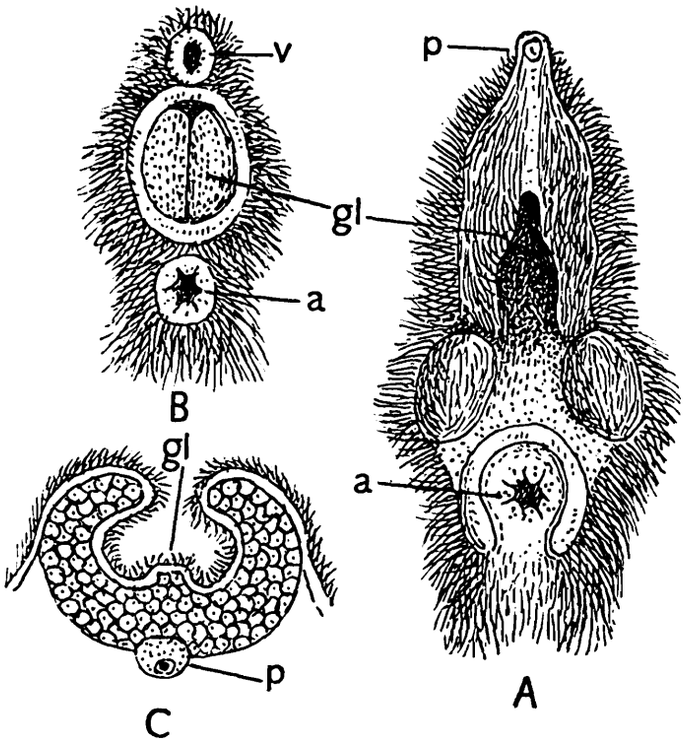


Fig. 84.

A. Anal and genital area of Large Indian Civet (*Viverra zibetha*) ♂, showing the anus (*a*) surrounded by a raised rim of integument, the divided scrotum, the prepuce (*p*), and the orifice of the glandular sack (*gl*) partially open.

B. The same of the Little Civet (*Viverricula indica*) ♀, showing the anus (*a*), the vulva (*v*), and the sack of the gland fully distended.

C. Vertical transverse section of the gland of ♂ *Viverra zibetha*, showing the hair-lined cavity of the gland (*gl*), the thick secreting area of "cells," and the penis (*p*) below.

and pointed, and the hind cusp (metacone) long and blade-like; the outer edges of the two upper molars are turned obliquely inwards, forming an angle of about 100° with that of the upper carnassial; the lower carnassial (m_1) has the heel large, not much shorter than the fore part of the tooth, which has its three cusps normally developed.

This subfamily is found throughout the Oriental Region, where it contains the three genera described below. In Africa it is represented by the African Civet (*Civettictis civetta*), which, although formerly assigned to *Viverra*, differs from that genus and from other Oriental forms in some structural details in the feet and skull. The African Genets (*Genetta*) are also most nearly related to the Viverrinæ, but should perhaps form a separate subfamily.

The three genera occurring in British India may be distinguished as follows :—

Key to the External Characters.

a. Anterior edges of the ears widely separated by the broad forehead ; a dorsal crest of hairs extending posteriorly at least from the shoulders.
  b. At least the 3rd and 4th digits of the fore foot with well-developed skin-sheaths protecting the claws ; feet thickly hairy between the pads . . . . . [p. 344. VIVERRA Linn.,
  b'. Digits without skin-lobes protecting the claws ; feet nearly naked between the pads . . . . . [Pocock, p. 354. MOSCHOTHERA
a'. Anterior edges of the ears set close together, the forehead at this point narrow ; no dorsal crest of long hairs ; claws, as in *Moschothera*, unprotected by sheaths of skin [Hodgs., p. 362. VIVERRICULA

Key to the principal Cranial Characters.

a. Suture between the malar bone and maxilla comparatively short, much shorter than the median length of the nasals and than half the length of the cheek-teeth ; muzzle long and stout ; the combined auditory bones short, shorter than the width across the occipital condyles.
  b. Postorbital processes developed and situated in front of the middle point of the total length of the skull . [p. 344. VIVERRA Linn.,
  b'. Postorbital processes suppressed or nearly so, their position behind the middle point of the total length of the skull. . . [Pocock, p. 354. MOSCHOTHERA
a'. The cheek-suture, above described, very long, about as long as the median length of the nasals and more than half the length of the cheek-teeth ; muzzle short and slender ; auditory bones large, their length exceeding the width across the condyles [Hodgs., p. 362. VIVERRICULA

Genus **VIVERRA** Linnæus.

Viverra, Linnæus, Syst. Nat. ed. 10, p. 44, 1758 ; and of subsequent authors (part) ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, pp. 423–4, 1933 (*sensu stricto*).

Type of the genus, *V zibetha* Linn.

Distribution.—NORTHERN INDIA (Nepal, Bhutan, Assam, etc.), BURMA, S. China, Indo-China, Siam, and from the Malay Peninsula to the Philippines and Moluccas*.

Distinguished externally from the other genera of the Viverrinæ by the structure of the fore feet, of which the

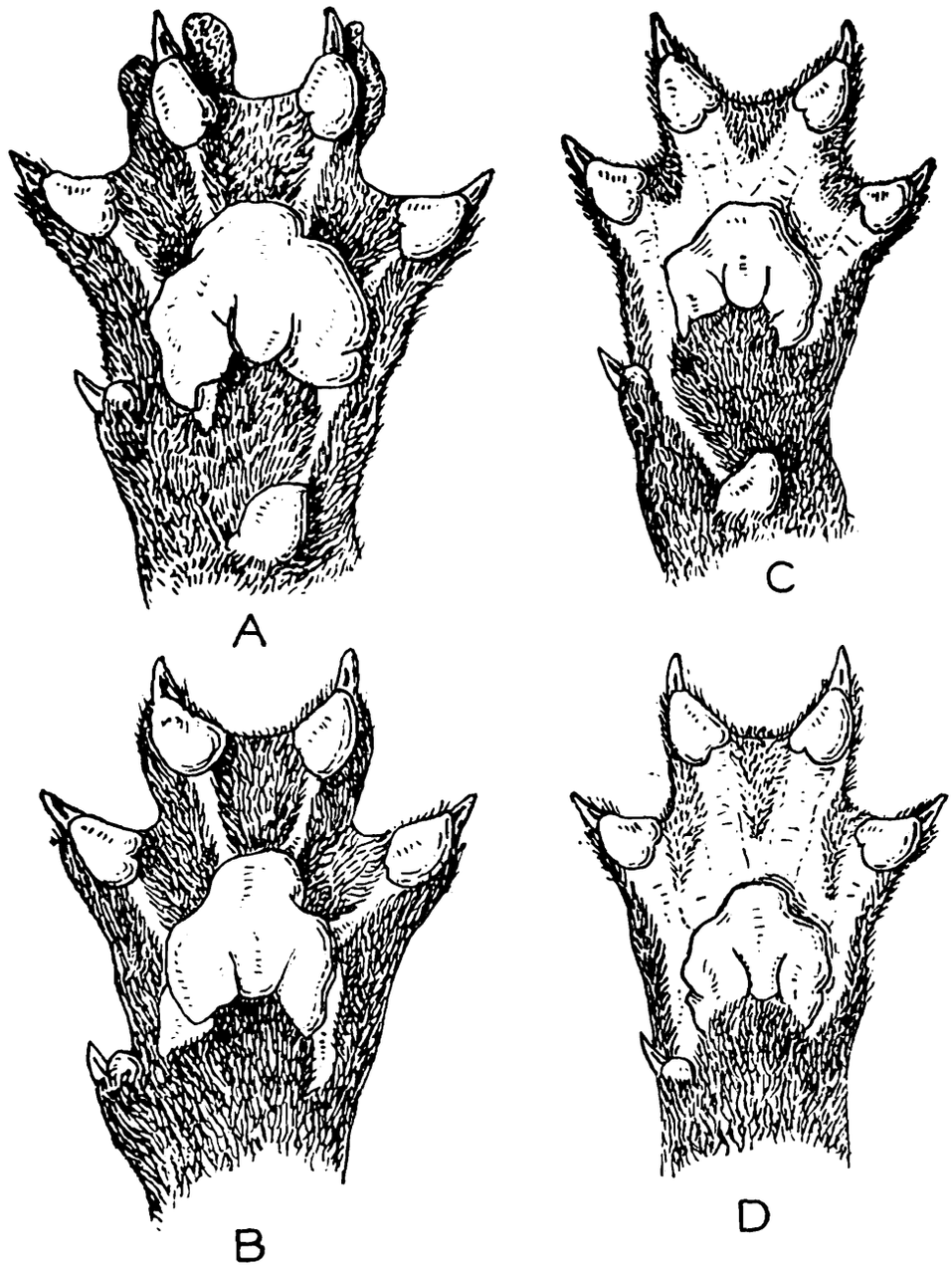


Fig. 85.

A. Lower side of left fore paw of Large Indian Civet (*Viverra zibetha*), showing the claw-sheaths on the third and fourth digits.
B. The same of the left hind paw, which has no protecting claw-sheaths.
C & D. Same aspect of the fore and hind paws of the Little Civet (*Viverricula indica*). In some specimens there is more hair on the soles.

* The smaller Oriental species (*Viverra tangalunga*), which ranges eastwards from the Malay Peninsula and does not come into the fauna of British India, has probably been introduced by man into the Moluccas and elsewhere for the sake of its perfume.

3rd and 4th digits are provided with lobes of skin which, like those of the typical Felidæ, act as protective sheaths for the retractile claws. On the 3rd digit there is a pair of these lobes, on the 4th a single lobe on the outer side. These protect the claws of the four principal toes, when unspread, the claw of the 2nd abutting against the inner lobe of the 3rd, the claw of the 5th against the outer lobe of the 4th, and the claw of the 4th against the outer lobe of the 3rd. The soles of the feet are hairy all round the pads, except for narrow streaks of naked skin along the middle line of the digits and a similar streak running from the plantar to the carpal pad. The carpal pad consists of a single external lobe, and the metatarsal pads are suppressed.

The skull is long and narrow, with narrow, nearly parallel-sided, not strongly constricted waist, and the postorbital processes developed, but small and a little in front of the middle point between the tip of the premaxillæ in front and of the occipital crest behind; the sagittal crest is moderately strong in the adult; the infraorbital foramen is approximately above the junction point of pm^3 and pm^4, and the suborbital portion of the cheek is comparatively short, the suture between the anterior or malar bone of the zygomatic arch and the maxilla being much shorter than the median length of the nasals, than half the length of the cheek-teeth, and than the width across the occipital condyles, this width exceeding the length of the compound auditory bulla.

39. **Viverra zibetha** Linnæus. The Large Indian Civet.

(Bibliographical references are contained under the subspecific headings.)

Distribution.—Northern India and Southern China over South-East Asia to the Malay Peninsula.

The general colour is grey or tawny, with the pattern of the flanks variable in distinctness, but certain features of the pattern are very constant. There is always a black spinal stripe running from behind the shoulders to the root of the tail, but not continued uninterruptedly along the upper side of that organ, which exhibits a variable number of complete black and white rings, the black much broader than the white; the front of the muzzle on each side has a whitish patch emphasized by blackish behind, and the chin and fore throat are blackish; the sides and lower surface of the neck are conspicuously banded with black stripes set off by white interspaces; one of these stripes, starting behind the ear, runs backwards nearly to the shoulder, where it turns vertically downwards and passes on to the lower surface of

the hind throat to join its fellow of the opposite side; a second, starting below the ear, similarly runs backwards and downwards to form a much broader black band on the middle of the throat below; a third, below the latter in its origin, passes on to the throat in front of it, between it and the black area of the fore throat. Hence the sides of the neck and throat are ornamented with three black and two white collars, of which the most conspicuous and constant are the two white collars with the broad black collar between them. The lower portion of the legs at least is black. There are usually three, sometimes two, pairs of teats.

This species is considerably larger than *V tangalunga*, the only other species of the genus, and is further distinguished by the white bands on the tail forming complete rings and the pattern of the flanks, when distinct, showing a decided tendency to run into vertical wavy stripes. In *V tangalunga*, which is about one-fourth smaller, the black dorsal stripe is continued to the end of the tail, and the body-pattern is composed of solid black spots, usually numerous, small, and close set, and never showing a tendency to run into wavy "mackerel-like" stripes.

In *V zibetha*, especially in the northern races, the coat, colour, and pattern vary considerably in accordance with the season. In winter the coat is long and thick, in summer short and sleek. The body-pattern is strongly pronounced in summer, indistinct or even obliterated in winter; and the ground-colour varies individually, even irrespective of season, from tawny to clear, almost silvery-grey, the contrast between the pattern and the ground-colour being more emphatic in grey than in tawny specimens. There appears to be but one moult, which takes place in May, June or July, the date varying no doubt with latitude.

Males and females are approximately alike in size and in cranial and dental characters.

The differences above alluded to in colour and pattern, now known to be individual and to a great extent seasonal, account for the number of names applied to most of the local races of this Civet.

39 *a*. **Viverra zibetha zibetha** Linnæus.

Viverra zibetha, Linnæus, Syst. Nat. ed. 10, p. 44, 1758.
Viverra undulata, Gray, Spic. Zool. p. 9, pl. 8, 1830.
Viverra orientalis or *melanurus* and *V civettoides*, Hodgson, Calc. Journ. Nat. Hist. ii, pp. 47–50 and p. 62, 1842.
Viverra zibetha zibetha, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 428, 1933.

Vernacular.—Khatás (Hindi, but not restricted to this

species); *Mach-bhondar*, *Bágdas*, *Pudo-ganda* (Beng.); *Bhrán* (Nepal Terai); *Nit-birahi* (Nepal); *Kung* (Bhotia); *Saphiong* (Lepcha); *Ningalichitua* (Pahari).

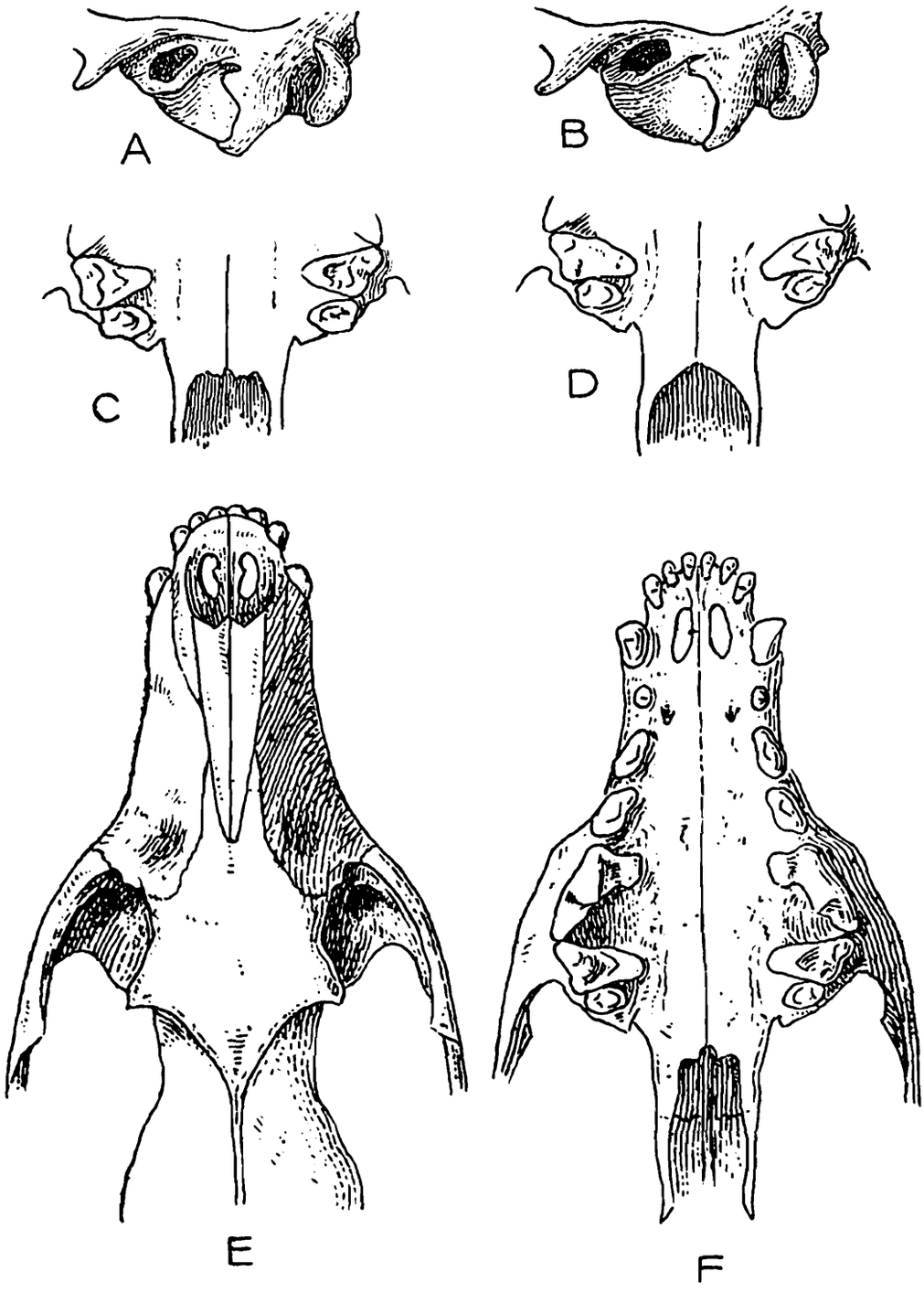


Fig. 86.

A & B. Outer view of left auditory region of two skulls of *Viverra zibetha* from Gorkha, Nepal, to show individual variation in the size and shape of the bulla.

C & D. Hinder end of palate of two examples of the same species, showing individual differences of no systematic importance.

E. Fore part of skull of *V zibetha* from the North Shan States.

F. Palate of skull of same from Bhutan Duars.

(All figures $\frac{2}{3}$ nat. size.)

Locality of the *type* of *zibetha*, Bengal; of *undulata*, Nepal; of *orientalis* and *melanurus*, Nepal; of *civettoides*, Darjeeling.

Distribution.—NEPAL*, SIKKIM, BHUTAN, UPPER BENGAL, and apparently S. Kamrup in ASSAM.

Winter coat thickened with underwool and the contour hairs long, those of the dorsal crest at their greatest length in February or March, about 60 to 70 mm., and of the flanks about 35 to 40 mm. Summer coat with little or no underwool and the contour hairs of the crest up to about 40 mm., of the flanks about 20 mm. Skins from Sevoke, 500 ft., in Upper Bengal (Crump), and from Bhutan Duars, 600 ft. (Baptista), resemble in the length of the contour hairs skins from Sikkim at various altitudes from 2,000 ft. to 6,000 ft. (Crump and Baptista). General colour varying from deep tawny through all shades of that tint to grey, specimens from the same locality and killed on the same day sometimes differing considerably in hue. Pattern equally variable. At its best in the new short summer coat it may consist of conspicuous blackish transverse stripes on the fore quarters and of loops and rosettes on the hind quarters; but at the same locality and date it may be brown and much less conspicuous. In the long winter coat it is not well defined, hardly traceable on the fore quarters, and represented by obscure mottling and brindling on the hind quarters. Sometimes it is altogether evanescent.

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* I have seen no skins of this Civet from the Himalayas west of Nepal, and feel sure Col. A. P. Ward was mistaken in recording it from Kashmir (Journ. Bomb. Nat. Hist. Soc. xxxi, p. 8, 1927). He said it is very rare, but occasionally found towards Chamba. His flesh-measurements, head and body 30 in., tail 17 in., weight 22 lb., are correct enough; but his remark that Blanford's skull-measurements are far larger than anything in the western Himalayas shows that the skull he had did not belong to this species. His further statement that the animal is found "often living under thatched roofs" suggests confusion with the Kashmir Toddy-Cat (*Paradoxurus*), although he cited the latter under a separate heading. I am not acquainted with any other record of *V zibetha* in Kashmir; and Col. Stockley tells me he never came across it in that country or in Kumaon, although all collectors agree that it is one of the easiest mammals to trap. According to Blanford this Civet is found in Orissa and Chutia Nagpur, and Dunbar Brander tells me (*in litt.*) that his dogs killed a large Civet, which he took for *zibetha*, in "that very wild country Uprora." He also saw one at Pachmarhi, as recorded in his book. This was "working along a ledge on the face of a cliff, within gunshot range," but was not worth shooting because of an intervening chasm it would have taken 12 hours or more to get round. It would be interesting to know to what species these "large Civets" belonged. Whatever it may be, it must be very rare in Peninsular India, since no specimen was secured anywhere south-west of the Ganges by the collectors of the Bombay Mammal Survey.

The flesh-measurements (in English inches) and weights (in lb.) of some specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Banso Bahari, Nepal ; ad. ♂.	32⅔	18⅘	5⅕	21
Gorkha, Nepal ; ad. ♂	29⅕	18	5	20
Gorkha, Nepal ; ad. ♀ ..	32⅖	14⅗	5⅕	20
Narbong, Darjeeling ; ad. ♂	31	16	5	14
Pashok, Darjeeling ; ad. ♂	30⅘	15⅕	5⅕	—
Rongli, Sikkim ; ad. ♀	29⅘	16½	5⅕	20
Sevoke, Bengal ; ad. ♀	32	—	5⅖	—
Sevoke, Bengal ; ad. ♀	30⅖	16½	5⅕	—
Rajapara, S. Kamrup ; ad. ♂	32⅘	16⅘	6½	—
Rajapara, S. Kamrup ; ad. ♀	31⅗	16⅘	6⅖	—

There do not appear to be any appreciable differences in size between the males and females. The greater length of the feet in the pair from S. Kamrup (Wells) is probably due in part to the inclusion of the claws.

39 *b*. **Viverra zibetha picta** Wroughton.

Viverra zibetha picta, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 64, 1915, and xxvi, p. 46, 1918; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 432, 1933.

? *Viverra zibetha surdaster*, Thomas, Proc. Zool. Soc. 1927, p. 46, and 1928, p. 145 ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 433, 1933.

Vernacnlar.—Choung Dwin Se (Burmese, Upper Chindwin) ; *Kyoung-myeng* (Burmese).

Locality of the *type* of *picta*, H'Kamti, 500 ft., on the Upper Chindwin ; of *surdaster*, Xien Khouang, Laos.

Distribution.—Upper Burma and Assam, east of the Brahmaputra apparently as far south as the North Shan States ; also Laos, Tong-king, and Annam probably.

Resembling typical *zibetha* in the marked difference in length and luxuriance of coat and distinctness of pattern between summer and winter skins, but differing on the average in having the pattern a little less obliterated in the winter and showing more distinct brindling or spotting on the blackish-grey hue of the shoulders and fore quarters.

This race is of doubtful status. It was founded by Wroughton on a single specimen from H'Kamti, 500 ft., on the Upper Chindwin River in Upper Burma, which was killed in July, and exhibits a bold brown pattern on the tawny ground-colour of its short coat. Wroughton contrasted it with winter skins of *zibetha*, overlooking its close similarity to the Nepalese example of the latter, which Hodgson named *civettoides*. He subsequently withdrew the name, relegating it to the synonymy of *zibetha* on discovering, as he thought, that the distinctness of

the pattern is not a racial character. But the examination of a long series of skins shows that the race is admissible on the character I have mentioned, although summer skins are not distinguishable from those of typical *zibetha*.

In addition to the type, numbers of skins have been examined from the following localities :—Golaghat, 300–400 ft., the Garo Hills, 3,000–4,000 ft., the Jaintia Hills, 4,000 ft., and the Naga Hills, 3,500–4,500 ft. As in typical *zibetha*, the length of the winter coat does not appear to be affected by altitude, the contour hairs being as long in January skins from Golaghat as in March skins from the Garo Hills.

The probable extension of this race as far south as the North Shan States is attested by skins from Gokteik and Pyaunggaung (Shortridge), which, although in full moult, are long-coated as in *picta* and *zibetha*, and thus differ from the following race, *pruinosa*, to which Wroughton assigned them.

Flesh-measurements (in English inches) and weights (in lb.) of *V z. picta* and *pruinosa* are as follows :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
picta.				
Sadiya, Assam ; ad. ♂	34	17⅖	5⅖	—
Golaghat, Assam ; ad. ♀	30	17⅗	4⅘	15½
Jaintia Hills, Assam ; ad. ♀	32⅘	16⅖	5⅗	16
Garo Hills, Assam ; ad. ♀	29⅕	14⅘	4⅘	18¼
H'Kamti, Upper Chindwin (type) ; ad. ♂ . ..	32	17	5	17½
Pyaunggaung, N. Shan States ; ad. ♂ ..	33⅗	18⅗	5⅕	20
Pyaunggaung, N. Shan States ; ad. ♂	33⅕	17⅕	5⅗	18
pruinosa.				
Bankachon, Tenasserim ; ad. ♂.	31⅘	17	5	21
Thaget, Tenasserim (type) ; ad. ♀.	30⅖	17⅕	5⅕	21 19

The skull and teeth of *picta* do not differ from those of *zibetha* *.

* The race described by Thomas as *surdaster* was based upon a youngish specimen from Laos and was distinguished by the small size of the auditory bulla, measuring 15 mm. But the bulla of a fully adult skull of *zibetha* from Nepal is the same length and 5 mm. shorter than the longest bulla in skulls of *zibetha*. Skins assigned to *surdaster* have been recorded also from Tong-king, Annam, and Cochin-China. Additional material may show that the race is valid ; but for the present its status is doubtful. To the north no doubt both *picta* and *surdaster* intergrade with the southern Chinese race, *ashtoni* ; but the latter is longer in the coat, a January skin from Fukien having the crest and flank hairs about 90 and 50 mm. long respectively.

39*c*. **Viverra zibetha pruinosa** Wroughton.

?*Viverra malaccensis*, Gmelin, Syst. Nat. i, p. 92, 1788 *.
Viverra zibetha pruinosa, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv. p. 64,1 915; Kloss, Journ. Nat. Hist. Soc. Siam, ii, p. 292, 1917.
Viverra zibetha sigillata, Robinson & Kloss, Rec. Ind. Mus. xix, pt. 4, p. 176, 1920.
Viverra zibetha pruinosa, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi. p. 434, 1933.

Vernacular.—*Musang* (Malay at Bankachon).

Locality of the type of *pruinosa*, Thaget, on the Little Tenasserim River; of *sigillata*, Bang Nara, Patani, in Peninsular Siam.

Distribution.—TENASSERIM, Southern Siam, Malay Peninsula.

Distinguished from the more northern races recorded above by the comparative shortness of the coat and distinctness of the pattern in the winter months, the ground-colour similarly varying from grey to tawny, and the pattern from black to brown.

The skin of an adult ♂ from Bankachon, Tenasserim, Dec. 24, has the hairs of the crest and flanks 54 and 25 mm. respectively. In the type from Thaget, on the Little Tenasserim River, March 28, the same contour hairs are about 51 and 26 mm. Skins from Patani and Perak collected in July, and described by Kloss as *V. z. sigillata*, have the crest-hairs 38 and 34 mm. respectively, and the flank-hairs 20 mm. The pattern in these two summer skins is only a little more distinct than in the winter skins from Tenasserim.

The flesh-measurements and weights of an adult pair from Bankachon and Thaget in S. Tenasserim (Shortridge) are recorded above (p. 351). An adult pair from the Malay Peninsula, a ♂ from Kuala Lumpur, and a ♀, the type of *sigillata*, from Patani, are a trifle larger, the head and body being respectively 32⅘ and 32⅖ and the tail 19⅘ and 17⅖ in.

The skull and teeth are as in the other races.

The following table (p. 353) shows the individual variation in the size of the skull and of the principal teeth in the three races of *V. zibetha*. A point in the variation to be noticed is the marked difference in the width-measurements between the first two on the list. The differences are purely a question of age.

Habits.—There is no reason to suppose that the habits of these three races differ in any important respect.

In Sikkim and Darjeeling, according to Crump, the typical race of this Civet is the commonest of all the Carnivora, and

* It is possible that the name *malaccensis* was meant partly for this Large Malayan Civet and not for the Little Civet (*Viverricula*) described under this genus (p. 363).

Skull- and tooth-measurements (in mm.) of the three British Indian races of *Viverra zibetha*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
V. z. zibetha.									
Gorhka, Nepal; ad. ♂	144	140	69	17	24	25	100	14	14
Pashok, Darjeeling; old ♂	143	141	75	21	26	28	101	14	15
Sevoke, Bengal; ad. ♀	143	141	70	18	23	26	100	—	14
Rongli, Sikkim; ad. ♀	137	136	70	20	22	23	94	13	13
V. z. picta.									
H'Kamti, Upper Chindwin (type); ad. ♂	134	132	69	20	22	23+	96	13	13
Pyaunggaung, N. Shan States; ad. ♂	141	140	68	22	25	23	101	14	14
V. z. pruinosa.									
Bankachon, Tenasserim; ad. ♂	134	129	72	17½	24	25	95	14	13½
Thaget, Tenasserim (type); ad. ♀	138	135	70	19	22	24	96	14	14½

occurs from the base of the foothills up to 7,000 ft. or more, being most abundant at an elevation of about 3,000 ft. It is purely nocturnal, is a great thief among the village chickens, and can be easily lured to a trap baited with meat. It appears, nevertheless, to be equally addicted to a vegetable diet, feeding to a great extent on berries, and having a special liking for cardamons. The stomachs of specimens examined by Hodgson contained the remains of fowls, clearly taken from a refuse-heap near a kitchen, of rats, shrews, and frogs. The omnivorous diet of the animal, noted by several observers, was summarized by Blanford's statement that it kills any birds or small mammals it can capture, and also feeds on eggs, snakes, frogs, insects, as well as upon fruits and some roots. It lies up in woods, under bushes, in thick grass or in holes, probably dug by some other animal. There are said to be three or four young to the litter, born in May or June ; but Hodgson's suggestion that the eyes are open at birth is probably untrue. The newly-born young are black, with white on the upper lip, the inner surface of the ear, some rings on the tail, stronger below than above, and sometimes at least with the two white collars on the throat faintly showing.

On the Upper Chindwin this Civet, represented by *picta*, is, according to Mackenzie, fairly common and a great fowl thief. He shot a pair in the jungle fishing in a small pool by a stream. Their stomachs contained respectively four and five practically undigested fishes, about 3 in. long, with the heads bitten off. No trace of the heads was to be found. This seems to be the first record of *V zibetha* being a fish-eater. Shortridge recorded the race as plentiful at Pyaunggaung in the North Shan States, where, like *Viverricula*, it appears to attach itself to the vicinity of villages and is probably a scavenger and a poultry-thief. He here confirms the experience of all collectors that *V zibetha* is very easily trapped.

Nothing has been recorded of the habits of the southern race, *pruinosa*, which, according to Shortridge, is plentiful at Bankachon and, like all the Civets, very easily trapped.

Genus **MOSCHOTHERA** Pocock.

Moschothera, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 441, text-figs. 3 & 4, 1933.

Type of the genus, *Viverra civettina* Blyth.

Distribution.—Travancore and from Lower Burma to Siam, Indo-China, and the Malay Peninsula.

Distinguished from *Viverra* by the complete absence of skin-lobes acting as claw-sheaths on the 3rd and 4th digits of the fore foot and by the scanty hair-growth on the fore and hind feet between the plantar and digital pads. The skull

differs in the suppression of definite frontal postorbital processes, which are represented merely by ridges marking the anterior attachment of the temporal muscles ; the sagittal

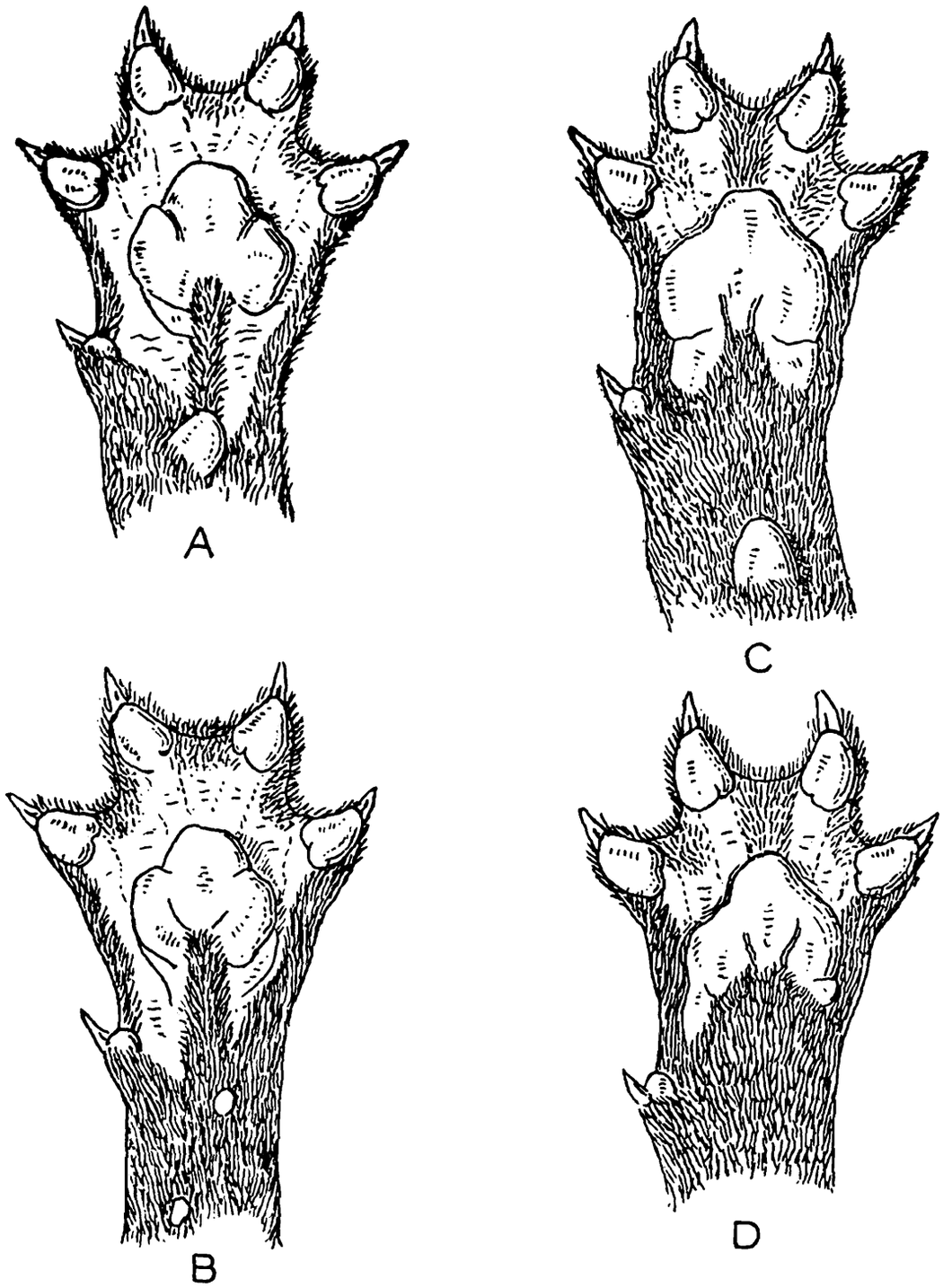


Fig. 87.

A. Lower side of left fore paw of the Malabar Civet (*Moschothera civettina*).
B. The same of left hind paw, showing the greatly reduced, disc-like remnants of the two metatarsal pads.
C & D. Lower side of left fore and left hind paws of the Large-spotted Civet (*Moschothera megaspila*).

crest is a low ridge and the nasals and whole facial portion of the skull are longer, the distance from the position of the

suppressed postorbital processes to the tip of the premaxilla exceeding the distance from the former point to the tip of the occipital crest.

The two species assigned to this genus have long been known, but not intimately, there being no information derived from fresh specimens regarding the structure of the scent-pouch or of the feet, the recorded characters of the feet being supplied by relaxed skins.

The two are widely separated geographically, and by most authors who have discussed them, including Blyth, Blanford, and Lindsay, have been regarded as distinct species; but Robinson and Kloss, who detected their close kinship, considered them to represent merely local races of a single species. Their wide geographical severance precludes, however, the probability of the discovery of intermediate forms, and the evidence is in favour of the earlier view of their kinship.

They may be briefly contrasted, as follows :—

a. Soles of the feet round the plantar pads comparatively well clothed with hairs; no trace of metatarsal pads. Skull with very weak temporal crests on the frontal bones, lower edge of mandible less emarginate behind and teeth smaller	[p. 356. *megaspila* Blyth,
a'. Soles of the feet comparatively naked; remnants of the metatarsal pads persistent. Skull with stronger temporal crests on the frontal bones, lower edge of mandible noticeably emarginate behind; teeth larger .	[p. 358 *civettina* Blyth,

From the small number of preserved skins, it is evident that the Civets of this genus are rare, possibly approaching extinction. When additional material comes to hand other differences than those enumerated will probably be discovered.

40. **Moschothera megaspila** (Blyth). The Large-spotted Civet.

Viverra megaspila, Blyth, Journ. As. Soc. Beng. xxxi, p. 331, 1862; id., Proc. Zool. Soc. 1864, p. 484; Gunther, Proc. Zool. Soc. 1876, p. 428, pl. 37; Blanford, Mamm. Brit. India, p. 99, 1888; Robinson & Kloss, Rec. Ind. Mus. xix, p. 175, 1920; Lindsay, Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 146, pls. 1 & 2, 1928.

Moschothera megaspila, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 443, text-figs. 3 & 4, 1933.

Vernacular.—*Kyoung-myeng* and *Kyaung-myeng-Kwet* (Burmese); *Hen-Hawn* and *Amnge* (Shan); *Músang-jebat* (Malay).

Locality of the *type*, Prome in Lower Burma.

Distribution.—CENTRAL and SOUTHERN BURMA, Malay Peninsula, Siam, and southern Indo-China.

Soles of the feet partially naked only in front of the plantar-pad, the webbing between the 3rd and 4th digits hairy as

far back as the pad, but the hairy patches on the other interdigital webs not reaching so far inwards; the skin at the sides of the plantar pad and above it entirely covered with hair, completely isolating the pads of the pollex and hallux and the carpal pad; no remnants of metatarsal pads traceable.

Hairs of the crest from about 50 to 100 mm., averaging about 60 mm.; contour hairs of the flanks from 25 to 30 mm. General colour varying from silvery-grey to golden-buff or tawny, and the pattern from black to brown, the spots large or comparatively small, separated or sometimes fusing into blotches or into vertical stripes behind the shoulders or into a pair of dorsal stripes bordering the median crest, the white bands on the tail very seldom forming complete rings, mostly restricted to the sides and lower surface.

Some individual differences between two specimens from Tenasserim may be recorded. The first, from Victoria Point, Nov. 27, in early winter coat, has the crest-hairs 48 mm., the flank-hairs 30 mm., the general colour grey, with a decided ochreous-tawny wash on the shoulders and pale tawny behind, and a pattern of small, scattered, indistinct spots on the shoulders, of large black well-separated spots on tas flanks, the uppermost forming on the loins a longitudinal stripe on each side of the crest; the tail has seven white stripes below, the first three reaching some distance up the sides, the next three restricted to the ventral surface, and the last completely encircling the tail near its apex. The second, from Tenasserim Town, March 9, in late winter coat, has the crest-hairs 67 mm., the tint slightly tawnier, and the tail with only five white rings, dorsally incomplete and restricted to its proximal portion, the distal portion being entirely black. The only other available Burmese skin, from Allagappa, 30 miles west of Sagaing in Upper Burma, shows the beginning of the moult, the crest hairs being about 70 mm., the flank-hairs 25 mm., the general colour much greyer, with only a faint buff wash on the fore quarters, the pattern black and standing boldly out against the silvery-grey ground-tint.

The rest of the skins examined, all from countries outside the limits of the British Indian fauna, are undated. They show considerable variations in coat, colour, and pattern. One from Nan in Siam is pale tawny-grey, with the pattern golden-brown. One from Penang is like the latter, but has the pattern deeper brown. One from Nahtrang in Annam, 1,200 ft., resembles the Tenasserim Town skin, but has the crest-hairs only 40 mm., the flank-hairs 27 mm. Three from Cochin-China differ greatly from each other. In one the crest-hairs reach the extraordinary length of 100 mm., the flank-hairs being 30 mm.; the general hue is grey washed with tawny, as in the Tenasserim skins, but the spots are

smaller, showing a tendency to run into blotches and stripes. In another the contour hairs are of average length, the general tint much deeper tawny, and the pattern forms two vertical stripes on the fore part of the flanks. The third also has the contour hairs normal, but the general hue is golden-buff, with many of the large, widely separated spots rusty-brown, those adjoining the crest forming a complete longitudinal stripe on each side.

The material is quite insufficient to show whether the species is differentiated into distinguishable local races or not.

The flesh-measurements (in English inches) and weights, (in lb.) of the two specimens of this species collected by Shortridge in S. Tenasserim and the measurements of the only available specimen of the other species, *civettina*, are as follows :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
megaspila.				
Tenasserim Town ; ad. ♀	31¾	15¼	5⅛	18½
Victoria Point ; ad. ♀	30	14¾	5+	19
civettina.				
Travancore ; ad. ♂.	30	13	—	14½

Except that the tail is a little shorter, only about half the length of the head and body, the dimensions agree closely with those of *Viverra zibetha*.

Habits.—There appears to be very little special information about the habits of this species, which Blanford states are similar to those of *V zibetha*. According to a note by Shortridge on specimens observed at Victoria Point, Tenasserim, it is very similar to *V zibetha* in general appearance, except that the head is more massive and has a swollen appearance about the muzzle ; but it does not smell nearly so strongly of " civet " as *V zibetha*. Incidentally he added that he had never seen any kind of *Viverra* climb a tree, although no doubt they are well able to do so if they choose. The litter, according to Cantor's observation in the Malay Peninsula, consists of from one to three cubs.

41. **Moschothera civettina** (Blyth). The Malabar Civet.

Viverra civettina, Blyth, Journ. As. Soc. Beng. xxxi, p. 332,1862 ; other references as under the preceding species.

Moschothera civettina, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 445, text-figs. 3 & 4, 1933.

Locality of the *type*, Travancore.

Distribution.—The coastal district and Western Ghats of S. INDIA.

Skull-measurements (in mm.) of *Moschothera civettina* and *M. megaspila*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
M. civettina.									
Travancore ; ad. ♂ .	145	139	75	24	23	26	102	14	14
M. megaspila.									
Victoria Point, Tenasserim ; ad. ♀ .	150	147	72	29	25	25	109	12½	13
Tenasserim Town ; ad. ♀ .	149	144	73	27	23	26	104	14	14

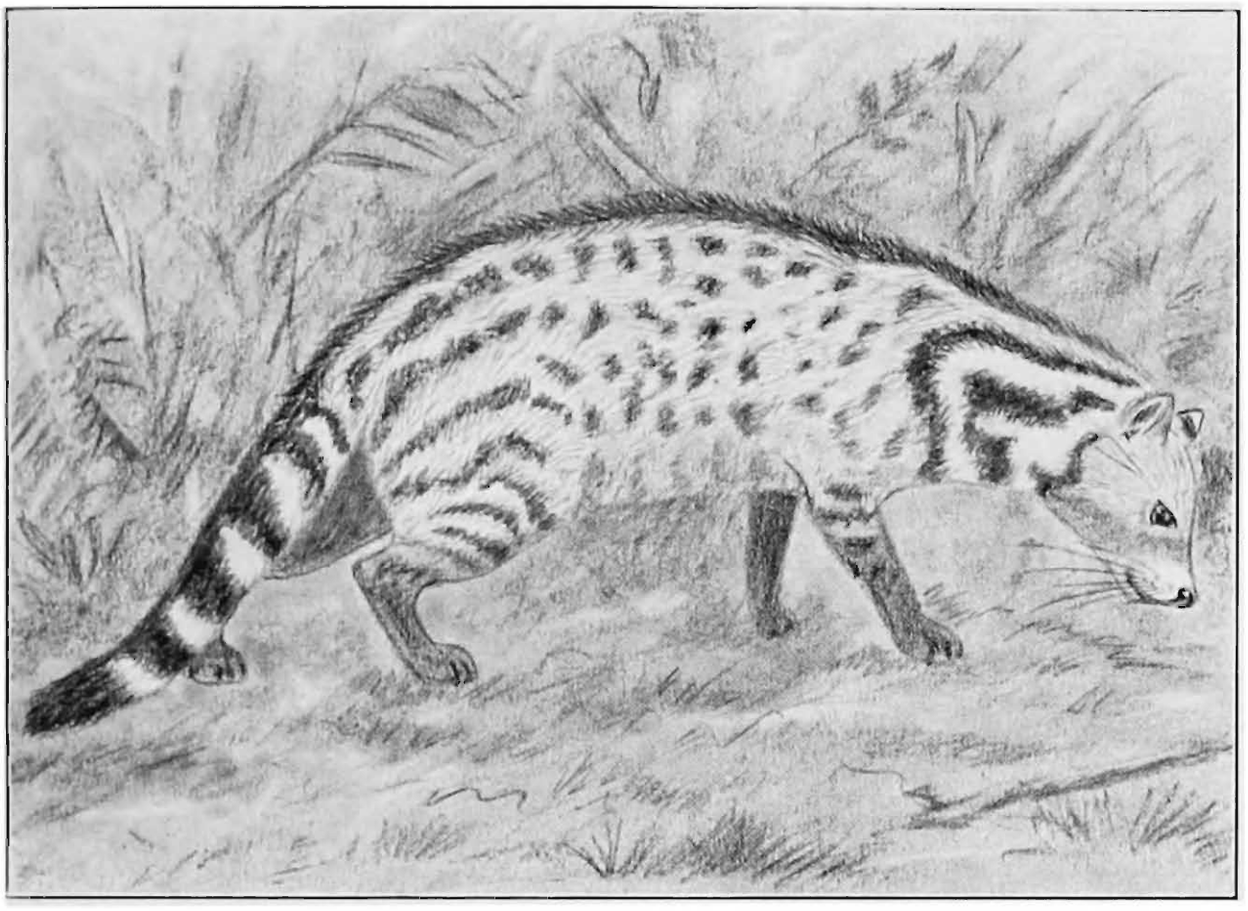
Distinguished principally from *M. megaspila* in external characters by the greater nakedness of the soles of the feet, the hairs on the interdigital webs being between the digital pads, forming submarginal patches, with the skin in front and at the sides of the plantar pad naked, this naked area extending above the pad on each side as far up as the carpal pad on the fore foot and to the level of the hallux on the hind foot, with a hairy median strip between them, reaching to the middle of the plantar pad behind. On the hind foot also remnants of the metatarsal pads persist as two naked spots, the external a little above the level of the hallux, the internal considerably higher. These differences, however, are based on the examination of a single example of *M civettina* that died in the Zoological Gardens in Trivandrum, and may prove to be subject to individual or seasonal variations.

The coat in this specimen is tolerably long and full, the contour hairs of the crest and flanks being about 50 and 30 mm. respectively. The ground-colour is clear grey, nearly matching the specimen of *megaspila* from Sagaing; the pattern is black or nearly so, the spots being smaller and more closely set than in most, but not all, skins of *megaspila*, but more spotted on the shoulders and chest. The tail has five white rings extending farther up the sides than in any skins of *megaspila*, the last being only about two inches from the tip, whereas in *megaspila* the terminal six inches or so of the tail are typically black. There is also more white on the muzzle and chin than in *megaspila*, accompanied by slight differences in the bands of the throat. But on the evidence of a single skin of *civettina* definite differences in colour and pattern between the two species cannot be established.

The flesh-measurements and weight of this example are entered above (p. 358). Although the tail is shorter than in the two specimens of *megaspila* from Tenasserim, the length of that organ in individuals of *Viverra zibetha* is too variable for it to be trusted as of systematic importance in this instance.

The skull is distinguishable from the three skulls of *megaspila* available for examination by having two strongish V-shaped temporal ridges running forwards from the sagittal crest to the postorbital frontal bosses, with the waist a little more constricted, although the animal was younger. Also the lower edge of the postdental portion of the mandible is markedly concave just behind the level of the last lower molar.

Habits.—Apparently all that is known of the habits and occurrence of this Civet is contained in the paragraph, quoted by Blanford, from Jerdon's volume:—"The Malabar Civet Cat is found throughout the Malabar coast from the latitude of Honore



Malabar Civet (*Moschothera civettina*).

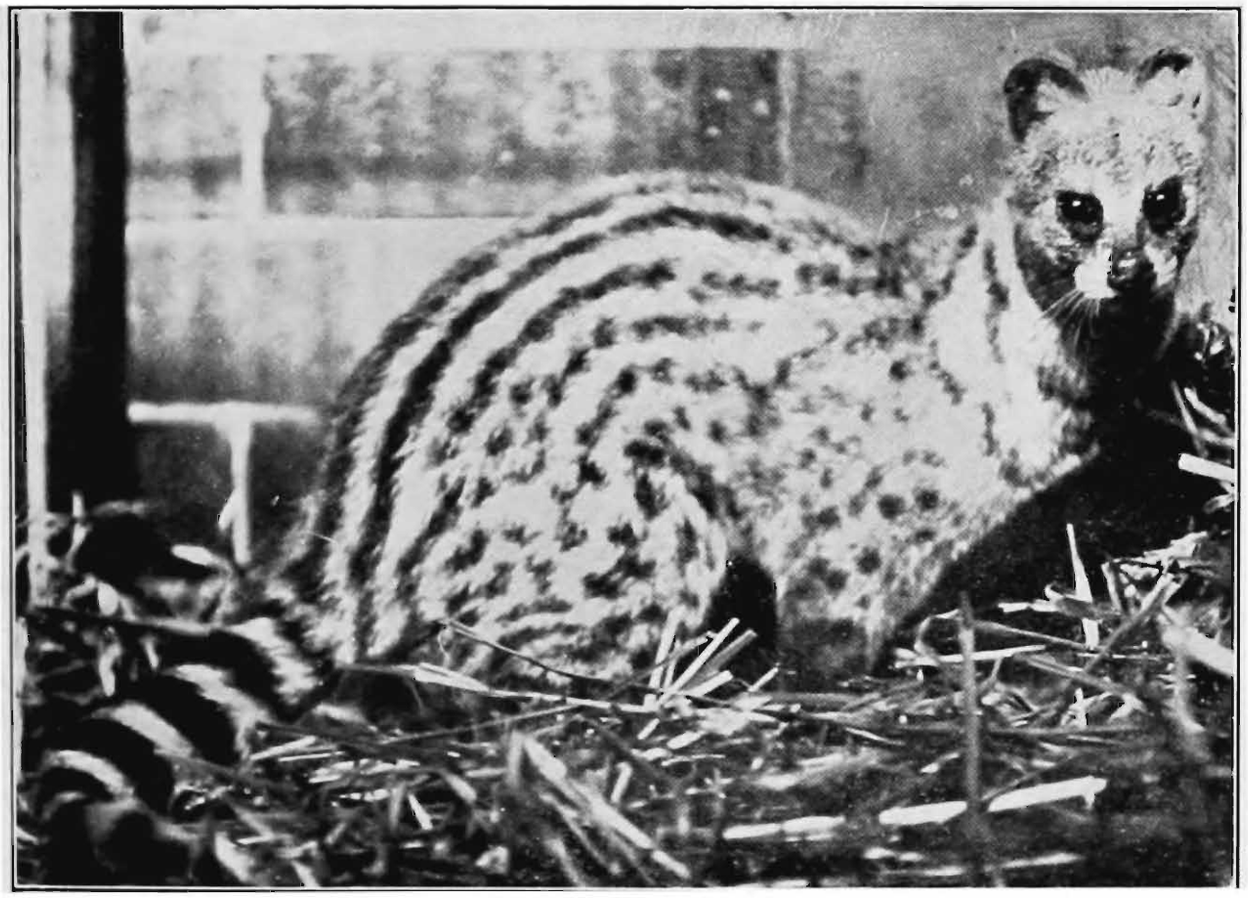


Photo W. S. Berridge.

Little Civet (*Viverricula indica*).

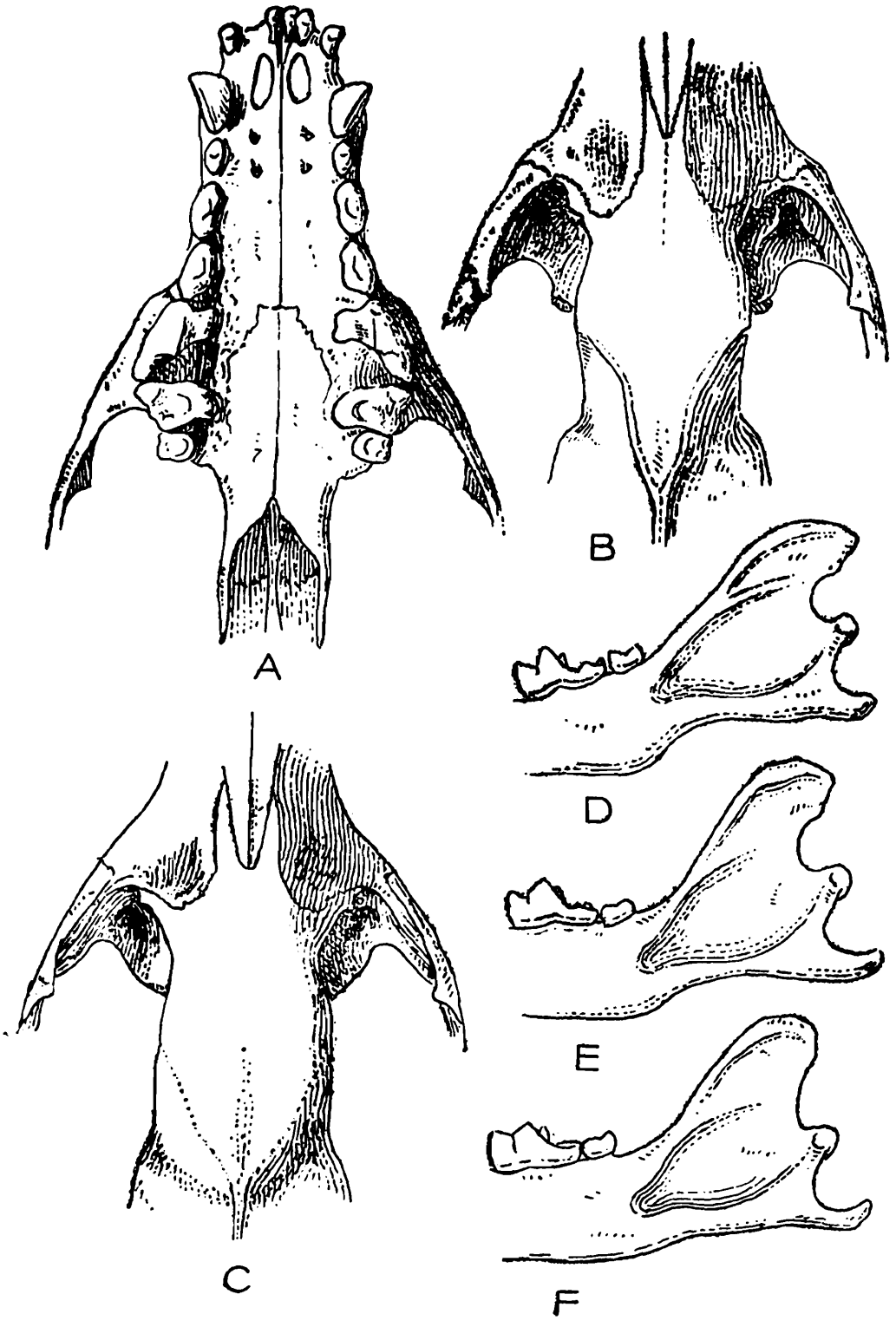


Fig. 88.

A. Palate of skull of *Moschothera civettina* from Trivandrum.
B. Frontal area of skull of the same.
C. The same of skull of *M. megaspila* from Tenasserim Town.
D, E, F. Posterior portion of mandible of Raffles's skull of *M. civettina*, of skull of same species from Trivandrum, and of skull of *M. megaspila* from Tenasserim Town. (All figures $\frac{2}{3}$ nat. size.)

(Honawar) at all events to Cape Comorin. It inhabits the forests and the richly wooded lowland chiefly, but is occasionally found on the elevated forest-tracts of Wynaad, Coorg, etc. It is very abundant in Travancore, and I have procured it close to my own house at Tellicherry. I have never obtained it from the Eastern Ghats nor from Central India. It is stated by the natives to be very destructive to poultry." Since, however, the collectors for the Mammal Survey failed to get a single specimen, it seems that the species must be very much rarer than in Jerdon's time. In the first decade of the present century the late Harold Ferguson did his best, at my request, to secure specimens for the Zoological Society in London, but without success; and in 1923 A. P. Kinloch omitted the species from his list of the dominant mammals of the Nelliampathi Hills, although his remark that there is "another Civet up here, judging from its droppings considerably larger than the Toddy-Cat, but I have never seen it," may have referred to this rare animal. The facts suggest that the species is on the wane.

Genus **VIVERRICULA** Hodgson.

Viverricula, Hodgson, Ann. Mag. Nat. Hist. i, p. 152, 1838; id., Journ. As. Soc. Beng. x, p. 909, 1841; and of most subsequent authors, including Blanford, Mamm. Brit. Ind. p. 100, 1888; Pocock, Proc. Zool. Soc. 1915, pp. 136 & 147; id., Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 629, 1933.

Viverrula, Hodgson, Calc. Journ. Sci. ii, pp. 53–5, pl. i, 1842 (by error for *Viverricula* and misprinted *Viriccula* in expl. of plate).

Type of the genus, *V. indica* (Geoffr.).

Distribution.—Peninsular India from Sind, the Punjab, and the foothills of the Himalayas, Ceylon, Burma, S. China, and thence southwards through the Malay Peninsula to Sumatra and Java. Artificially imported and now wild in Madagascar, Sokotra, and possibly elsewhere.

Distinguished externally from *Viverra* and *Moschothera* by the absence of the dorsal crest and by the insertion of the ears, the anterior edges of which are set closer together on the forehead, a feature which, in conjunction with the shorter, more pointed muzzle, gives a more alert aspect to the face. The feet are as in *Moschothera*, but the scent-gland is relatively not so well developed as in *Viverra*. The neck-stripes are similar in arrangement, but narrower, more variable, and not set off by pale interspaces to the same extent; the body-pattern consists of small spots on the fore quarters, larger spots, tending to run into longitudinal lines, on the flanks, and of six to eight stripes down the back. Skull distinct from that of *Viverra* and *Moschothera* in many particulars. The muzzle is short and weak, the cranial portion long,

narrow, and compressed above posteriorly, the subocular portion of the cheek is longer, pm^4 being set farther back, the infraorbital foramen approximately above the point of contact of pm^2 and pm^3, and the suture between the zygomatic arch and the maxilla very long, about as long as the median length of the nasals, and half the length of the upper cheek-teeth and the width across the occipital condyles ; the auditory bulla is also relatively much longer, exceeding the width across the condyles. The teeth too are more compressed and trenchant, and the first upper molar has a narrower inner lobe.

All the different forms of this Civet are regarded as representing a single species which has the characters and distribution of the genus.

42. **Viverricula indica** (Geoffroy). The Little Civet.

Civetta indica, Geoffroy, Cat. Mamm. p. 113, p. 1803.
Viverricula malaccensis of all recent authors to 1933, but not *Viverra malaccensis* Gmelin, Syst. Nat. i, p. 92, 1788.
Viverricula indica, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, pp. 629–31, 1933 * ; for other bibliographical references see under the subspecific headings.

42 *a*. **Viverricula indica mayori** Pocock.

Viverricula indica mayori, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 632, 1933 ; Phillips, Man. Mamm. Ceylon, p. 168, 1935.

Vernacular.—Urulœra (Sinhalese) ; *Poolu poona*, *Veeregu* (Tamil) ; *Pulugoo Poonai* (Jaffna Tamil).

Locality of the *type*, Maha Oya in the Eastern Province of Ceylon.

Distribution.—CEYLON. "Common all over the island, both in the hills and in the low country" (Phillips).

Distinguished from the typical S. Indian race, *indica*, described below, by its slightly smaller average size and shorter tail and by the absence of noticeable change in coloration and in the length and thickness of the coat, at least from May to December. The general colour is on the whole tolerably uniform, varying from grey to buffish-grey ; the pattern is distinct and blackish-brown or black, but varies considerably in boldness not only in the width of the dorsal stripes but in the extent to which they are broken up or more or less coalescent. No two examples are exactly alike ; two from the same locality may be dissimilar, and each may closely match another from a remote part of the island.

* It is needless to repeat here my reasons, given at some length in this paper, for discarding for this species the name *malaccensis* applied by Gmelin to the figure and description of an alleged Civet from Malacca published by Sonnerat, who used a Genet from the Cape as his model. Sonnerat's account does not agree with any known form of *Viverricula*, and there is very little evidence that the latter was included in his composite description.

42 *b*. **Viverricula indica indica** (Geoffroy).

Civetta indica, Geoffroy, Cat. Mamm. p. 113, 1803 *.
Viverra indica, Desmarest, Nouv. Dict. d'Hist. Nat. vii, p. 170, 1817 ; id., Mamm. i, p. 210, 1820 ; Sykes & Horsfield, Proc. Zool. Soc. 1832, p. 22 ; Geoffroy, Mag. de Zool. 1836, p. 10 (in part, specimens from Malabar).
Viverricula malaccensis indica, Robinson & Kloss, Rec. Ind. Mus. xix, p. 177, 1920.
Viverricula indica indica, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 633, 1933.

Vernacular.—Punagina-Bekku (Kanarese) ; *Fowádi-Manjur* (Marathi) ; *Puluk-Philli* (Wadari) ; *Punkassibekku* (Haran Shikaris) ; *Mushak-billi* (Dekhani) ; *Pulunguotay Punugu* (Coorg).

Locality of the *type*, " India " ; Western Ghats (Sykes and Horsfield) ; Dharwar (Robinson and Kloss).

Distribution.—Southern India from the Western to the Eastern Ghats and, according to Robinson and Kloss, as far north as Lake Chilka on the east coast.

Coat very variable in length and texture before and after the moult, the contour hairs in the fresh coat being from about 20 to 25 mm. long and gradually increasing in length to 35 or 40 mm. and becoming harsh, brittle, and liable to be broken at the tip before being shed. Colour also variable, but, when the coat is soft and full, it is on the average relatively dull, varying from brownish or olivaceous-grey to lighter grey, occasionally only with a brighter ochreous tinge ; but in the old coat the hairs of the interspaces apparently bleach to grey or even silvery. The pattern is usually distinct, blackish or brownish, but is sometimes obscured somewhat by an ochreous tinge.

Specimens often vary considerably from the same locality and at approximately the same time of year. Of five skins from the typical locality, Dharwar, 2,400 ft. (Shortridge), one, Nov. 9, has the coat coarse, shaggy, about 37 mm., and the general tint almost silvery, with the pattern obscure. especially on the tail. Another, Dec. 8, has the coat smoother, but equally thick with underwool and about the same length, and the colour dull buffy-grey, not bleached, with the pattern more conspicuous. The others are intermediate. Examples from other localities in S.W India, from Satara (Prater), N. Coorg, 3,550 ft., S. Coorg, 2,000–2,840 ft. (Shortridge), collected from December to February agree fairly well with the Dharwar skins, and two from the Nilgiris, 3,000–4,000 ft., collected in July, although like the unbleached Dharwar skin of Dec. 8 in tint, have the coat harsh and short, 25 to 30 mm. From the Eastern Ghats (Baptista), two from Kurnool, May,

* Since only a few copies of this work were printed and privately given to friends by Geoffroy, its publication is open to dispute, and Desmarest may be regarded as the author of the name, although he gave Geoffroy the credit of it.

closely resemble the long harsh-coated, bleached November skin from Dharwar, except that the underwool is scanty and the pattern more distinct.

Of three skins from the Palkonda Hills (Baptista), two, July 24 and Aug. 2, have the coat harsh, shabby, and dead, and are also like the bleached Dharwar skin, but not so silvery, with the coat shorter and the pattern even more obscure; the third, July 15, is very different, and seems to have completed the moult earlier, the coat being full, soft, and fresh, 25 mm., and the coloration unusually black and white.

A skin from the Vontimitta Range, 325 ft., Sept. 14, also has the coat fresh, soft, and full, but the general colour normal; and one from the Denkanikota Range, 3,062 ft., Oct. 22, is similar, whereas a July skin from Salem, 1,000 ft., has the coat coarse, brittle, and bleached.

From these skins it seems that the date of the moult is inconstant. Typically the coat is harsh and more or less bleached from May to August with the moult in progress, and full and soft from September to February, but there are individual exceptions to this generalization.

The following table of flesh-measurements (in English inches) and weights (in lb.) of the Ceylonese and S. Indian races, *mayori* and *indica*, shows clearly the average superiority in size of the latter over the former. The data of *mayori* are taken largely from Phillips's volume. The dimensions of the two ♂ specimens with localities are respectively those of the largest and smallest of this sex in the British Museum collected by Dr. Mayor, who failed to secure an adult ♀, thus bearing out Phillips's statement that the ♂ is more abundant than the ♀.

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
mayori.				
Phillips's largest; ad. ♂	23⅜	15	4	6¼
Maha Oya (type); ad. ♂.	23	14⅘	3½	6½
Weligatta; ad. ♂ ..	21	13⅘	3½	4¾
Phillips's average of 12; ad. ♂.	21⅓	13½	3½	5⅛
Phillips's largest; ad. ♀	22⅖	14⅕	3⅗	5⅜
Phillips's average of 5; ad. ♀	20½	13+	3½	5¾—
indica.				
Dharwar; ad. ♂ .	25⅕	16⅘	4	—
Medha, Satara; ad. ♂	24⅕	15⅖	3⅗	8
Dharwar, ad. ♂	23½	15⅗	3¾	—
Benhope, Nilgiri Hills; ad. ♂.	21¾	14¼	3¼	—
Dharwar; ad. ♀ .. .	23⅗	16⅖	3⅘	—
Virajpet, S. Coorg; ad. ♀	23½	14⅖	3⅗	7
Dharwar; ad. ♀ ..	22⅘	15⅖	3⅗	—
Palkonda Hills; ad. ♀	22⅕	15⅕	—	5

The skull-measurements confirm the flesh-measurements in attesting the average inferiority in size of *mayori* to typical *indica*.

Skull-measurements (in mm.) of *Viverricula indica mayori* and *V v. indica.*

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
V. i. mayori.									
Kumbukkan ; ad. ♂ .	101	98	48	13½	15	18	67	8	7
Maha Oya (type) ; ad. ♂	97	95	47	11	12	18	65	8+	8
Gammaduwa ; ad. ♂.	96	94	44	11	12½	16	62½	8—	7
Weligatta ; barely ad. ♂	93	91	43	14	14	17	61	8	8
Tammanewa ; ad. ♀	95	92	42	11½	12	16	61	8	7
V. i. indica.									
Dharwar ; ad. ♂	104	101	46½	12	13½	17—	68	8½	8—
Dharwar ; ad. ♂ .. .	99	99	46	13	13	16	66	9	8½
Virajpet, S. Coorg ; just ad. ♂	99	99	43	13	13	17	67	8	7
Virajpet, S. Coorg ; ad. ♀	99	96	46	12½	13	16—	65	7½	7
Haleri, N. Coorg ; ad. ♀	96	95	45	12½	13	15	63½	8	7
Dharwar ; ad. ♀	97	94	44	12	11½	15	64	8	7

42 *c*. **Viverricula indica bengalensis** (Gray).

Viverra bengalensis, Gray & Hardwicke, Ill. Ind. Zool. i, pl. 4, 1832.
Viverricula malaccensis bengalensis, Robinson & Kloss, Rec. Ind. Mus. xix, p. 177, 1920.
Viverricula indica bengalensis, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 637, 1933.

Vernacular.—*Mashk-billa*, *Katus* (Hindi), *Gundha Gokal*, *Gando gaula* (Beng.) ; *Jabadio* (Cutch).

Locality of the *type*, " most part of Bengal," according to Gray ; Calcutta, as restricted by Robinson and Kloss.

Distribution.—The plains of NORTHERN INDIA, south of the Ganges, from Calcutta to Gujerat, and possibly Sind.

A race provisionally admitted on the evidence of several skins, from scattered localities, which are on the average paler and greyer than those assigned to *indica* from Southern India, none exhibiting the dark olivaceous or ochreous-brown hue of some examples of *indica*, but the grey examples of the latter are practically indistinguishable from them.

The individual and seasonal variations are very similar to those of *indica*. The coat is from 30 to 35 mm. in April skins from Hazaribagh and Hoshangabad (Crump), in a March skin from Gujerat, and a December skin from Kathiawar, from 20 to 22 mm. in a July skin from Sehore and a June skin from Gujerat. The ground-colour in the fresh coat ranges from yellowish- and greyish-buff to silvery-grey ; the dead harsh coat bleaches grey, and in some skins the hind-body is bleached and the head and fore quarters well coloured. The pattern may be black and sharply defined or considerably diluted with ochreous and comparatively inconspicuous.

In addition to the skins from the localities above referred to, there is one, undated, from Larkana in Sind (Prater). The coat is shaggy, harsh, and long, 38 mm., the colour is grey, and the pattern deep brown. It closely resembles two skins of *indica* from Kurnool killed in May, but, pending the collection of additional material, the skin may be provisionally assigned to *bengalensis*.

According to the measurements entered below *bengalensis* is a little shorter in the head and body than *indica* with the same length of tail. The skull, too, is a little shorter on the average than in *indica* ; but hardly differs in other respects. The claim of Robinson and Kloss that the skull of *bengalensis* is larger and has larger bullæ is not borne out by additional specimens.

42 *d*. **Viverricula indica deserti** Bonhote.

Viverricula malaccensis deserti, Bonhote, Ann. Mag. Nat. Hist. (7) i, p. 120, 1898.
Viverricula indica deserti, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 639, 1933.

Locality of the *type*, Sambhar, near Jaipur in Rajputana.

Distribution.—RAJPUTANA, so far as at present known.

Distinguished from the preceeding races by its longer, shaggier coat, which in late summer and early winter is longer

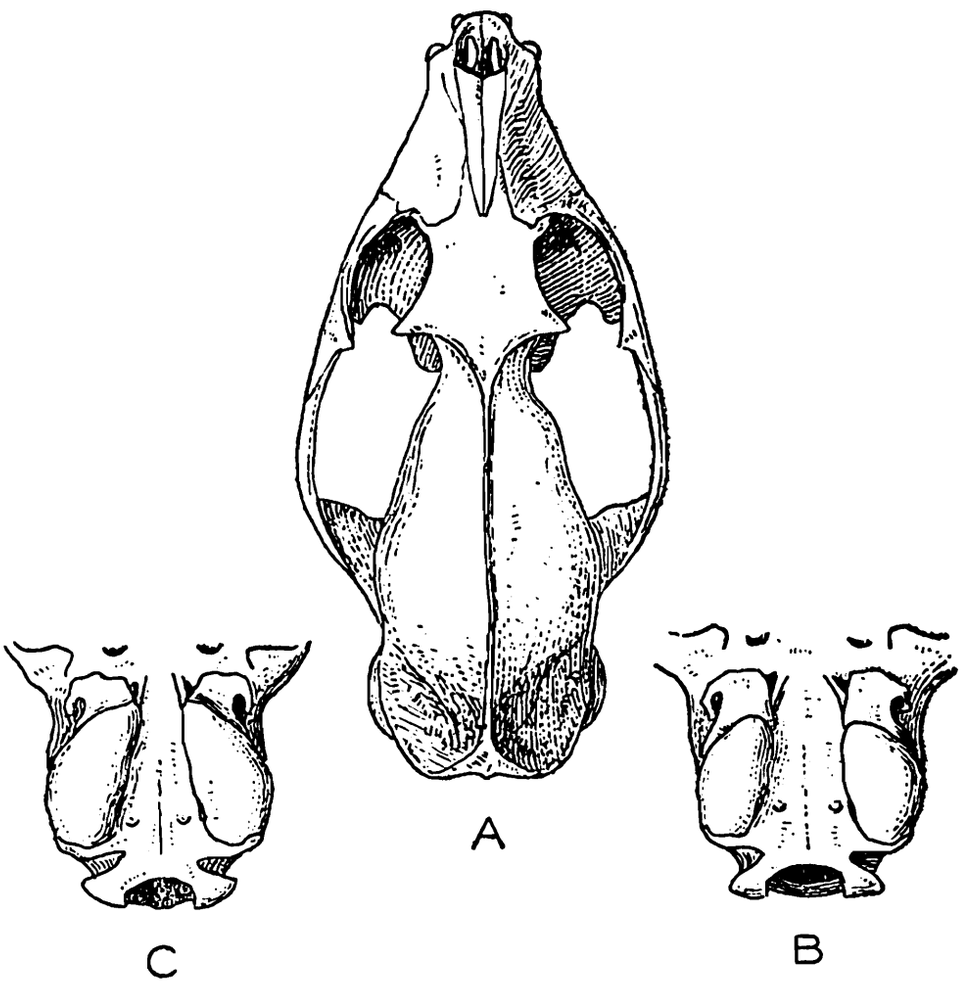


Fig. 89.

A. Upper view of skull of *Viverricula indica wellsi* from Kangra.
B. Lower view of occipital region of the same, showing the auditory bullæ.
C. The same of a skull of *V. indica baptistæ* from Bhutan Duars.

than the longest winter coats in *indica* and *bengalensis*. The " waist " or postorbital area of the skull is also narrower.

This race is provisionally admitted on the evidence of two specimens only. The type, from Sambhar (Adam), December, has tolerably luxuriant underwool, and the contour hairs 45 mm. long ; the general colour is grey, and the stripes and spots form an obscure, irregularly-clouded pattern. a mixture of grey, ochreous, and dusky brown, but no black,

A second specimen, from Nasirabad, August, has the coat 42 mm., the ground-colour buffy-grey, and the pattern obscure, mixed black and rusty ochre, and hardly forms any definite stripes.

The skull of the type, the only one known, is very similar to that of *bengalensis* and *indica* except for the exceptional narrowness of the " waist," which is not an age character ; the distance between the bullæ is also less than in the skulls of the previously described races. Until additional specimens are procured from Rajputana the precise status of this race must remain in doubt.

An adult ♂ from Dagshai, near Simla, 6,000 ft. (Dunn), Jan. 26, closely matches *bengalensis* in size, in its grey colour, and well-defined black pattern, but has the coat a little longer, 38 mm. The skull is like the smallest of the *bengalensis* skulls, an adult ♂ from Hoshangabad, but the waist is narrower and the bulla shorter. By its colour, pattern, smaller skull, and upper carnassial and shorter bulla it differs from the race from Kangra described below, which from its distribution it might be expected to resemble ; and apart from colour it similarly differs from *deserti*. Additional specimens from this district of the Upper Punjab are required before the status of this skin can be determined.

42 *e*. **Viverricula indica wellsi** Pocock.

Viverricula indica wellsi, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 640, 1933.

Vernacular.—*Malpusa* (Hindi in Kumaun).

Locality of the *type*, Kangra, 2,000 ft.

Distribution.—KANGRA, KUMAUN, and the UNITED PROVINCES.

Closely resembling *deserti* in the length of the coat and the coalescence and confusion of the dorsal pattern, but differing in being on the average more richly tinted in general colour.

In a series of five winter skins from Kangra, 2,000 ft. (Wells), February and March, the coat ranges from 25 to 46 mm. long ; the general colour is mostly buff, with the pattern very obscure owing to its ochreous tinge blending with the ground-colour. In one skin the pattern is more distinct, with some black in it, and in another the ground-colour is bleached grey. Two skins from Ramnagar, Kumaun, 1,500 ft., January, and ten undated skins from the United Provinces (Burke) closely match the Kangra series.

The following table of flesh-measurements shows approximate equality in the length of the head and body to the S. Indian form (*indica*) and slight superiority to the Plains

form (*bengalensis*), but the tail is apparently on the average shorter even than in *bengalensis*.

The skull is very like those of these two races, but is longer than in *bengalensis*, and has the postorbital area narrower than in either, although not so narrow as in *deserti*.

The flesh-measurements (in English inches) and weights (in lb.) of specimens from the Plains of Northern India (*bengalensis*), from Rajputana (*deserti*), and from Kangra and Kumaun (*wellsi*) are as follows :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
bengalensis.				
Hazaribagh, Bengal ; ad. ♂	23⅜	16⅘	4	6¼
Sehore, C.I. ; ad. ♂	22⅘	15⅘	3⅘	—
Hoshangabad ; ad. ♂	21⅗	14⅗	3⅗	5
Kathiawar ; ad. ♀ .	22⅖	15⅖	3⅗	5¾
Danta, Gujerat ; ad. ♀	21⅘	16¼	3⅗	5½
Hazaribagh ; ad. ♀	21⅖	15	3⅗	6
deserti.				
Sambhar, Rajputana (type) ; ad. ♂.	23—	16—	4—	—
wellsi.				
Kangra, 2000 ft. ; ad. ♂	25⅜	14⅘	4	—
Kangra ; ad. ♂	24⅘	15⅕	3⅘	—
Kangra ; ad. ♂	24⅗	14⅘	4	—
Kangra ; ad. ♀ . . .	22	14⅖	3½	—
Ramnagar, Kumaun ; ad. ♀	22⅖	14⅖	3½	6½

A number of unsexed old skins collected by Hodgson in Nepal, without further particulars, resemble the next race rather than the last in shortness of coat and distinctness of pattern ; but in cranial characters they are nearly intermediate, as might be expected from their distribution.

42*f*. **Viverricula indica baptistæ** Pocock.

Viverricula indica baptistæ, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 43, 1933.

Vernacular.—*Saiyar*, *Bag-nyul* (Nepal Terai).

Locality of the *type*, Hasimara in Bhutan Duars.

Distribution.—From BHUTAN and UPPER BENGAL to ASSAM.

Distinguished from *wellsi* and *deserti* by its shorter coat and more distinct pattern, but closely resembling *wellsi* in its bright colouring, which is brighter than in *deserti*, *bengalensis*, and *indica*. It is also decidedly smaller in its flesh-measurements.

A series of ten skins, collected between Nov. 7 and April 20, have the coat from 27 to 35 mm. long, the general colour buff or ochreous, occasionally with a grey or olivaceous cast,

Skull-measurements (in mm.) of *Viverricula indica bengalensis*, *V i. deserti*, and *V. i. wellsi*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
V i. bengalensis.									
Calcutta ; ad. ♂	98	96	48	12	13	16½	—	8	—
Hazaribagh, Bengal ; ad. ♂	99	97	45	11	12	16	65	7½	7
Sohagpur, Hoshangabad ; ad. ♂	94	92	42	10	11	16	60	9—	8
Sohagpur, Hoshangabad ; ad. ♂	90	83	41	12	11	15	59	8—	7
Danta, Gujerat ; ad. ♀	96	95	44	13	13	14	64	8	7
Rajkat, Kathiawar ; ad. ♀	94	94	47	13—	11	16	63	7½	7
V i. deserti.									
Sambhar, Rajputana (type) ; ad. ♂	99	99	45	8½	11	15	65	8	7
V. i. wellsi.									
Kangra ; ad. ♂.	105	102	48	11	14	17½	68	8½	8
Kangra ; ad. ♂.	101	100	47	11	15	15	68	8	7½
Kangra ; ad. ♂.	101	99	45	11	12	16	65	8½	7
Kangra ; ad. ♀.	100	97	46	11	12	15	65	7½	7½
Ramnagar, Kumaun ; ad. ♀	100	98	45	11½	11	15	66	8—	7+

and the well-defined pattern varying from blackish to rufous-brown. Specimens representing this race were collected at Hasimara and Bharnabari, 600 ft., in Bhutan Duars (Baptista), Haldibari, near Cooch Behar (Crump), Darbhanga, 150 ft. (Inglis), N. Kamrup, 300 ft., and possibly Sadiya (Blanford) and Golaghat, 250 ft., in Assam. A specimen from Mokokchung in the Naga Hills, 4,500 ft. (Mills), which in 1933 I assigned to this race, agrees better in size with the next race, although the end of the tail is not so pale. It is probably an intermediate form.

As the table of flesh-measurements shows, this race is a little smaller than the other Indian races, coming very near the Ceylonese race in that respect. The skull is about the same length as that of *mayori*, but that of *baptistæ* is more lightly built, being narrower in all the width-dimensions given.

42 *g*. **Viverricula indica thai** Kloss.

Viverricula malaccensis thai, Kloss, Journ. Nat. Hist. Soc. Siam, iii, p. 352, 1919 ; Robinson & Kloss, Rec. Ind. Mus. xix, p. 178, 1920 ; Chasen, J. Siam Soc. Nat. Hist., Suppl. x, p. 41, 1935.
Viverricula indica thai, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 650, 1933.

Vernacular.—*Koung-ka-do* (Burmese) ; *Wa-young-kyoung-byouk* (Arakan) ; *Kyaung-myin* or *Kyaung myeng* (Burmese, Mt. Popa).

Locality of the *type*, Prapatom, west of Bangkok, Siam.

Distribution.—Siam, Indo-China, and BURMA.

Distinguished from *baptistæ* by the longer winter coat, the tail conspicuously whiter at the end, owing to defective black banding, and the skull larger, with the bullæ more widely spaced.

Two names were given to races of this Civet inhabiting the mainland of S.E. Asia—*V. indica thai*, based upon specimens from Prapatom, about 40 miles west of Bangkok in Siam, and *V indica klossi*, proposed by myself in 1933 for specimens from Penang, as a substitute for the inadmissible name *V malaccensis malaccensis* adopted by Kloss for specimens from the Malay Peninsula. The Siamese form was distinguished from the Malayan by having the buffy ground-colour slightly paler and duller, with more black speckling, and the tail more nearly white. In 1933 I assigned to *thai* several specimens from Tong-king, Annam (Delacour and Lowe), and Cochin-China, and one from 60 miles north of Raheng on the Me-wong River, Siam, which seems to agree closely with the type from Prapatom.

Provisionally I assign all the Burmese skins in the British Museum to *thai*. Their colour, however, is extremely variable, and they seem to fall into two categories.

A skin from the Chin Hills, 4,000 ft., in Upper Chindwin, April 5, with the coat 38 mm., the ground-colour bright buff, and the pattern rusty, closely matches a skin from Saigon, Cochin China. Another from Yin in Lower Chindwin, Sept. 18, with the coat 33 mm., the fore quarters brownish, the flanks grey, and the pattern black, resembles in its combined features skins from Tong-king, Annam, and Cambodia; but two skins from Mt. Popa, 4,061 ft., Sept. 3, and the Allagappa Valley, 30 miles west of Sagaing, have the coat thin, short, harsh, and bleached to whitish-grey on the flanks, but the pattern black and sharply defined. The extension of this race to the southern end of the Irrawaddy Valley is attested by a skin from Rangoon which in its brownish coloration resembles the fore quarters of the skin from Yin in Lower Chindwin, and suggests the unbleached phase of the skins from Mt. Popa and the Allagappa Valley.

Skins of the second category came from the valley of the Sittang (J. M. D. Mackenzie). Six from the delta of the Sittang, some 40 miles south of Pegu Town, March, have the coat decidedly less luxuriant and less shaggy than skins from Upper Burma collected in February and March; the ground-colour is ochreous or buff, the pattern well defined, blackish or rusty black, and the tail is noticeably whitish at the end. In brightness of tint these skins differ strikingly from the skin from Rangoon and from most of the skins from Upper Burma, except the one from the Chin Hills. One of three skins from 30 miles north of Toungoo, Jan. 8, has the fresh winter coat close and soft, not loose, and in colour and pattern is very like the skins from the Sittang Delta. The other two, on the contrary, March 18 and 23, have the coat thinner, shorter, and harsher, the colour buffy-grey or silvery-grey on the flanks, darker on the back, with the pattern black. The coat is clearly dead and bleached, with the moult imminent, and the skins closely resemble those collected on Mt. Popa and in the Allagappa Valley in September and October.

In colour and shortness of coat the well-coloured Sittang Valley skins are very like skins of *klossi* that I have seen from the Malay Peninsula, and in 1933 I provisionally identified them as that race; but the tails are whitish at the end as in *thai*, and on geographical grounds they are probably the same as the Siamese race.

The flesh- and skull-measurements of the Upper and Lower Burmese specimens are in tolerably close agreement. In the table of skull-measurements are entered two from Chittagong (B. B. Osmaston), which have no skins. That of the ♀ is the same length and width approximately as the skull of the type of *thai*, also ♀, from Prapatom, and the skull of the ♂ is the largest of *Viverricula* I have measured. The

skulls from Toungoo and the Sittang Delta are a little larger than skulls of typical *klossi* from Penang.

Clearly there may be at least two races, a northern and a southern, represented in Burma. Additional specimens are wanted, especially from Northern Burma and Tenasserim. Until these come to hand it seems better to regard them as one.

The flesh-measurements (in English inches) and weights (in lb.) of specimens from the Western Himalayan area (*baptistæ*) and from Burma (*thai*) are as follows :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
baptistæ.				
Angarakata, N. Kamrup; ad. ♂	21$\frac{1}{5}$	13$\frac{3}{5}$	3$\frac{3}{5}$	6
Hasimara, Bhutan Duars; ad. ♂	20$\frac{2}{5}$	13$\frac{1}{5}$	3$\frac{3}{5}$	—
Hasimara, Bhutan Duars; ad. ♂	20$\frac{1}{5}$	13$\frac{1}{5}$	3$\frac{2}{5}$	—
Hasimara, Bhutan Duars; ad. ♀	20$\frac{2}{5}$	11$\frac{2}{5}$	3$\frac{2}{5}$	—
Hasimara, Bhutan Duars; ad. ♀	20$\frac{1}{5}$	12$\frac{2}{5}$	3$\frac{2}{5}$	—
thai.				
Mokokchung, Naga Hills; ad. ♂	22$\frac{1}{2}$	16±	3$\frac{1}{2}$	—
Mt. Popa, Upper Burma; ad. ♂	25$\frac{2}{5}$	16$\frac{1}{2}$	4	7$\frac{1}{2}$
Toungoo, Lower Burma; ad. ♀	22$\frac{3}{5}$	13$\frac{2}{5}$	3$\frac{3}{5}$	—
Toungoo, Lower Burma; ad. ♂	21	14$\frac{2}{5}$	3$\frac{3}{5}$	—
Toungoo, Lower Burma; ad. ♂	20$\frac{4}{5}$	16$\frac{2}{5}$	3$\frac{4}{5}$	—

Habits.—The Ceylonese race of this Civet is common, according to Phillips, all over the island, both in the hills and low country. Although apparently purely nocturnal in the more thickly populated districts, lying up by day in some thick clump of fern, long grass or scrub, very rarely among rocks or boulders, in the wilder jungle, it may be seen hunting in the daytime. When chased by dogs, which easily follow its strong scent, it usually tries to escape by dodging and twisting in and out through the thickest undergrowth, sometimes going to ground, but when driven into the open it is not swift enough to escape its pursuers. Although reported to be a good climber, the animal was only once seen by Phillips to take refuge in a tree.

It feeds chiefly on birds, small mammals like rats and squirrels, on frogs, insects, and their grubs, but also on fruits and certain roots.

It breeds at all seasons, the young, from three to five in number, being born in a chamber at the end of a short burrow usually under a rock or tree-stump or in a field-drain.

In essentials this account no doubt applies to all the subspecies of *V indica*, except possibly in the breeding at all seasons. In the main it agrees with Blanford's report, although according to the latter the species is said to be "distinctly arboreal." Phillips's statement about the infrequency with which it takes refuge in a tree is in agreement with the structure of the feet and with Shortridge's report that he never saw any kind of Civet climb a tree.

Skull-measurements (in mm.) of *Viverricula indica baptistæ* and *V i. thai*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
V. i. baptistæ.									
Hasimara, Bhutan Duars (type); ad. ♂	99	98	43	12	11	15	66	8	7
Hasimara, Bhutan Duars; ad. ♂	94	93	44	14	11	14½	61	8	7½
Hasimara, Bhutan Duars; ad. ♂	91	91	40	8½	10	15	—	7	—
Angarakata, Kamrup; ad. ♂ ..	93	92	45	12	12	16	62	7+	7—
Hasimara, Bhutan Duars; ad. ♀	92	91	44	9	10	14	61	7½	7½
Hasimara, Bhutan Duars; ad. ♂	89	88	42½	9	10	14	58	7½	7
V i. thai.									
Mokokchung, Naga Hills; ad. ♂	100	99	45	11	12	16	68	8	7
Chittagong; ad. ♂.	107	103	48	13	13	17½	69	9	7½
Allagappa, Upper Burma; ad. ♂	101	100	46	—	—	—	—	8—	—
Mt. Popa, Upper Burma; ad. ♂	99	99	47	12	12½	16½	66	8½	8
Rangoon; ad. ♂	102	99	45	14	12½	15	67	8	7½
Chittagong; ad. ♀.	98	96	45	12½	12	16	63	7½	7
Toungoo; ad. ♂..	101	97	46½	13	12	16	65	8	7
Sittang delta; ad. ?	—	99	48	10½	12½	17	67	8	7
Sittang delta; ad. ?	98	96	46	11	11	16+	63	8	7

In Dharwar, according to Shortridge, the typical race is plentiful, its chief food consisting probably of Gerbils (*Tatera*) and other field-rats, which exist in enormous numbers. He found it equally plentiful in Coorg, and noted that numbers are kept in captivity at Kolar in Eastern Mysore for the sake of their perfume, which is largely used in India for flavouring tobacco smoked by the natives. Incidentally he remarked that this Civet, like the Toddy-Cat and Common Mongoose, is not so destructive to domesticated poultry as the smaller wild cats. This is not from lack of opportunity, because they habitually live in large numbers near human dwellings. They will kill fowls when opportunity occurs, but they prefer, apparently, to prey on rats, lizards, and other small animals, which are found everywhere in abundance. They are fond of carrion, and are invariably attracted by dead animals.

The Nepalese race was reported by Hodgson to be solitary, even pairs being seldom seen together. It was found in forests, detached woods, or copses, whence it wandered freely by day, occasionally at least by night as well, into the open country, feeding upon birds, eggs, snakes, frogs, and insects as well as upon some fruits and roots.

Subfamily PARADOXURINÆ.

Resembling the Viverrinæ in the presence of well-developed scent-glands in both sexes, but the glandular pouch represented externally by a more widely-spread area of naked skin bordered by tumid lips capable of being folded over to meet in the middle line, but not so as to constitute a definite closed pouch for the storage of the secretion. In the male also there is a neck of naked skin round the base of the penis, continuous behind with the glandular area, and in the ♀ the glandular area embraces the vulva, which lies near its centre*. The feet also are adapted for climbing, being short and broad, with the five digits evenly spaced, except the third and fourth of the hind foot, which have their pads joined proximally, and forming a continuously curved line, the first being approximately on the same level as the fifth and not raised as a "dew-claw" above the plantar pad. The plantar pad is wide, composed of four distinct, subequal lobes, and continuous behind with the equally wide bilobed carpal pad on the fore foot and with the two large metatarsal pads on the hind foot, of which the underside is naked nearly or quite to the heel, the gait being subplantigrade, not digitigrade.

* For figures and descriptions of the glands and other external characters of the genera of this group see my paper in Proc. Zool. Soc. 1915, pp. 387–412, where references to the works of other authors are discussed.

The general shape is also different, the body being longer and more sinuous, the legs shorter, and the tail typically much longer.

The skull is generically variable in form, being sometimes more, sometimes less, modified in response to the action of the

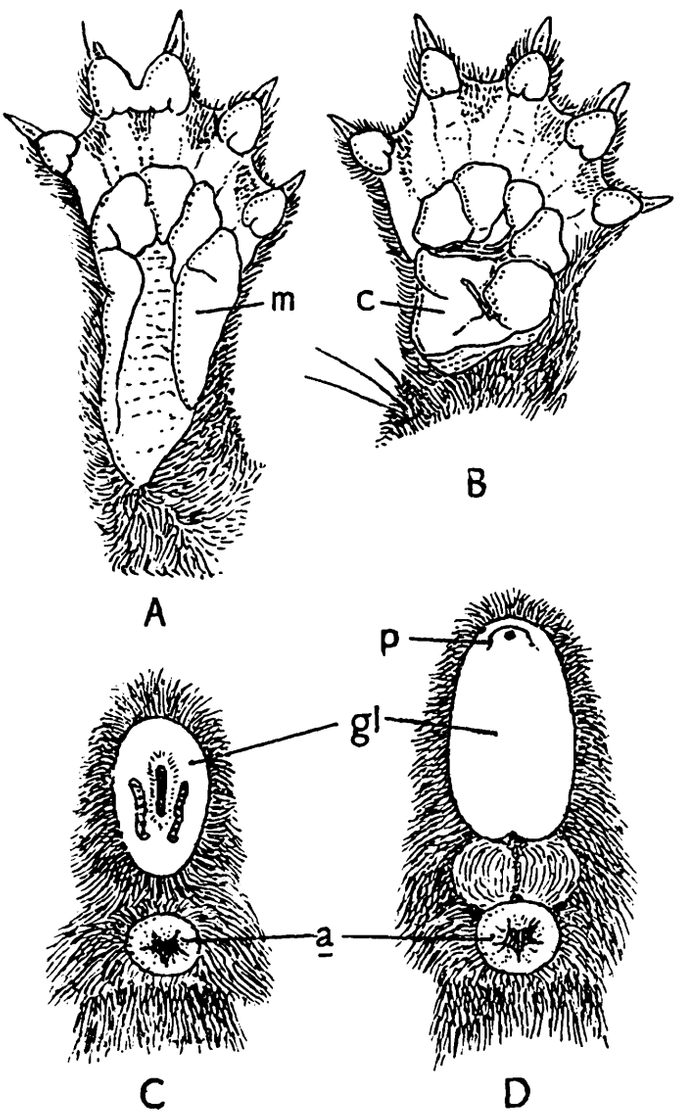


Fig. 90.

A. Lower view of right hind foot of *Paguma larvata larvata* : *m*, internal metatarsal pad.
B. Lower view of right fore foot of the same : *c*, inner half of carpal pad.
C. Anal and genital area of ♀ *Paradoxurus hermaphroditus* : *a*, anus ; *gl*, shallow glandular pouch with row of secreting pores on each side of the vulva in the centre.
D. The same of ♂ *Paradoxurus hermaphroditus* : *a*, anus ; *gl*, shallow glandular pouch, spread open with the scrotum behind it and the prepuce (*p*) in front.

temporal muscles than in the Viverrinæ. The dental formula is typically the same as in that subfamily, but the teeth themselves, like the shape of the skull, are generically very

variable. They may be similar to those of *Viverra*, except that the postcanine teeth are slightly less compressed, the lower carnassial (m_1) is typically a little longer than the external length of the upper (pm^4), and always the last two upper cheek-teeth (m^1 and m^2) are less abruptly inturned, so that the upper carnassial is set a little more forward, not so near the " point of maximum efficiency " of the jaw, these features indicating that the teeth are not so specialized for flesh-eating as in the Viverrinæ.

This subfamily, ranging throughout the forested parts of the Oriental Region, is represented in British India by three well-defined genera distinguishable by external and cranial characters.

Key to their Identification by External Characters.

a. Tail not prehensile; hind foot with the heel hairy; coat not exceptionally long and shaggy; hairs on the backs of the ears short.
  b. A definite pattern of dorsal stripes and lateral spots, at least in the new coat, but not infrequently concealed by the long black hairs . . . . [& Geoffr., p. 379. PARADOXURUS Cuv.
  b'. No pattern of stripes or spots on the body. PAGUMA Gray, [p. 415.
a'. Tail prehensile; hind foot with heel naked; coat long and shaggy, the backs of the ears clothed with long hairs projecting beyond their tips as a tuft [p. 431. ARCTICTIS Temm.,

Key based on Cranial and Dental Characters.

a. Skull with the palate not produced over the anterior half of the mesopterygoid fossa; its postorbital area strongly constricted, much narrower than the interorbital and than the maxilla above the canines . [& Geoffr., p. 379. PARADOXURUS Cuv.
a'. Skull with the palate produced backwards over the fore part of the mesopterygoid fossa; postorbital area about the same width as the interorbital.
  b. Teeth normal, fourth premolar and first molar above and below large, nearly as in *Paradoxurus*; muzzle larger, its width above the upper canines about the width of the postorbital area; interorbital and frontal area not noticeably inflated by air-cells. . . . . [p. 415. PAGUMA Gray,
  b'. Teeth, except canines, reduced, the fourth upper premolar and first molar above and below small; width of maxilla above canines much less than interorbital width; interorbital and frontal regions typically a good deal inflated with air-cells. [p. 431. ACTICTIS Temm.,

The only other genus of the Paradoxurinæ is Musschenbrök's Palm-Civet (*Macrogalidia musschenbroeckii*) from N. Celebes. This large species is most nearly related to *Paradoxurus*, resembling *P. zeylonensis* in the reversal of the hairs on the neck and in its brown colour, with at most a faint pattern. The skull is like that of *Paradoxurus* in its narrow, constricted, postorbital area and other features due to muscular development, and like that of *Paguma* in the extension of the palate over the fore part of the mesopterygoid fossa; but it differs from both in having the palate parallel-sided instead of widened behind by the divergence of the rows of the cheek-teeth. Also the enamel of the teeth, especially of the canines, is conspicuously pitted (see Pocock, Proc. Zool. Soc. 1933, p. 1013).

Genus **PARADOXURUS** Cuvier & Geoffroy.

Paradoxurus, F. Cuvier & Geoffroy, Hist. Nat., Mamm. pt. 24 p. 5, 1821.
Platychista, Otto, Nov. Act. Acad. Caes. Leop., xvii, p. 1089, 1835.
Bondar and *Macrodus*, Gray, Proc. Zool. Soc. 1864, pp. 531 & 536,

Type of *Paradoxurus, typus* Cuv. & Geoffr. (=*hermaphroditus* Schreber); of *Platychista, pallasi* Otto (=*hermaphroditus*, Schreb.); of *Bondar, bondar* Desm.; and of *Macrodus, macrodus* Gray (=*javanicus* Horsf.).

Distribution.—Over nearly all the forested parts of the Oriental Region from CEYLON and INDIA, northwards to the Himalayas, thence eastwards through UPPER BURMA to S. China and Hainan, southwards through Indo-China, Siam, Malaya, the larger and smaller Austro-Malayan islands to Celebes, Ceram, and the Kei Islands.

Tail nearly as long as the head and body, sometimes quite as long, and about six times as long as the hind foot. Coat on the body consisting of long contour hairs and more or less underwool, varying with latitude, in winter. Pattern of dorsal stripes and lateral spots usually manifest, sometimes very faint. Head broad, muzzle narrow, with the rhinarium large, deeply sulcate in the middle, with prominent angles above anteriorly; ears large, rounded at the tip, the interior ridges and bursa well developed, the posterior flap of the latter rising behind the edge of the pinna, the anterior flap deeply emarginate. Feet as described under the subfamily.

The skull exhibits marked muscular moulding as compared with that of the other British Indian genera, notably in the postorbital area, which is deeply constricted a short distance behind the well-developed postorbital processes, and is considerably narrower than the interorbital area and than the

muzzle above the canines; the sagittal crest is present in the adult of both sexes, and the zygomatic arches are often strongly salient; the palate is not produced behind to cover the anterior half of the mesopterygoid fossa, and is flat and expanded between the posterior cheek-teeth. The dental formula is

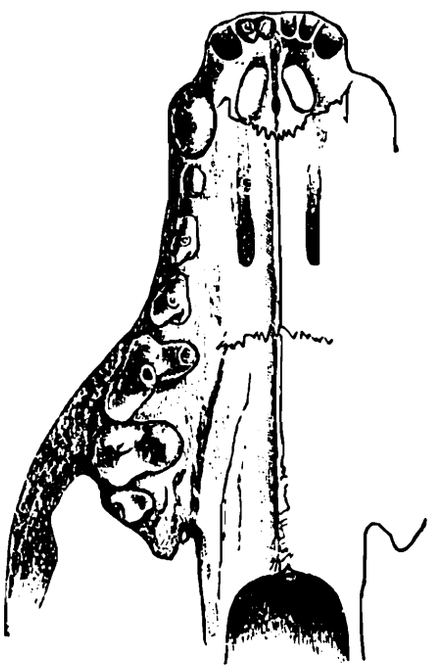


Fig. 91.—Right half of palate of *Paradoxurus hermaphroditus*, showing the upper teeth and the anterior part of the mesopterygoid fossa. (From Blanford.)

normal for the Viverridæ and the teeth are tolerably similar to those of *Viverra*, except for the differences stated under the subfamily heading.

The three species admitted as British Indian in this volume may be briefly distinguished as follows :—

a. Hairs on the neck reversed in direction, growing forwards from the shoulders to the head; contour hairs of the coat typically less long and shaggy; pattern at most obscure.

b. General colour from dark sepia-brown to golden-brown; facial vibrissæ reddish; prepalatine foramina in skull of normal length .. .. [p. 381. *zeylonensis* (Schreb.)

b′. General colour typically darker; facial vibrissæ from brown to blackish; prepalatine foramina exceptionally long, projecting beyond the level of the canines, except in old skulls ... . . [p. 383. *jerdoni* Blanf.,

a′. Hairs on the neck directed backwards; contour hairs typically long and shaggy; pattern better defined; facial vibrissæ black; prepalatine foramina of normal length (Schreb.), p. 387. *hermaphroditus*

43. Paradoxurus zeylonensis (Schreber). The Golden Palm-Civet.

Viverra zeylonensis (Pallas), Schreber, Säug. iii, p. 451, 1777.
Viverra zeylanica, Gmelin, Syst. Nat. ed. 13, i, p. 89, 1788.
Paradoxurus zeylanicus, with var. *fuscus* or *montanus*, Kelaart, Prodr. Faun. Zeylon. pp. 39–40, 1852.
? *Paradoxurus aureus*, F. Cuvier, Mem. Mus. Hist. Nat. Paris, p. 48, pl. 4, 1822; Blanford, Fauna of Brit. Ind., Mamm. p. 110, 1888; and of most subsequent authors.
Paradoxurus zeylonensis, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 859, 1933*; Phillips, Man. Mamm. Ceylon, p. 174, pl. 13, 1935.

Vernacular.—*Kalawedda* (Sinhalese); *Marum nai* (Tamil).

Locality of the *type* of *zeylonensis* (=*zeylanicus*), Ceylon; of *fuscus* or *montanus*, Newera Eliya, Ceylon; of *aureus*, unknown.

Distribution.—CEYLON.

Hair in front of the shoulders radiating from two whorls and growing forwards along the nape and sides of the neck to the head; on the fore throat also it grows forwards, radiating from a single whorl. General colour of upper side brown, but individually variable from dark sepia to ochreous, rusty or golden-brown, the tips of the contour hairs frequently lustrous, sometimes greyish; legs about the same tint as the back, but the tail and face sometimes noticeably paler, buffy-grey, the face without grey pattern, but the vibrissæ dirty white. The dorsal pattern characteristic of the typical species of *Paradoxurus* absent or represented by faint bands and spots slightly darker than the ground-colour. The lower side slightly paler and sometimes greyer than the upper, especially, apparently, in younger specimens, in which grey may be dominant over brown even on the back.

There is not sufficient material to establish the existence of possible local races; but the following variations may be noted. Two examples from Nuwara Eliya, collected by Kelaart and named by him *fuscus* (*montanus*), are decidedly paler on the head and face than others from different localities, but the type is darker, more rusty brown than the other and has no pattern, the topotype being more golden-brown with

* *Note on the synonymy.*—The original specimen of this species was from Ceylon, as recorded by Pallas, who sent a description of it to Schreber for publication. Gmelin epitomized this description, but altered the name to *zeylanica*, and this inadmissible emendation was adopted by Kelaart and Blyth. In 1885 Blanford (Proc. Zool. Soc. 1885, p. 612) quoted the species as *Paradoxurus zeylonensis*; but in his volume in the 'Fauna of British India, Mamm.,' he abandoned that name in favour of *aureus* given by Cuvier to a young example of *Paradoxurus* from an unknown locality. In this he was followed by subsequent writers. In my paper quoted above I gave my reasons, which need not be here repeated, for thinking that Blanford's original opinion on this point was correct.

faint pattern. In two examples from Mousakanda, Gammaduwa, C.P. (W W A. Phillips), one, a subadult ♂, is rather darker than the type of *fuscus*, the hairs of the back having very dark brown tips, especially on the croup, and there is a dark brown band down the upper side of the tail, of which the underside is grey; the other, quite immature, is much greyer than other known skins, grey with a brownish tinge above and quite grey below. These two specimens bear out Blyth's statement that two living examples sent to him by Kelaart gradually darkened with age. An adult ♀ from Maha Oya, E.P., is dull greyish-brown above, with no bright tint; the tip of the tail is white, and there is a white patch on the belly. A ♂ from Koslanda, S. Ceylon, intermediate in tint between the darker and paler brown specimens, is remarkable for the very pale hue of the tail, which becomes gradually white from the base to the tip.

The coat varies from about 30 to over 40 mm. It is longest, namely, 43 mm., in the undated type of *fuscus* (*montanus*) from Nuwara Eliya, and shortest, namely, 29 and 27 mm. respectively, in a skin from Gammaduwa, 3,000 ft., C.P., dated September, and one from Maha Oya, E.P., dated August. No doubt the length varies both seasonally and with altitude.

The flesh-measurements (in English inches) and weights (in lb.) of some specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight. lb.	oz.
Phillips's largest ; ad. ♂	22⅔	19⅗	3½	7	3
Phillips's average of 7 ; ad. ♂	20½	18	3	6	4
Gammaduwa (Phillips's, in Brit. Mus.) ; ad. ♂ .	20⅔	17⅔	2⅘	5	8
Phillips's largest ; ad. ♀	20	17⅘	3—	5	0
Phillips's average of 5 ; ad. ♀.	18⅓	16½	2½	3	3
Maha Oya (Mayor, in Brit. Mus.) ; ad. ♀. .	20+	18	2⅘	4	0

Habits.—This species, according to Phillips, although not uncommon, is locally distributed in the hills and low country, but seems to be commoner in the hills round Kandy and in the Dambulla and Dikoya districts of the Central Province than elsewhere. It has been recorded from Colombo, but is not at all common there. It is very rare at Kalutara in the Western Province, but has been observed at Ratnapura and several places in the North Central and Eastern Provinces.

In habits it is nocturnal and essentially arboreal, usually spending the day in the hollow branches of large jungle-trees ; not infrequently it occupies the roofs of bungalows adjoining the jungle. It feeds largely on seeds and fruits such as plantains, guavas, pineapples, and mangoes, but is apparently

by preference a flesh-eater, devouring any small mammals, birds, snakes, lizards, frogs, moths, and other insects it can catch. The young, generally two or three in number, are born mostly, apparently, in the later months of the year, October and November. They are dull mouse-grey or grey-brown in colour, occasionally showing a faint pattern of dorsal stripes.

44. **Paradoxurus jerdoni** Blanford. Jerdon's Palm-Civet.

Distribution.—Southern India, the Palni and Nilgiri Hills, Travancore, and Coorg.

Resembling *P. zeylonensis* in the reversal in growth of the hairs of the neck and throat, but larger and, although sometimes very similar in colour, usually considerably darker, either deep brown all over or brown or black speckled with silvery or buffy-grey on the back or flanks, and the pattern only occasionally just traceable on the back; the facial vibrissæ are blackish, not rufescent as in *zeylonensis*. The skull, larger and with larger teeth than in *zeylonensis*, is distinguished from that of all the other species of *Paradoxurus* by the exceptional length of the prepalatine foramina, which extend backwards beyond the line of the posterior edges of the upper canines, although becoming shorter in old skulls.

This southern Indian species appears to be represented by the following two local races.

44 *a*. **Paradoxurus jerdoni jerdoni** Blanford.

Paradoxurus jerdoni, Blanford, Proc. Zool. Soc. 1885, pp. 613 & 802, pl. 49; also 1886, p. 420; and of subsequent authors, at least in part.

Paradoxurus jerdoni jerdoni, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 863, 1933.

Locality of the *type*, Kodaikanal in the Palni Hills.

Distribution.—Palni Hills, Nilgiri Hills, and Travancore.

Face uniformly coloured or with faint traces of grey speckling, but without definite grey pattern; the body on the average less conspicuously speckled with grey-tipped or buff-tipped hairs.

Skins assigned to this race show great individual variation in colour. The coat in the type is mostly destroyed by moth; but three, to all intents and purposes topotypical examples, collected in the Palni Hills by Mr. C. McCann, indicate the coloration of the race. An adult ♀ from the Pamber River, Kodaikanal, 7,000 ft., May 16, has the coat thick, 42 mm. long, and the general tint uniformly dark glossy brown all over, with some faint buffy speckling, whereas two adult ♂ specimens from Tiger Shola, 5,600–5,700 ft., April 22 and 27, have the

Skull-measurements (in mm.) of *Paradoxurus zeylonensis*, *P. jerdoni jerdoni*, and *P. j. caniscus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. zeylonensis.									
"Ceylon"; ad. ♂	106	104	58	11	18	20	76	7½	
Gammaduwa; ad. ♂	103	101	56	12	19	18	74	7	9
Maha Oya; ad. ♀	101	98	53	13	17	17	74	7	8
P. jerdoni jerdoni.									
Tiger Shola, Palni Hills; ad. ♂	115	112	55	13	20	20	84	10	10
Kodaikanal, Palni Hills (type); ad. ♂	113	113	62	13	21	20	84	9	10
Pamber River, Palni Hills; old ♀	109	—	60	—	20	20	—	—	—
P. j. caniscus.									
S. Coorg (type); ad. ♂	112	112	60	13	20	20	84	9	10

coat 41 and 43 mm. and the tint blackish-brown, with the back behind the shoulders, the flanks, and belly speckled with clear grey, and some grey in front of the ears. One is more grizzled than the other, has a white tail-tip, and some yellow at the base of the tail. The difference between the uniformly brown ♀ and the grizzled ♂ specimens is striking; but the difference is probably individual, not sexual or seasonal. The example figured by Blanford, which probably came from the Anaimalai Hills, is like the Tiger Shola skins, but has the

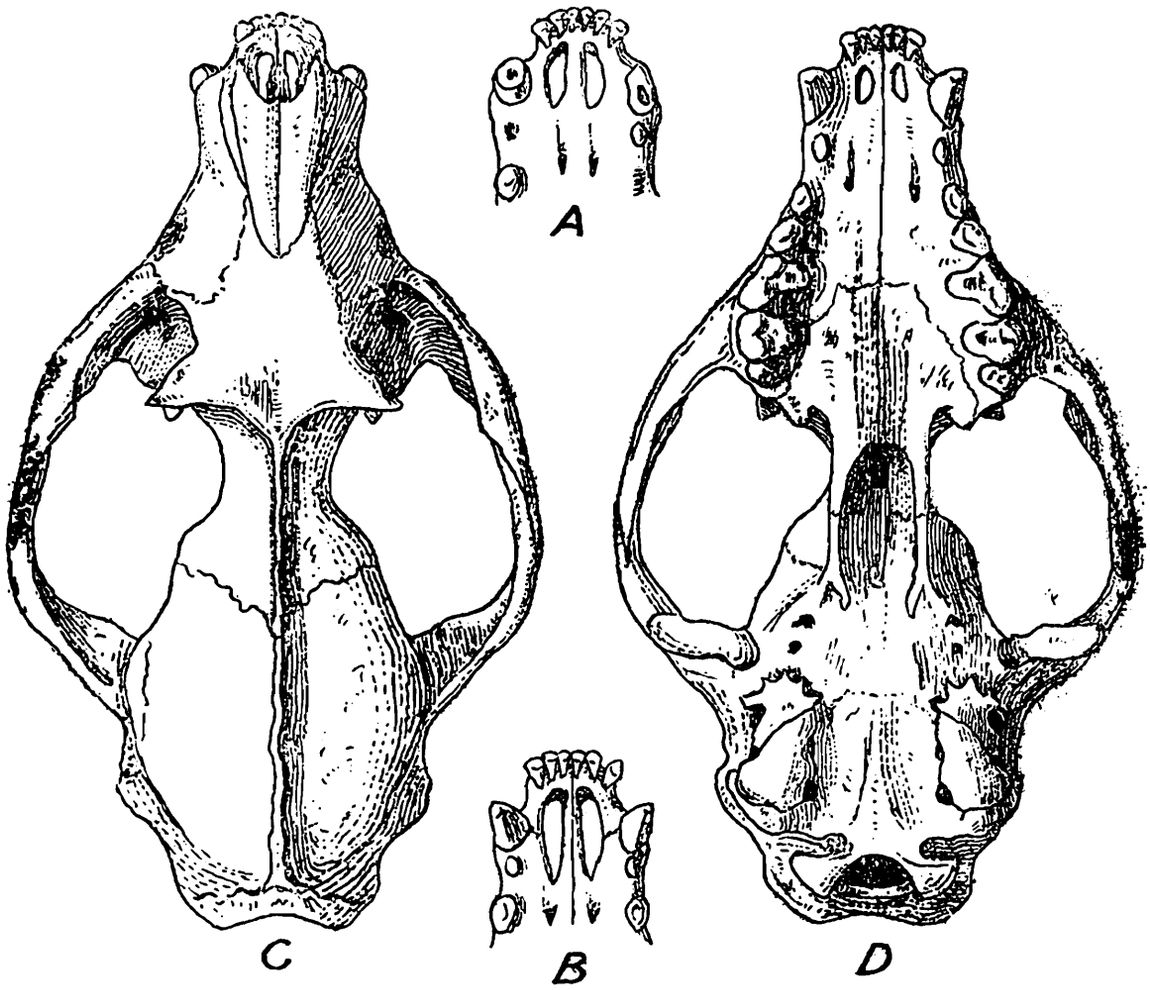


Fig. 92.

A. Anterior part of bony palate of very old specimen of *Paradoxurus jerdoni*, showing the shortening of the prepalatine foramina with age.
B. The same of younger specimen from Tiger Shola, showing the normal, exceptionally large prepalatine foramina.
C. & D. Upper and lower views of exceptionally well-developed ♂ skull of *P. h. hermaphroditus* from Bellary. All figures $\times \frac{1}{3}$.

dorsal pattern faintly indicated. An unsexed specimen from Wellington in the Nilgiri Hills, December 11, has the very full coat about 40 mm. long and the tint uniformly deep brown, like the skin from the Pamber River, but somewhat richer.

On the other hand, an old ♂ from Kateri in the Nilgiri Hills has the back and flanks distinctly speckled like the ♂ skins from the Palni Hills, although the speckling is more buffy-grey. Another ♂, from the northern end of the Travancore range, January, has the coat only 35 mm., and resembles the skin from Kateri in colour except that the speckling is noticeably less conspicuous, but a ♀, undated, skin from Trivandrum differs from the foregoing in being dominantly buffy-grey owing to the more extensive and profuse paleness of the hair-tips.

A series of five skins of various ages from Lovedale, Ootacamund, in the Nilgiri Hills, 7,300 ft. (Phythian Adams), agrees with those previously described, some being uniformly brown on the back, others speckled with buffy-grey to a varying extent.

Conceivably more than one subspecies is represented by the skins above described. This can only be decided by additional material.

The flesh-measurements (in English inches) and weights (in lb.) of the specimens collected by McCann in the Palni Hills are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Tiger Shola ; ad. ♂	23⅕	21	3½	8
Tiger Shola ; subad. ♂	22⅕	19⅕	3⅖	6
Kodaikanal ; ad. ♀	21⅗	17⅗	3+	—

44 *b*. **Paradoxurus jerdoni caniscus** Pocock.

Paradoxurus jerdoni caniscus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, pp 803–4, 1933

Locality of the *type*, Virajpet in S. Coorg, 3,000 ft.

Distribution.—North and South Coorg.

Distinguished from the typical race by having the grey and black facial pattern, or mask, well defined, as well as in some Indian examples of the next species, *hermaphroditus*, and consisting of a large grey patch in front of the ear, and one below and one above the eye set off by black intervening areas, the back, flanks, belly, and tail being also more profusely speckled with grey-tipped hairs.

There is a certain amount of individual variation in the three known skins. Two, adult ♂ and ♀, from the typical locality (Shortridge), collected January 13, are alike except than the ♀ has the hairs on the basal portion of the tail paler, dirty white. The coat is about 35 mm. in both. A young ♂ from Haleri, N. Coorg, February 28, has the coat a trifle longer, 37 mm., and considerably more white on the body, the tail being mainly white, with a black longitudinal dorsal stripe and a black tip.

The flesh-measurements (in English inches) and the weights (in lb.) of the type and topotype are as follows :—

Locality and sex	Head and body.	Tail.	Hind foot.	Weight.
Virajpet ; ad. ♂	24	21	$3\frac{3}{5}$	$9\frac{1}{2}$
Virajpet ; ad. ♀	$22\frac{4}{5}$	21	$3\frac{2}{5}$	$5\frac{1}{2}$

Habits.—According to Shortridge this race is fairly plentiful in Coorg, although not nearly so abundant as the common Toddy-Cat. The two species are found side by side in the same localities, especially round coffee estates, and are not distinguished by the natives. Their habits are nearly identical, both being largely arboreal and to be seen in trees on moonlight nights ; but this race of Jerdon's Palm-Civet was not observed to frequent the roofs of bungalows like the Toddy-Cat.

45. **Paradoxurus hermaphroditus** Schreber. The Common Indian and Burmese Palm-Civets, " Toddy-Cat " of Anglo-Indians ; Polecat and Black Palm-Civet in Ceylon.

(Essential bibliographical references are entered under the subspecies.)

Vernacular *.—*Ugguduwa*, *Kalawedda* (Sinhalese), *Marum nai* (Tamil) ; *Mara naie* (Jaffna Tamil) in Ceylon ; *Ud* (Mahratta) ; *Kullibekku* (Coorg), *Manupilli*, *Punugupilli* (Telegu) ; *Punaginabekku*, *Kerabekku* or *Kerabek* (Kanarese) ; *Nulla philli* (Waddani) ; *Mahngutchi* (Haran Shikaris in Dharwar) ; *Togot* (Singbhum), *Khotas*, *Menuri*, *Lakáti*, *Changar*, *Jhar-ka-Kutta* (Hindi) ; *Bhondar*, *Baghdankh*, *Bham* (Bengali) ; *Kyoung-na-ga*, *Kyoung-won-baik* or *Kyaung-wum-paik* (Burmese) ; *Tok-Toh*, *Sapo-mi-aing* (Karen) ; *Khubbo-palaing* (Talain) ; *Musang* or *Musang Pandan* (Malay).

Distribution.—The same as for the genus.

Distinguished from *P. zeylonensis* and *P. jerdoni* by the backward slope of the hairs of the neck and from *jerdoni* also by the shorter prepalatine foramina of the skull.

The pattern, too, is, as a rule, better defined than in those species, especially in the short, new coat, where it consists of longitudinal stripes on the back, spots on the sides, shoulders, and thighs, and sometimes on the base of the tail. The head also typically shows a definite pattern, the " mask," composed of white patches on a black ground, the fundamental plan being a patch on each side of the muzzle, one, the subocular,

* Under this species I have made no attempt to allocate the recorded vernacular names to the different subspecies. In some cases there is no doubt to which they apply ; but in others the same name may be given to two or more races.

below the eye, and one, the superciliary, above it; a larger, preaural patch, in front of the ear, and a frontal band sweeping across the forehead; this "mask," however, is very variable individually and racially, the white patches being sometimes nearly obliterated by the extension over them of the black intervening spaces, sometimes enlarged, and to a great extent confluent, so that the head may be dominantly black or largely white. The pattern on the body may also be obscured by the black pigmentation of the long contour hairs concealing the underlying under-hair, which is more or less woolly. Legs black. Tail also black, at least at the end, generally paler at the base, and sometimes faintly striped.

This species, in accordance with its extensive distribution, is represented by a very large number of local races distinguished by size, coloration, and cranial and dental characters. Individual variations, seasonal or otherwise, are also generally well marked.

Many local races are now distinguished in the British Indian fauna. These were assigned by Blanford to two species, *P. niger*, occurring in Ceylon and India, from the Himalayas southwards, and *P. hermaphroditus*, found to the east of the Bay of Bengal. He admitted, however, the existence of intergrading forms, and, in accordance with his principle of ignoring local races or subspecies, should have followed Blyth and Jerdon in uniting the two as representing a single species. There also seems to be no reason to doubt that the name *hermaphroditus* was originally given to a South Indian specimen, and not to a specimen from Malaya or Sumatra.

The marked individual variation in colour and pattern in specimens from Peninsular India resulted in the ascription of a large number of spurious names to these Palm-Civets, especially by Gray and Hodgson. The individual synonymy was fully discussed in my papers (Journ. Bomb. Nat. Hist. Soc. 1933–4), and my reasons for the nomenclature here adopted need not be repeated. All that need be said is that the races here admitted as occurring in Ceylon and Hindustan from the Himalayas southwards are indistinguishable by colour and pattern when the contour hairs are moulted and the new coat, showing a definite pattern of stripes and spots, is growing.

45 *a*. **Paradoxurus hermaphroditus hermaphroditus** (Schreber).

Viverra hermaphrodita (Pallas), Schreber, Säug. iii, p. 426, 1778.
Paradoxurus hermaphroditus, Gray, Proc. Zool. Soc. 1864, p. 532 (not of Blanford, 1885 and 1888, and the authors who followed him).
Viverra nigra, Desmarest, Mamm. p. 208, 1820 (not *V. nigra* Peale & Beauvois, 1796.)

Paradoxurus niger, Blanford, Proc. Zool. Soc. 1885, p. 792 ; id., Mamm. Brit. Ind. p. 106, 1888 (in part) ; Wroughton, Journ. Bomb. Nat. Hist. Soc. xxv, pp. 48–51, 1917.

Paradoxurus typus, F. Cuvier & Geoffroy St. Hilaire, Hist. Nat. Mamm., pt. 24, p. 5, pl. 186, 1821.

Paradoxurus hermaphroditus typus, Robinson & Kloss, Rec. Ind. Mus. xix, p. 178, 1920.

Paradoxurus typus var. *fuliginosus*, Gray, Proc. Zool. Soc. 1832, p. 65.

Paradoxurus hermaphroditus hermaphroditus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 867, test-fig. 1, A, B (heads) and 2, C, D (skull), 1933 ; Phillips, Man. Mamm. Ceylon, p. 171, pl. xii, 1935.

Locality of the *type* of *hermaphroditus* unknown, recorded from " Bombay " ; of *nigra* (*niger*) and *typus*, Pondicherry ; of *fuliginosus*, S. India.

Distribution.—CEYLON and SOUTHERN INDIA as far north as the Narbada River.

Distinguished when in full coat by the combination of comparatively short and thin underwool with long, extensively blackened contour hairs almost entirely concealing the underlying pale tint, which may vary in skins from the same locality from whitish to buff or rich ochreous, but when the contour hairs are shed or thinned by the moult the ground-colour is revealed wholly or in part, and with it the distinct pattern of black stripes and spots. The " mask " on the short-haired head does not change appreciably with the season ; it varies very considerably individually in the relative extent of the black and white.

The long-coated dark phase, agreeing closely with the description of *hermaphroditus*, in which the pattern is often obscured and the pale hue of the under-hair shows as streaks or mottling when the contour hairs are parted, the phase described by Gray as a distinct variety, *fuliginosus*, is represented by an undated skin from Ceylon, and by many skins from Coorg, Kanara, Dharwar, Ratnagiri, and Satara in S.W India, collected from November to February, when the coat usually shows no sign of moulting. But in one from S. Coorg, dated January, most of the contour hairs are shed from the rump and hind back, revealing the grey under-hair, which shows pronounced pattern. Specimens collected at the end of April and early in May in the North Central and Southern Provinces of Ceylon show moult of the contour hairs in various stages. One of these from Udugama, S.P., differs greatly from the Ceylonese representative of the *fuliginosus*-type above referred to not only in the less abundance of the contour hairs, but in the ground-colour being a rich, nearly ochreous-buff instead of grey, and the conspicuous whiteness of the mask, which in the other is largely obliterated by black. These two skins are illustrations of the extensive

individual differences which may occur in the race. Another series of skins collected from August to October in the Eastern Ghats, *i. e.*, the Dharmapuri and Denkanikota Ranges, N. Salem, and the Palkonda Hills in S. Cuddapah, is very similar in coat and general coloration to those collected in Ceylon in April and May, and similarly differs from the majority of skins from the Western Ghats collected from November to February.

The specimens from the Eastern Ghats, occurring up to 3,000 ft. or more, as well as one from Madras, which closely resembles the skin from Udugama in Ceylon, are of interest from the proximity of their localities to Pondicherry, whence the specimens described respectively by Desmarest and Cuvier as *niger* and *typus* were shipped.

A few skins from the district of Hoshangabad, collected on March 5 and 21, at 2,500 and 3,300 ft., are in full coat, and in their black, marbled with grey, coloration are very like the skins from Satara, whereas one dated April 1, 1,000 ft., is thinner-coated, showing the beginning of the moult. Like the skins from Satara, they are somewhat fuller in the coat than those found farther south, thus intergrading in that respect with the race from Gwalior (p. 393).

The following table shows the flesh-measurements (in English inches) and the weights (in lb.) of some of the largest specimens :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Satara ; ♂ ..	22½	24⅕	3	10
Hoshangabad ; ♂	21½	21⅗	3¼	7¾
Palkonda Hills ; ♂	22⅘	21⅕	3½	6
Ceylon, N.C.P. ; ♂	21¾	18⅕	3½	8
Satara ; ♀	21½	19⅕	2⅗	8
Dharwar ; ♀ . .	22⅘	23	3⅖	—
Palkonda Hills ; ♀	20⅘	18	3⅓	6
Ceylon, S.P. ; ♀	23⅘	17⅘	3½	—

Phillips's measurements and weights of Ceylonese examples are approximately as follows :—

	Head and body.	Tail.	Hind foot.	Weight.
Largest ad. ♂ .. .	22⅖	18⅘	3⅗	7¼
Average of 10 ad. ♂♂	20½	17	3+	6¼
Largest ad. ♀	20¼	18⅘	3½	6
Average of 4 ad. ♀♀	18½	17	3	5

These data agree tolerably closely with those recorded in my table.

Skull.—In adult and old ♂ skulls the sagittal crest is well developed, reaching 6 mm. in height in an oldish well-developed skull from Bellary, and the postorbital processes

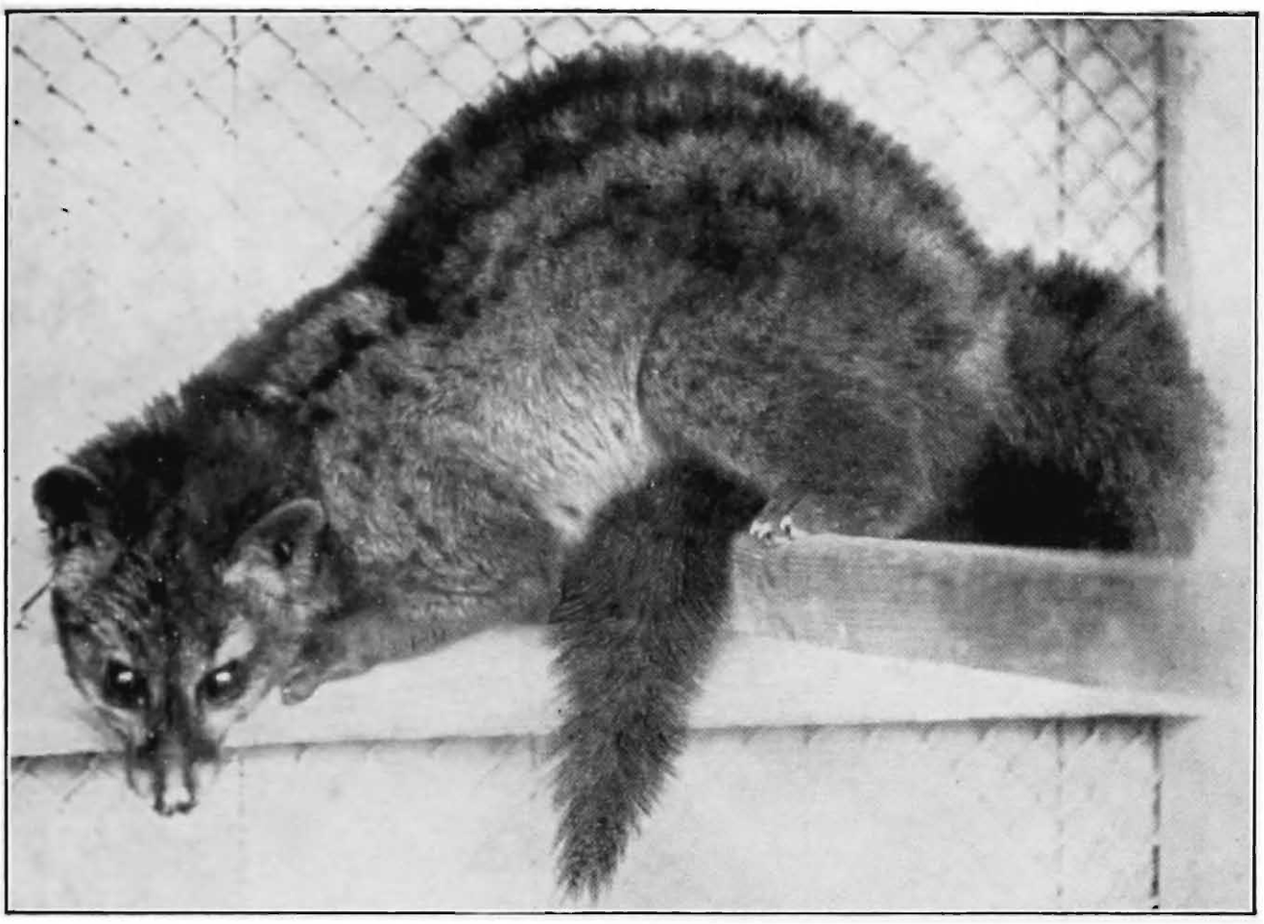
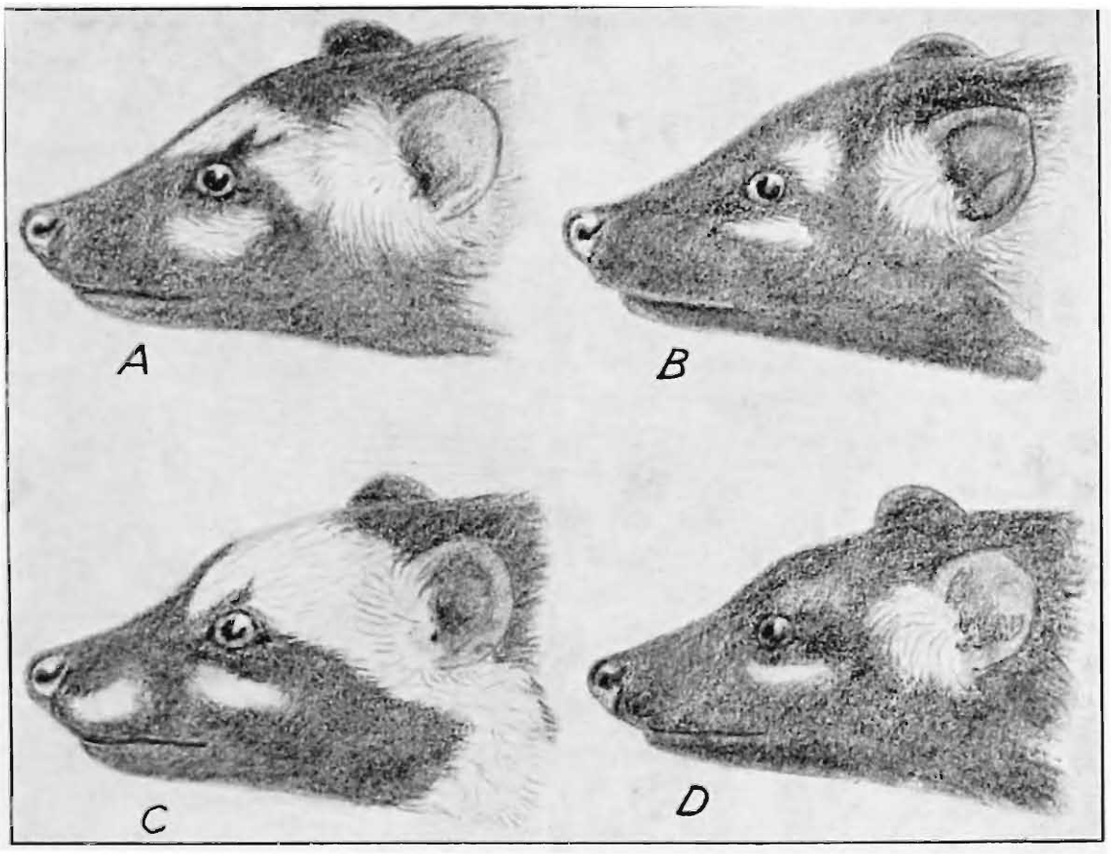


Photo W. S. Berridge.

Indian Palm-Civet (*Paradoxurus hermaphroditus*).



A & B. Heads of two examples of *Paradoxurus hermaphroditus hermaphroditus*, showing variation in pattern. C. Head of Burmese Palm-Civet (*Paradoxurus hermaphroditus laotum*) from Mingun. D. Head of Lesser Palm-Civet (*Paradoxurus hermaphroditus minor*) from Tenasserim.

Skull-measurements (in mm.) of *Paradoxurus hermaphroditus hermaphroditus* and *P. h. nictitatans*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. h. hermaphroditus.									
"Ceylon"; ad. ♂	—	—	61	12½	18	19	79	8	10—
Denkanikota Range, Salem; ad. ♂	105	103	60	13	18	19	78	8	8½
Dharmapuri Range, Salem; ad. ♂	107	106	62	11	19	19	78	7	9
Bellary; ad. ♂	115	110	69	13	22	21	—	8½	—
Satara; ad. ♂	117	115	63	13	20	21	85	9	10
Hoshangabad; ad. ♂	112	111	67	11	19	20	84	8	10
Hoshangabad; ad. ♂	106	105	65	12	20	19	80	8	9
Satara; ad. ♀	107	107	56	12	19	18	80	8	9
S. Coong; old ♀	103	102	56	10½	20	19	78	8	—
Gammaduwa, Ceylon; ad. ♀	100	99	53	12	15	17	72	7	9
P. h. nictitatans.									
Khondmals, Orissa; just ad. ♂	106	105	56	11	18	18	76	7	9
Khondmals, Orissa; just ad. ♂	102	100	53	12	16	17	74	7	8
Hazaribagh; just ad. ♀	93	92	49	11	15	15	67	8	9

are triangular, pointed, and have their posterior edges approximately in the same transverse line. In adult and old ♀ skulls, which are on the average a little shorter than ♂ skulls and narrower across the zygomata, the sagittal crest is complete but low, about 1 mm. high, and is late in forming, the two temporal ridges in a young adult ♀ skull from Dharwar, with complete dentition, being 5 mm. apart on the frontals and 10 mm. on the parietals. As shown in the subjoined table, the skulls vary individually in their principal dimensions as well as in the size of the bullæ and teeth.

45 *b*. **Paradoxurus hermaphroditus nictitatans** Taylor.

? *Paradoxurus leucopus*, Ogilby, Zool. Journ. iv, p. 300, 1828.
Paradoxurus nictitatans, Taylor, Journ. Bomb. Nat. Hist. Soc. vi, p. 429, 1891.
Paradoxurus hermaphroditus nictitans, Pocock, Journ. Bomb. Nat. Hist. Soc., xxxvii, p. 172, text-fig. 3, A, B (skull), 1934.

Locality of the *type*, Kondmals, Orissa Division of S. Bengal.
Distribution.—Lower Bengal.

Distinguished, on the evidence of a few specimens, from the preceeding race by its smaller size and possibly average difference in colour, being greyer, less black, and with the pattern superficial.

The examples of this Palm-Civet recorded and collected by Taylor, as well as one or two additional specimens, are only provisionally admitted as representing a distinct race pending the collection of more material than is at present available. Taylor considered the partial albinism of his type, of which the mother was also similarly coloured, as a specific feature. The type has only the head and shoulders normally coloured, the rest being white. Subsequently he procured two other specimens with the white less extensive, appearing as a broad belt encircling the hind body and extending over the ventral surface, the feet and the terminal third of the tail being also white. These specimens came from Kondmals in Orissa. Where the coat is pigmented the coloration is very similar in the three specimens, including the type, in the British Museum, the ground-tint being clear grey or slightly tinged with buff and covered to a varying extent by long black-tipped contour hairs, but black is very little in evidence on the grey tail. The pattern is indefinite and superficial, being formed by the confluence of the black tips of the contour hairs. The coat has rather more underwool on the average than in typical *hermaphroditus*.

A just adult ♀ example collected at Hazaribagh (Crump) in June, with its long coat still unmoulted, probably represents

the normally coloured phase of this race. The coat is long and shaggy, the under-hair is grey, and the black-tipped contour hairs, 57 mm. long, are tolerably abundant, but there is no definite pattern. Its measurements are as follows :— Head and body 18⅗ in., tail 19⅕ in., hind foot 3 in., and its weight was 3 lb. It is thus considerably smaller than adult ♀ examples of typical *hermaphroditus*. Its skull also is smaller than that of the latter race, as indicated in the table (p. 391) ;

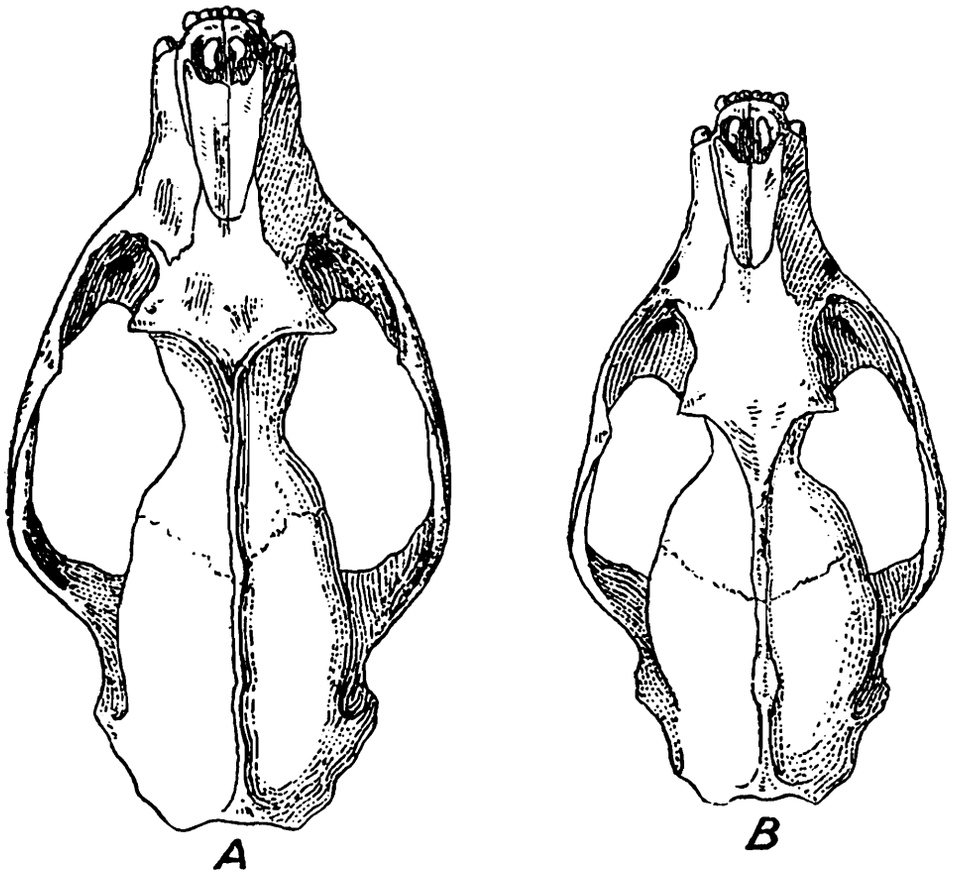


Fig. 93.

A. Skull of adult ♂ of *Paradoxurus hermaphroditus nictitatans* from Khondmals, Orissa.
B. Skull of adult ♀ identified as *Paradoxurus hermaphroditus nictitatans* from Hazaribagh. Both figures × ⅓.

and the skull of a ♂, just adult, with complete but low sagittal crest, from Khondmals, is also smaller than average ♂ skulls of typical *hermaphroditus*, resembling ♀ skulls of that race.

45 *c*. **Paradoxurus hermaphroditus scindiæ** Pocock.

Paradoxurus hermaphroditus scindiæ, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 176, 1934.

Locality of the *type*, Guna in Gwalior, about 40 miles north of lat. 24°

Distribution.—Gwalior, Bhopal, Central India, and probably Rajputana, *i. e.*, the country drained by the

Chambal and its tributaries flowing north-east into the Ganges.

Distinguished from typical *hermaphroditus* of Southern India and Ceylon by its slightly larger size and, in winter, by its longer, more luxuriant woolly coat, which is not concealed to the same extent by the long black-tipped contour hairs. The pale ground-colour varies from darker or lighter grey to buffy-grey, which, combined with the blackness of the contour hairs, yields a marbled or blotchy pattern.

Skins referred to this race were collected between October and December at Guna, Binganj, Cachora Fort, and Agar at altitudes varying from 1,375 to 1,680 ft. in Gwalior and at Neemuch (Nimach), also in Gwalior, in March and April, at 1,400 and 1,500 ft. One of the specimens from Neemuch is remarkable for the tawny hue of the under-hair and the brown hue of the tips of the contour hairs, which are probably faded previous to the moult. There is also a skin from Sehore in Bhopal, April 29, which, like the tawny Neemuch skin, has the coat thinnish and shaggy, but the ground-colour is grey. Skins from Samblar, Rajputana, September 15, in poor coat, also seem to belong to this race.

The difference in coat between this race and *hermaphroditus* is as follows :—In *scindiæ* the approximate average length of the wool between December and April is 45 mm., of the contour hairs 60 mm, the corresponding measurements for the same months in *hermaphroditus* being 30 and 53 mm.

The flesh-measurements (in English inches) of some examples of *scindiæ* are :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Guna ; yg ad. ♂	26½	22⅕	3½
Binganj ; ad. ♀...	26	24	3⅓
Cachora Fort ; ad. ♀	24⅘	22	3⅕
Agar-Malwa ; yg. ad. ♀.	24⅗	20⅘	3
Bhopal ; ♀. ..	23⅕	21⅘	3¼
Sambhar ; yg. ad. ♂	24½	23	3⅗

The two ♂ specimens, namely, the type from Guna and the one from Sambhar, although not fully adult, are bigger than the largest ♂ specimens of *hermaphroditus*, and the average dimensions of ♀ specimens of *scindiæ* are : head and body 24½ in., tail 22 in. ; of *hermaphroditus*, 21½ in. and 20 in. respectively.

45 *d*. **Paradoxurus hermaphroditus laneus** Pocock.

Paradoxurus hermaphroditus laneus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 178, fig. 4, B, 1934.

Locality of the *type*, Gopalpur, 5,200 ft. in Kangra.

Distribution.—Kangra in the UPPER PUNJAB from 2,000 to 7,000 ft.

Closely resembling *scindiæ* from Gwalior in size and general appearance, but with the winter coat fuller, more woolly, perceptibly more resistant to the touch and keeping the contour hairs, which are less extensively black terminally, even more erect than in that race; the sides of the neck are also somewhat blacker.

Several examples collected in March at Gopalpur, 5,200 and 7,000 ft., and in the Kangra Valley, 2,000 to 2,500 ft. (Wells). The series shows stages of the coat-change, the type from Gopalpur, March 6, being in full winter coat, whereas one from the Kangra Valley, March 28, is in full moult. The ground-colour varies from grey to buffy-grey and, combined with the black of the more or less upstanding contour hairs, produces in full coat a marbled or mottled pattern of lines and spots. In the type the white of the mask is a good deal reduced.

In the ♀ in full moult a large number of the contour hairs are shed and the neck, shoulders, and fore-back are covered with a short, close coat of soft greyish-white new hair showing a very distinct pattern of black stripes and spots. In its coloration this skin is not distinguishable from skins of *scindiæ* or *hermaphroditus* in similar coat-change.

A young dark grey specimen showing the pattern was collected by H. Whistler in September at Dharmsala, 4,000 ft.

In four examples in good coat the wool is about 40 mm. and the contour hairs about 60 mm. long, the wool being a little shorter, although thicker, than in *scindiæ*.

Flesh-measurements (in English inches) of some quite or nearly full-sized specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Gopalpur ; ad. ♂ ..	27$\frac{1}{5}$	24$\frac{1}{5}$	3$\frac{3}{5}$
Kangra Valley ; yg. ad. ♂	26$\frac{4}{5}$	25	3$\frac{3}{5}$
Kangra Valley ; ad. ♂	23$\frac{1}{5}$	22$\frac{4}{5}$	3$\frac{2}{5}$
Kangra Valley ; ad. ♀	25$\frac{1}{5}$	24	3$\frac{1}{5}$
Kangra Valley ; ad. ♀	26$\frac{4}{5}$	25$\frac{3}{5}$	3$\frac{3}{5}$

There is very little difference between the sexes in size. The average of the two ♀ specimens, head and body 26 in. and tail about 25 in., is a little greater than in *scindiæ*.

The skull is a little longer than in *scindiæ* and *hermaphroditus* and has slightly larger teeth. That of the type is exceptionally well developed muscularly, the sagittal crest, in the middle of its length being 7$\frac{1}{2}$ mm. high, and the width across the postorbital processes from tip to tip is 40 mm.

Skull-measurements (in mm.) of specimens assigned to *Paradoxurus hermaphroditus scindiæ*, *P. h. laneus*, and *P. h. vellerosus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. h. scindiæ.									
Guna, Gwalior (type); yg. ad. ♂	115	(112±)	64	13	19—	20	83	8	9
Sambhar, Rajputana; yg. ad. ♂	112	110	60	13	19½	19½	82	8	9
Binganj, Gwalior; ad. ♀	112	108	59	12	18	18½	80	8	9
Cachora Fort, Gjwalior; ad. ♀	103	102	56	14	18	20	76	8	9
Sambhar, Rajputana; old ♀	105	104	60	11½	18	19	77	8	—
P. h. laneus.									
Kangra (type); old ♂	120	119	70	13	24	22	89	9	11
Kangra; yg. ad. ♂	120	118	65	13	21	20	88	9	10½
Kangra; ad. ♀	113	112	61	12½	19—	19	84	9	—
Kangra; ad. ♀	111	111	60	13	20	18	82	9	10
P. h. vellerosus.									
Kashmir; yg. ad. ♂	125	121	69	15	23	22	92	9	10

45 *e*. **Paradoxurus hermaphroditus vellerosus** Pocock.

Paradoxurus hermaphroditus vellerosus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 181, text-fig. 4, A (skull), 1934.

Locality of the *type*, Kashmir.

Distribution.—KASHMIR, on the evidence of the only known specimen.

Resembling the type of *laneus* in colour and pattern, but distinguished from that race and from *scindiæ* by its longer woolly coat and longer skull.

The undated, unmeasured type, the only described specimen

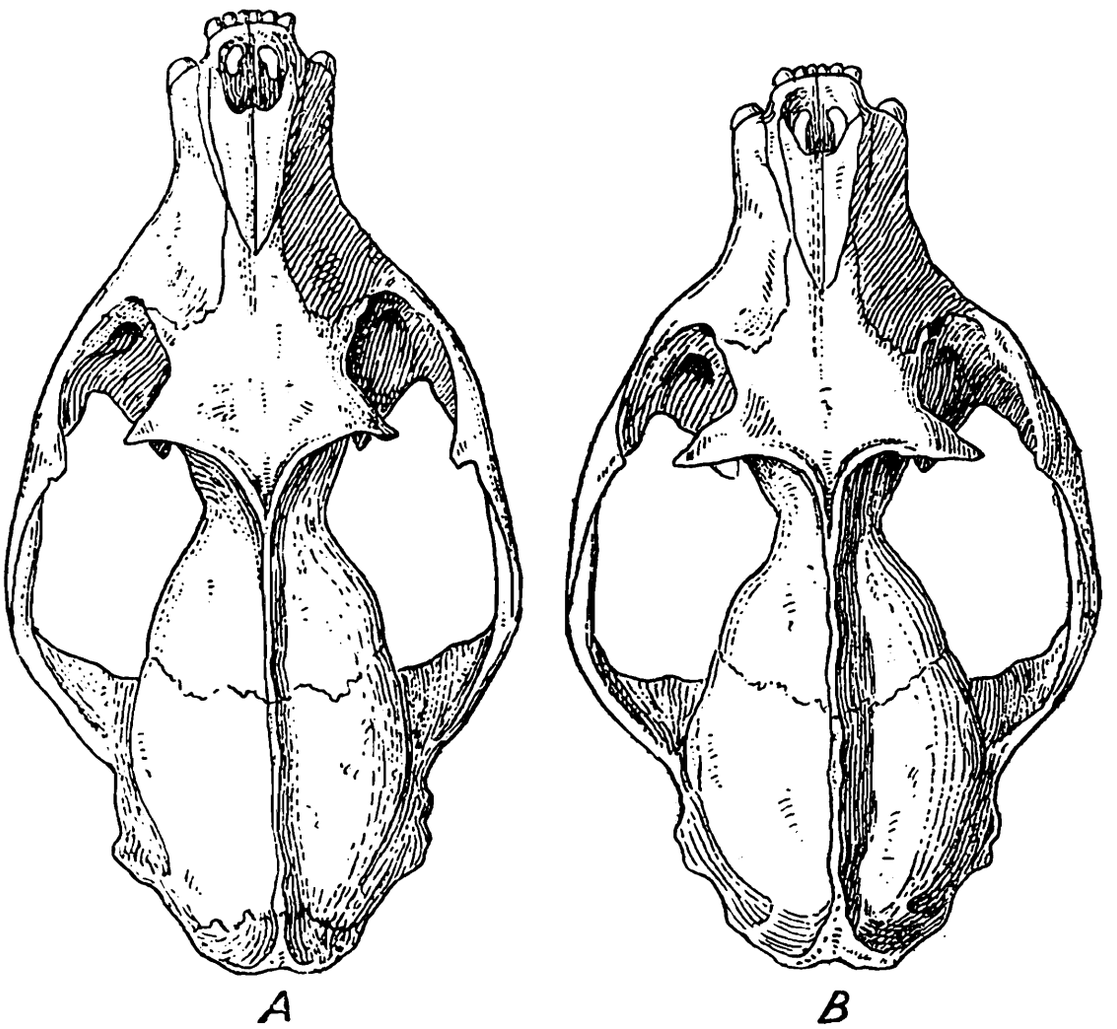


Fig. 94.

A. Skull of subadult ♂ of *Paradoxurus hermaphroditus vellerosus* from Kashmir.
B. Skull of fully adult ♂ of *P. h. laneus* from Kangra. Both figures × ⅓.

of this race, is evidently in full winter coat, of which the wool is about 50 mm. long and the contour hairs 60 mm. Although the skull has the basioccipital suture still open, and probably had not attained its full length, it is decidedly longer than the skull of the type of *laneus*, as the table of measurements shows. On account of its comparative youth it is less well developed. The zygomatic width is less, the

sagittal crest is lower, only 4½ mm. high, the postorbital processes are smaller, only 34 mm. from tip to tip, and the cranium is narrower above the posterior root of the zygomatic arches. No doubt with increased age the skull would have surpassed that of *laneus* in these respects as well as in length.

Probably the examples from Kashmir recorded by Col. Ward as *P. niger* (Journ. Bomb. Nat. Hist. Soc. xxix, p. 10, 1927) were representatives of this race. It is found, he says, in the outer ranges, and is arboreal and very nocturnal, sleeping throughout the day. But the measurements he cited—head and body 23 in., tail 20 in., and skull 100 mm.—apply to a much smaller animal than the type of *vellerosus*, which, judging from its skull, must have exceeded the largest example of the Kangra race, *laneus*. There is, however, no evidence that the example Ward measured was mature. He also referred to a specimen from Simla with the head and body 24 in. long, which is racially unidentifiable, but may have been an immature example of the Kangra race.

Under the heading of *Viverra zibetha* I suggested above that Col. Ward's record of that species from Kashmir may possibly have been due to confusion with the large Kashmir Toddy-Cat (*vellerosus*). He cited *Nil Biral* as its native name and said that it often lives under thatched roofs. This is a very unlikely habitat for *V zibetha* to choose, but agrees precisely with records of the Toddy-Cat.

45*f*. **Paradoxurus hermaphroditus bondar** (Desmarest).

Viverra bondar, Desmarest, Mamm. p. 210, 1820.
Paradoxurus bondar, Gray, Illustr. Ind. Zool. pl. 12, 1833; id., Proc. Zool. Soc. 1864, p. 531, and Cat. Carn. B. M. p. 18 (*bondar*)
Paradoxurus pennantii, Gray, Proc. Zool. Soc. 1832, p. 66; id., Illustr. Ind. Zool. pl. 13, 1833.
Paradoxurus crossi, Gray, Proc. Zool. Soc. 1932, p. 67; id., Illustr. Ind. Zool. pl. 7, 1833.
Paradoxurus hirsutus, Hodgson, Asiat. Res. xix, p. 72, 1836.
Paradoxurus strictus (Hodgson MS.), Horsfield, Ann. Mag. Nat. Hist. (2) xvi, p. 105, 1855; id., Proc. Zool. Soc. 1856, p. 396, pl. 47.
Paradoxurus hermaphroditus bondar, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 182, 1934*.

Locality of *type* of the *bondar*, Bengal; of *pennantii*, Higher Province of Bengal; of *crossi*, India; of *hirsutus* and *strictus*, Nepal Tarai.

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* No two authors out of the many who have attempted to straighten the involved synonymy of this and the next race of *P. hermaphroditus*, both occurring to the north of the Ganges, have reached the same result. The confusion is due partly to several of the names having been given to drawings of specimens or to specimens while alive in menageries

Distribution.—ROHILKAND and, according to Hodgson, " the open parts of the Nipalese Tarai and generally in British districts on the left (north) side of the Ganges to Northern Bihar."

Closely resembling *scindiæ* and *laneus* in the length and luxuriance of the winter coat, the wool being long and thick, with the black-tipped contour hairs upstanding, but the pattern is less pronounced, sometimes evanescent, and, when indicated, formed by the confluence of the black tips of the contour hairs and therefore readily disarranged ; the ground-tint of the under-coat varies from nearly white to " yellow " or tawny. On the evidence of a few skulls and measured skins *bondar* is also decidedly smaller than *scindiæ* and *laneus*.

The most western known examples assigned to this race are two—one an old ♀, the other unsexed—collected on March 8 in full winter coat at Pilibhit, 800 ft., in Rohilkand (Crump). The luxuriant woolly hair, from 35 to 37 mm. long, is mostly white or silvery grey ; this is sparsely oversprinkled with the black tips of the upstanding contour hairs, from 50 to 55 mm. long, which at most form irregular elongated patches readily broken up by the parting of the hair-tips. Except that the ground-colour and brow-band are white instead of yellow, these skins closely resemble Hodgson's description of his *hirsutus* and Gray's figure of *crossi* taken from a living menagerie specimen. Both the wool and the contour hairs of the type of *hirsutus* were approximately the same as in these Rohilkand specimens.

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from vague localities, partly to discrepancies between alleged type-specimens and the original descriptions. My reasons for the opinions here adopted were given in full in my paper in 1934. All that need be repeated in connection with this race is that the original description of *bondar* was taken from a copy of a sketch of a specimen from " Bengal " in which the coat was apparently very thick, the colour tawny, with the long hairs black at the tip and the pattern consisting of three dorsal stripes. As regards *pennantii*, based upon a coloured sketch of a specimen from the higher Province of Bengal, Gray himself (Proc. Zool. Soc. 1864, p. 531) dropped the name as a synonym of *bondar*. According to Gray's description and figure of *crossi*, taken from a specimen from " India " living in the Surrey Zoological Gardens, the coat was long and luxuriantly woolly and yellowish or buff in colour, but with no pattern. This agrees very closely with Hodgson's description of *hirsutus*, from the Nepal Tarai, which had the coat very long, full, and erect, the colour clear yellow, but no pattern. Hodgson himself thought this animal to be the same as *bondar*. The type of *strictus*, on the other hand, was distinguished from *hirsutus* on account of the distinctness of the pattern of stripes and spots. But the type-skin is in full moult and the pattern is shown on the newly erupted coat, and Hodgson was apparently unaware of the profound effect of coat-change on the colour and pattern. I consider *strictus* to be the same as *hirsutus* because both came from the Nepal Tarai, but it may represent *pallasii*.

Some flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Nepal Tarai ; ? ad. ♂. ..	23	22	—	6
Darbhanga ; yg. ad. ♂	20	18	3¾	8
Rohilkand ; old ♀ .	20	18	3—	4
Darbhanga ; yg. ad. ♀	18	19	3+	—

The number of available skulls is too small for profitable comparison with the skulls of other races. None of Hodgson's skins has a skull that can be definitely assigned to it. Measurements of these skulls are entered on the table (p. 404).

The race from Lower Bengal recorded above as *nictitatans* (p. 392) unmistakably resembles *bondar* in many particulars, and the two may prove indistinguishable. But the skulls of the young adult ♂ of *bondar* from Darbhanga and of the ♀ from Rohilkand are respectively larger than the just adult ♂ skull of *nictitatans* from Khondmals and the adult ♀ skull from Hazaribagh.

In the table of skull-measurements I have provisionally entered as belonging to this race all the available skulls from Nepal belonging to Hodgson's collection, although only one of them, the first on the list, has a skin on the whole more like *bondar* in colour and pattern than *pallasii*. But the identification of these skulls is doubtful. Except the one in question, they are less well developed in the short postorbital processes than the skulls of *pallasii*, but they are barely adult.

45 *g*. **Paradoxurus hermaphroditus pallasii** Gray.

Viverra prehensilis, Desmarest, Mamm. p. 208, 1820 (not of Kerr, 1792).

Paradoxurus pallasii, Gray, Proc. Zool. Soc. 1832, p. 67 ; Illustr. Ind. Zool. pl. 8, 1834, and subsequent papers.

Paradoxurus quadriscriptus (Hodgson MS.), Horsfield, Ann. Mag. Nat. Hist. (2) xvi, p. 106, 1856 ; Proc. Zool. Soc. 1856, p. 396, pl. 48.

Paradoxurus nigrifrons, Gray, Proc. Zool. Soc. 1864, p. 535.

Paradoxurus vicinus, Schwarz, Ann. Mag. Nat. Hist. (8) vi, p. 230, 1910.

Paradoxurus hermaphroditus pallasii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 187, 1934 ; id., Proc. Zool. Soc. 1934, p. 615*.

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* The typical specimen of *prehensilis* needs no discussion, since the name is unavailable. The figure and description of *pallasii* were taken from a living specimen in the Zoological Gardens brought by Buchanan from India, probably from Upper Bengal. The figure represents it as in good coat, grey in hue, with a decided pattern of stripes and spots, and a conspicuously white forehead. The type in the British Museum has the coat thick, but much shorter than in typical skins of *bondar*, but the pattern is not so definite as in Gray's figure, being apparently obscured by the recent make-up of the skin on modern

Locality of the *type* of *prehensilis*, Bengal (Buchanan); of *pallasii*, India (Buchanan); of *quadriscriptus*, Nepal (in the hills); of *nigrifrons*, India; of *vicinus*, probably Assam.

Distribution.—NEPAL, SIKKIM, UPPER BENGAL, ASSAM, and UPPER BURMA.

Winter coat full, with abundant wool, but shorter than in *bondar*, *laneus*, and *scindiæ*, the wool between December and March from 26 to 34 mm., the contour hairs from 34 to 43 mm. The comparatively short black tips of the contour hairs not concealing the ground-colour, which varies from clear grey to rich ochreous, nor the pattern, consisting of well-defined stripes and spots; the mask consisting typically of a white patch on the muzzle, another below the eye and of the brow-band which is usually more or less interrupted in the middle line by black speckling; basal half of tail generally striped.

Variations in the tint of the ground-colour, sometimes well marked in skins from the same locality, are shown by the following specimens:—One from Narbong, Darjeeling, 2,000 ft., one from Sevoke, south of Darjeeling in Upper Bengal (Crump), one from the Daranga River, N. Kamrup, 400 ft. (Wells), and one from Cachar are pale buffy-grey, like the type of *quadriscriptus*; a second specimen from Sevoke and one from Hasimara, Bhutan Duars, 600 ft. (Baptista), are decidedly more buffy than the first lot; others from Hasimara are richer, more ochreous, almost orange-ochreous in hue and grey or buff below. These and two skins from Golaghat, Upper Assam, resemble the type of *vicinus*; one from the Garo Hills (Wells) is intermediate between the richer and duller skins, and one from Haldibari, Cooch Behar, 150 ft., is dull-tinted in front, rich-tinted behind. A young specimen from the Uyu Forest, 60 miles east of Homalin in Upper Chindwin, resembling in coat and colour the richer-tinted Assamese skins, attests the extension of this race into Upper Burma. A pair of adult specimens from Haraincha, Morang, in the eastern Nepal Tarai (F M. Bailey), February, resemble those described above from districts farther to the east. The ♂ has the full winter coat thick, but only about 40 mm. long; the underhair of the back has a decided buffish tinge, the belly is buffy-grey, and the pattern consists of well-defined dorsal

lines; the hairs of the brow have been to a great extent rubbed off, but the area seems to have been extensively white. The type of *quadriscriptus* is buffy-grey, has a longer, shaggier coat than the type of *pallasii*, and hardly differs from the alleged type of *hirsutus*, except that the pattern of stripes is distinct. It connects the two races *pallasii* and *bondar*, as is not surprising from its locality, the hills of Nepal. The type of *nigrifrons* is like that of *pallasii*, but has a tinge of buff and the crown blacker; and the type of *vicinus* is similar, but richly tinted, and has the pattern definitely arranged.

stripes and fainter lateral spots. The ♀ differs in having the underhair of the back and the belly much richer, almost ochreous-buff, and the white brow-band more conspicuous.

The only available flesh-measured skins of adult specimens are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Hasimara, Bhutan Duars ; ad. ♂	24⅖	23	3⅗
Morang, E. Nepal Tarai ; ad. ♂	24⅕	20⅘	3¼
Hasimara, Bhutan Duars ; ad. ♂	23⅕	22⅕	3½
Sevoke, Upper Bengal ; ad. ♂ ..	22	21⅓	3⅗
Duranga River, N. Kamrup ; ad. ♂	22	—	3⅕
Sevoke, Upper Bengal ; ad. ♀ .	22⅗	22⅕	3½
Morang, E. Nepal Tarai ; ad. ♀	23	20⅘	3

The weight of a young adult ♂ from Haldibari, Cooch Behar, was 5¾ lb., of the ♂ from the Duranga River 5 lb.

45 *h*. **Paradoxurus hermaphroditus laotum** Gyldenstolpe.

Paradoxurus hermaphroditus laotum, Gyldenstolpe, K. Sv. Vet.-Akad. Handl. lvii, no. 2, p. 26, 1917 ; id., Journ. Nat. Hist. Soc. Siam, iii, p. 147, 1919 ; Robinson & Kloss, Rec. Ind. Mus. xix, p. 179, 1920 ; G. M. Allen, Amer. Mus. Novit. 359, p. 4, 1929; Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 267, 1932 ; Pocock, Proc. Zool. Soc. 1934, p. 620, fig. 1, A (skull), pl. 1, A, B (heads).

Paradoxurus birmanicus, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxv, p. 51, 1917 *.

Paradoxurus hermaphroditus ravus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 314, fig. 5, A (skull), 1934 (not *P. ravus* Miller, 1913)

Locality of the *type* of *laotum*, Chieng Hai, N.W Siam ; of *birmanicus*, Mingun, north of Sagaing, Upper Burma.

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* It is a little doubtful if *laotum* is the correct name for this race. It was given by Gyldenstolpe to a specimen larger both in its body and skull-measurements than any of the known Burmese specimens, as shown in the tables of measurements. But Gyldenstolpe's statement that the types of *laotum* and of *birmanicus*, the former name antedating the latter by one month, are representatives of the same race is usually accepted. The type of *laotum*, however, may be the smallest known example of a possible race, distinguished from the Burmese by its larger size, of which two other specimens are known. One of these, an old ♂, collected by Col. C. S. Stockley at Mewong in N.W. Siam, near the type-locality of *laotum*, has the largest known skull in the genus *Paradoxurus*, its total and condylobasal lengths being respectively 130 and 125 mm., a few mm. longer in both respects than the skull of the type of the Kashmir race, *P. h. vellerosus* (p. 397). This Mewong skull was figured and described with full measurements in my paper (Proc. Zool. Soc. 1934, pp. 618, 623, 625). The other large Siamese skull, that of an old ♀ from Muek Lek, west of Korat in S. Central Siam, has the total and condylobasal lengths 125 and 121 mm. respectively. These two Siamese skulls are provisionally regarded as aberrant "giants" of *laotum*. The skull of the type of the latter is nearly intermediate in size between the smaller of the two and the largest of the Burmese

Distribution.—BURMA from Mandalay and Chindwin to Tenasserim; also West and North Siam, Indo-China, and Hainan.

Resembling *pallasii* in the distinctness of the pattern throughout the year, but with the wool of the winter coat shorter and less luxuriant, and the contour hairs a little longer, up to 46 mm., so that the coat is shaggier and not so close. The colour on the average is greyer, rich buff or ochreous, skins being comparatively rare, and the brow-band is typically a more conspicuous feature of the mask, being more extensive, less invaded by black speckling, and frequently continued backwards over the middle line of the crown, which, however, varies from black to white in specimens from the same locality. The skull, on the average, has the

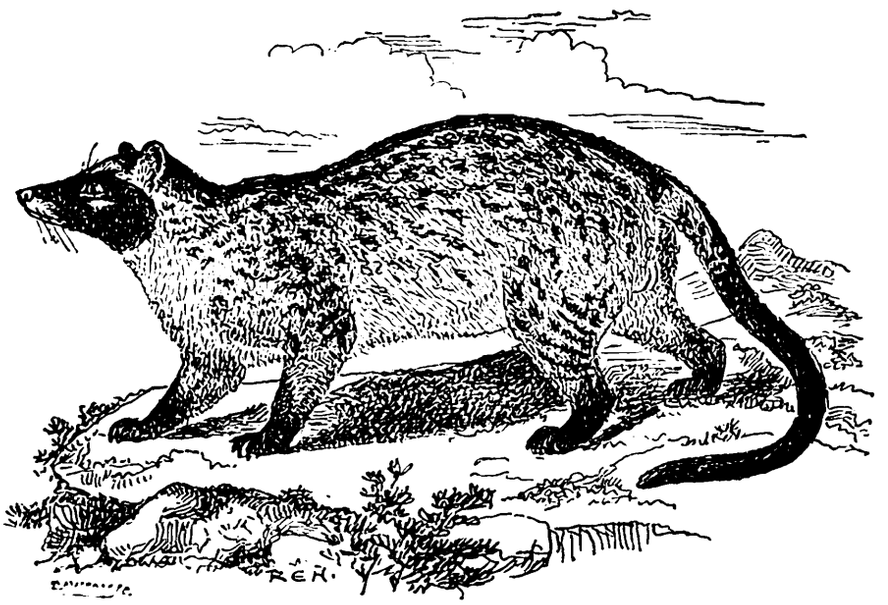


Fig. 95.—The larger Burmese race, *Paradoxurus hermaphroditus laotum*, from a drawing by Tickell of a specimen from Moulmein. (From Blanford.)

muzzle broader, the postorbital processes shorter, the external pterygoid crest larger, the sagittal crest earlier developed, and the dentition more robust than in the Indian races.

Specimens have been recorded from the following localities in British Burma:—Mingun, north of Sagaing; Lower Chindwin;

skulls. If there should prove to be a larger Siamese race taking the name *laotum*, Wroughton's name *birmanicus* will come in for the Burmese form. But the available evidence is at present in favour of the view here adopted. In the first of my papers of 1934 I cited both *laotum* and *birmanicus* as synonyms of *ravus*, a name given by Miller in 1913 (Smiths. Misc. Coll. xlix. no. 21, p. 2) to two specimens from Trang in Peninsular Siam. I had not then seen examples definitely assignable to *ravus*; but later a series, kindly lent to me by the Smithsonian Institution, showed my identification to be incorrect, *ravus* being distinguished from the Burmese race by its smaller size. It does not occur in British Burma.

Skull-measurements (in mm.) of specimens identified as *Paradoxurus hermaphroditus bondar* and *P. h. pallasii*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. h. bondar.									
Nepal (Hodgson); ad. ♂ ?	120	116	65	11½	21	20	85	8½	10
Nepal (Hodgson); ad. ♂	115	114	60	12	20	20	84	8	10
Nepal (Hodgson); ad. ♀ ?	110	108	56	11	17	19	80	7	9
Nepal (Hodgson); ad. ♀ ?	106	105	57	11	17	18	74	7½	8
Nepal (Hodgson); ad. ♀ ?	104	104	51	12	17	17	—	7½	—
Darbangha; yg. ad. ♂	109	105	59	12	17	19	77	7	9
Rohilkand; old ♀	103	100	56	11½	15½	17	74	7	—
P. h. pallasii.									
Morang, E. Nepal Tarai; ad. ♂	120	118	72	12	20	20	87	8½	10
Bhutan Duars; ad. ♂	120	118	65	10	19	19	85	8	10
Bhutan Duars; ad. ♂	117	115	68	12	19	19	—	8	—
Golaghat, Assam; ad. ♂	117	115	72	12	21	20	86	8	9
Narbong, Darjeeling; ad. ♂	114	111	65	11	20	20	85	8	9
Sevoke, Upper Bengal; ad. ♂	111	110	65	11	18	18	84	8½	10
Sevoke, Upper Bengal; ad. ♀	108	108	56	13	17	17	80	8	10
Morang, E. Nepal Tarai; ad. ♀	109	108	58	13	18	18	79	9	10

Mt. Popa, 4,960 ft. ; Toungoo, 500 ft. ; Lower Pegu ; Thaton, north-west of Moulmein ; Tenasserim Town.

The series from Mingun, the typical locality of *birmanicus*, exhibits the seasonal and individual variations in this race. A skin dated January 11 has comparatively abundant underwool, the ground-colour is whitish-grey, with a faint buff tinge, but the black tips of the copious contour hairs somewhat obscure the pattern, giving a marbled coloration. Other skins, dated July, have little or no underwool, the ground-colour varying from ashy to buffy-grey, the pattern well defined and not obscured by the contour hairs of the old winter coat, which are mostly still retained, although moulted on the fore quarters in one case ; the brow-band may be uniformly grey, or mesially speckled with black or completely divided by a black line, and the crown may be black or mesially speckled with white as far as the nape.

Skins from the other localities similarly vary in the coloration both of the head and body. Three skins, namely, one from Nan in Lower Chindwin, one from Toungoo, and one from Thaton, are unusually bright-tinted, ochreous-buff like the majority of skins of *pallasii*.

The following are some flesh-measurements (in English inches) and weights (in lb.) :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Tenasserim Town ; just ad. ♂.	24	20	3½	8
Tenasserim Town ; just ad. ♂..	23½	19—	3½	8
Mingun (*birmanicus* type) ; ad. ♀	22⅘	20½	3½	7¼
Kin, Lower Chindwin ; ad. ♀.	24½	21	3½	7½
Thayagon, Chindwin ; ad. ♀.	20	19½	3+	—
Tenasserim Town ; ad. ♀.	22	19⅕	3½	—

The type of *laotum*, an adult ♂, is a little larger than any of the Burmese skins, the head and body being 25½ in., the tail 21½ in.

According to Shortridge's observations at Mingun and on Mt. Popa, this Palm-Civet is apparently plentiful throughout the dry zone in Upper Burma, where its habits are the same as those of the typical race of *hermaphroditus* that he collected in S.W India.

45 *i*. **Paradoxurus hermaphroditus minor** Bonhote.

Paradoxurus minor, Bonhote, Fasc. Malay., Zool. i, p. 8, 1903 ; Miller, Smiths. Misc. Coll. lxi, p. 2, 1913.

Paradoxurus hermaphroditus minor, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 870, text-fig. 1, D (head), 1933, and xxxvii, p. 322, fig. 5, B, 1934 ; id., Proc. Zool. Soc. 1934, p. 616.

Locality of the *type*, Kampung Jalor in Peninsular Siam.

Distribution.—Lower Burma and S.W Siam through Tenasserim and Peninsular Siam to the Malay Peninsula and possibly Annam.

Closely resembles *pallasii* in colour and pattern and in the characters of the skull and teeth, but smaller and with the white areas of the mask on the average less distinct, the muzzle-patch being absent and the brow-band typically more obliterated by black. Differing from *laotum*, which it overlaps in range in Lower Burma, by its smaller size, narrower muzzle, and less robust, more trenchant teeth. Also the

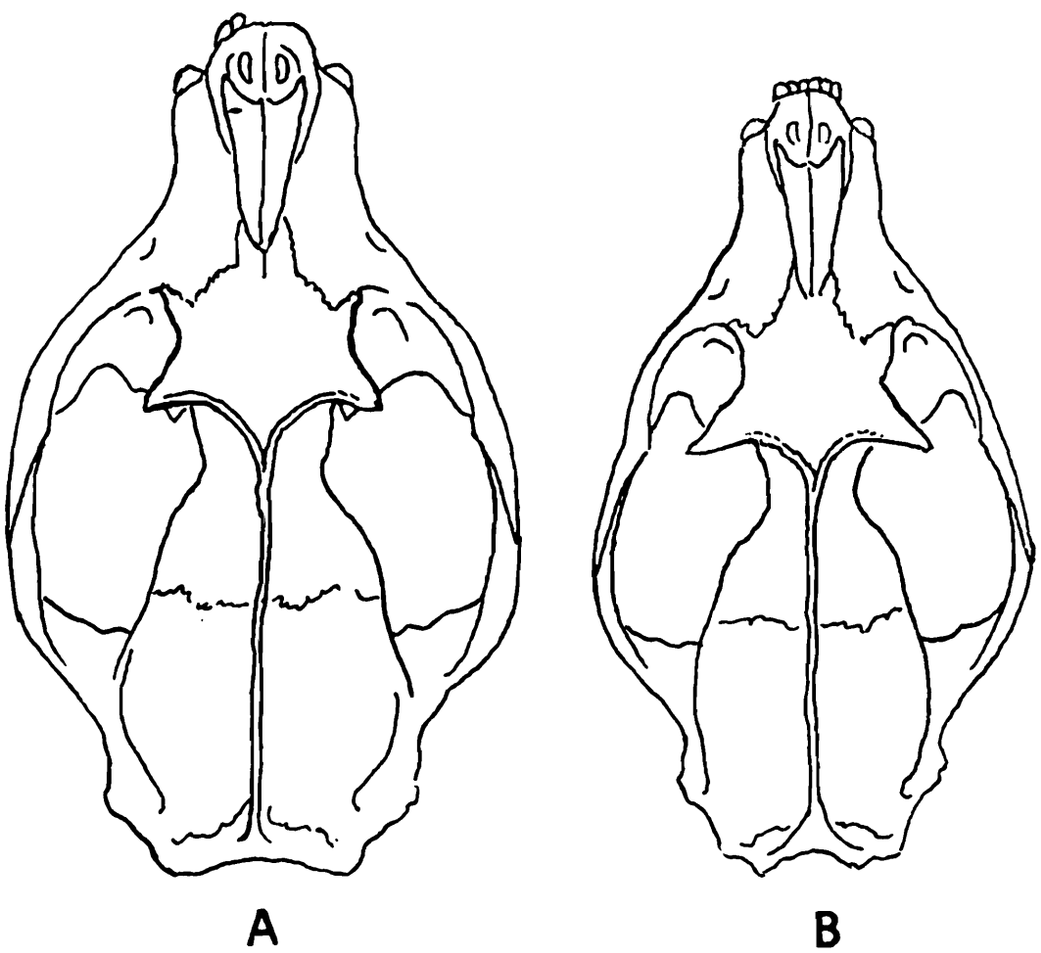


Fig. 96.

A. Skull of adult ♂ of the larger Burmese race, *Paradoxurus hermaphroditus laotum*, from 30 miles west of Sagaing, Upper Burma.
B. Skull of adult ♂ of the smaller Burmese race, *P. h. minor*, from Bankachon, Tenasserim.

ground-colour is on the average brighter and more ochreous, and the mask dominantly black instead of white.

This race varies considerably in colour, from rich ochreous-buff to grey, and also in size. Northern specimens are larger than southern, suggesting the possibility of more than one race being involved, but the available material hardly warrants the introduction of new names.

Only three skins have been recorded from British India, two from Tenasserim, one from Bankachon, Victoria Point, the other from Thaget on the Little Tenasserim River (Short-ridge), and the third from the Zamayi Reserve, 80 miles north of Pegu Town (Mackenzie). The Tenasserim skins, collected in December and March, are in full colour and coat, the contour hairs measuring 35 and 32 mm. respectively, only a trifle shorter than in *pallasii*, and the general colour and pattern are similar to those of the brightest-tinted specimens of that race, although the mask is blacker. The specimen from the Zamayi Reserve, dated April 30, being in full moult, is very different in colour, apparently from the fading of the dead hair. The contour hairs are shed and the short-haired coat is greyish-buff, with the pattern brown and ill defined, and the neck and head are dull brownish-grey.

Of other known specimens of this race, the type from Jalor in Peninsular Siam is paler than the Tenasserim skins; but one from Perak (June) is brighter coloured, nearly orange-buff on the body, and has the head largely brownish-grey as in the Zamayi Reserve skin; others from Selangor, 4,800 ft., vary from buffish-grey to cream-buff.

The following flesh-measurements (in English inches) and weight (in lb.) show the variations in this race :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Zamayi Res.; imm. ♂	18⅖	20	3	—
Bankachon; ad. ♂	19⅘	19	3+	4½
Selangor; ad. ♂	17⅗	18—	3—	—
Selangor; ad. ♀ ..	17⅗	17—	2⅘	—
Jalor (type); yg. ad. ♀	18	18⅖	2⅗	—

The specimen from Thaget in Tenasserim is almost exactly the same size as the one from Bankachon, but its weight was 5½ lb. The example from the Zamayi Reserve had not shed its milk-teeth and would probably, when full grown, have surpassed the Bankachon example in size. Both are considerably larger than the ♂ from Selangor, which seems to be the smallest adult ♂ *Paradoxurus* yet recorded.

The skull of the adult ♂ from Bankachon, included in the table, is well developed, with a high sagittal crest, narrow "waist," and strong postorbital processes. The immature ♂ skull, from the Zamayi Reserve, with the milk-teeth all in use and m^1 just erupted, has the temporal ridges 10 mm. apart on the parietals, although the skull is not far short of its potential full length, thus showing that the sagittal crest is late in forming as in *pallasii*, and not precocious, as indicated by the skulls of *laotum*, of about the same age, from Sagaing, Toungoo, and Tenasserim referred to above. Similar lateness in the formation of the sagittal crest is shown by ♀ skulls of *minor*,

Skull-measurements (in mm.) of *Paradoxurus hermaphroditus laotum* and *P. h. minor*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. h. laotum.									
N.W. Siam (*laotum* type) ; ad. ♂	119+	117½	72½	12+	20½	—	—	—	—
Tenasserim Town ; ad. ♂	116	112	64	11½	18	21	84	9	10
Mingun, nr. Sagaing, Upper Burma ; ad. ♂	114	(112±)	68	13	22	23	83	9	10
Mingun, nr. Sagaing (*birmanicus* type) ; ad. ♀	112	110	59	13	19	21	80	9	9
Tenasserim Town ; ad. ♀	112	110	62	11	18	19	82	9	9½
P. h. minor.									
Bankachon, Tenasserim ; ad. ♂	104	102	56	10½	17	17	77	7½	9
Thaget, Little Tenasserim River ; yg. ad. ♂.	100	98	(54±)	11	18	17	74	8	9
Zamayi Reserve, north of Pegu ; imm. ♂	99	97	—	14—	17	15	72	8	10

in none of which is the crest formed, the temporal ridges being 9 mm. apart on the parietals in a just adult skull from Selangor and about 10 mm. in the almost adult ♀, the type, from Jalor. Probably only aged females acquire the crest.

The largest ♂ skull known is that of an adult from 100 miles north of Bangkok, figured in my paper (Proc. Zool. Soc. 1934, p. 618, fig. 1, B). With a condylobasal length of 107 mm. and a zygomatic width of 60 mm. it is 5 mm. longer than the ♂ skull from Bankachon, some 12 mm. longer than adult ♂ skulls from Selangor, and the same length as the adult ♀ skull of *pallasii* from Sevoke, south of Darjeeling.

The status here accorded to *P. h. minor* is open to dispute on the grounds that it inhabits the same countries as two larger, intergrading races, namely, *laotum* in Lower Burma and *ravus* in the Malay Peninsula, without, so far as is known, intergrading with them. For these reasons it was considered by Bonhote and Miller as a distinct species. On the other hand, it is obviously very closely akin to *pallasii*, differing from that race merely in its average smaller size, in my opinion a subspecific character.

In Tenasserim Shortridge found this Palm-Civet plentiful about the villages, where it hides by day in the roofs of houses ; but Mackenzie's specimen from the Southern Zamayi Reserve, Pegu, was shot in a tree at dusk.

The described Races of Paradoxurus *from the Mergui Archipelago.*

Six subspecies of *P. hermaphroditus* were named by G. S. Miller from some of these islands (Smiths. Misc. Coll. lxi, no. 21, pp. 3–5, 1913). They are known to me only from the descriptions. Their distributions, names, and alleged distinctive features, epitomized in my paper (Journ. Bomb. Nat. Hist. Soc. xxxvii, pp. 324–6, 1934), are as follows :—

P. h. senex. Domel Island. Based on a single young adult ♂ distinguished from the typical examples of *ravus* Miller (*cf. supra*, p. 403, note), which has page priority, from Trang in Peninsular Siam, by having less traces of yellow on the back and sides and greatly reduced auditory bullæ, which are slightly inflated and only 10½ mm. long. Miller himself was doubtful about the constancy of the difference in colour and, considering the recently recorded variations in tint from clear ashy-grey to brownish-grey and buff in skins of *ravus* from Bagnara, Patani (see Proc. Zool. Soc. 1934, p. 636), no reliance can be placed on the characters derived from a single specimen. The length of the bulla is also too variable a feature to be trusted. In one specimen, for example, of *laotum*, from Tenasserim Town, the bulla, measured along its inner surface, is 10½ mm., in other specimens it is 13 mm.

P. h. fuscus. James Island. Based on a single adult ♀ distinguished from *senex* by its more extensive black markings and sooty-brown underside. Both these features are individually variable in mainland forms.

P. h. pallens. Kissaraing Island. Based on a single adult ♂ distinguished from typical *ravus* by having the tail distinctly brownish instead of essentially black, its basal third being like the head and body and contrasted with its distal portion. In the mainland race *laotum* this difference has no systematic value, being attributable to seasonal fading of black to brown.

P. h. pugnax. Sullivan Island. Based on two specimens resembling *pallens* from Kissaraing, but slightly smaller, and with the dark markings rather more extensive, especially on the thighs, the upper parts of the fore legs, nape, and cheeks. The distinctness of the pattern on the areas named is variable individually in the mainland race *laotum.*

P. h. sacer. St. Matthew and St. Luke Islands. Based on five specimens like *pallens* from Kissaraing, but with the stripes reduced and broken up into lines of spots, the skull smaller and scarcely exceeding that of *P. h. minor.* The disintegration of stripes into spots is not unknown as an individual character in some races of *P. hermaphroditus.* It has been recorded, for example, in skins of *ravus* from Patani ; but its occurrence in the five known examples from these islands suggests that subspecific importance may be attached to it.

P. h. pulcher. Clare Island. Based on two specimens like *pallens* of Kissaraing, but the ground-colour above and below between " cartridge-buff and cream-buff," more yellowish than in any of the other races from the Archipelago. Such differences in tint are not uncommon in individuals of several races of *P hermaphroditus.*

The flesh-measurements (in English inches) of the types of these races are as follows :—

Locality, name, and sex.	Head and body.	Tail.
Domel Island (*senex*) ; yg. ad. ♂	21	18⅜
James Island (*fuscus*) ; ad. ♀..	20	—
Kissaraing Island *pallens*) ; ad. ♀	21½	17
Sullivan Island (*pugnax*) ; ad. ♀	20⅘	17—
St. Matthew Island (*sacer*) ; ad. ♀	20⅘	17—
Clare Island (*pulcher*) ; ad. ♀	19⅕	18⅕

These measurements do not indicate any reliable differences in size between the races, but they show that collectively these insular forms are a trifle smaller on the average than in the mainland forms *laotum* and *ravus*, two adult ♀ examples of the latter from Trang and Jalor in Peninsular Siam giving

Skull-measurements (in mm.) of the alleged races of *Paradoxurus hermaphroditus* from the Mergui Archipelago.

Locality, name, and sex.	Cond.-basal length.	Zygomatic width.	Inter-orbital width.	Maxillary width.	Mandibular length.	Upper cheek-teeth.
Domel Isl. (*senex*); yg. ad. ♂	99	59−	17+	20	75+	38½
James Isl. (*fuscus*); ad. ♀	101+	53½	17−	18−	73+	37½
Kissaraing Isl. (*pallens*); ad. ♀.	103+	58½	18	19½	76+	39
Sullivan Isl. (*pugnax*); ad. ♀	99½	57−	17½	18½	74	39
St. Matthew Isl. (*sacer*); ad. ♀	99½−	57−	17½	19−	75+	39
St. Matthew Isl. (*sacer*); ad. ♂	101	60	17+	19+	73+	38
Clare Isl. (*pulcher*); ad. ♂	103+	61+	17−	20+	78½−	38½−
Clare Isl. (*pulcher*); ad. ♀	101½−	56½	16½	19−	75½−	38

a head and body length of over 23 in. But the dimensions agree closely with a small race named *cochinensis* by Schwarz in 1911, and the range of this race has been recorded from Cochin China to Peninsular Siam (see Proc. Zool. Soc. 1934, p. 626). It is quite possible that *cochinensis*, which has two years priority over the names given to the Mergui series, may come in for one or more of the races from that Archipelago, assuming that more than one race is admissible. The skull-measurements also agree, as stated below. But until more examples have been collected from the islands to show if the characters relied upon by Miller have the value assigned to them, and if they are different from those of *cochinensis*, the names proposed by Miller must provisionally stand.

The skull-measurements, approximately as recorded by Miller, appear on p. 411.

The variation in the condylobasal length of the skulls from 99 to 103 mm. is not greater than that of mainland skulls assigned to *laotum* and *ravus*, in which the length is respectively 110 to 117½ (omitting "giant"-skulls) and 104 to 108 mm. The Mergui series is decidedly smaller than either, but it is the same as in *cochinensis*, as stated above.

Habits.—The habits of all the British Indian races of this Palm-Civet appear to be similar. Although an expert climber and mainly arboreal in forest and jungle, it sometimes lives amongst rocks, and is everywhere liable to become partially parasitic on man, quite commonly taking up its abode under the roofs of bungalows near the jungle, in old drains, or even in houses in villages and towns. As lately indeed as the end of the last century it occurred in Calcutta, as stated in his edition of Sterndale by Finn, who observed one climbing up the stack-pipe of his house, and subsequently trapped a pair. The inducement to attach itself to man is no doubt the food it thereby secures. The roofs of bungalows harbour rats and other vermin, and as a destroyer of these the Palm-Civet might be welcomed were it not for its unclean habits and, being nocturnal, for the disturbing noise it makes overhead catching its prey at night. Prater, too, reported that at Satara it was a nuisance to the shopkeepers by raiding their stores of provisions, for, being omnivorous, it will eat fruits of many kinds as well as animal food, and is a notorious poultry thief. It preys, in fact, on any small mammals and birds it can overcome, as well as on snakes, lizards, frogs, and insects. In Ceylon, according to Phillips, it is very fond of the fruit of the passion flower vine, and may cause considerable loss to the growers of pineapples by raiding the plantations just before the fruit is ready for plucking. At Dharwar and Coorg Shortridge found it frequently in the neighbourhood of coffee-

estates, attracted by the berries, which it eats in quantities when ripe. But the damage done in this case is not so serious as might be expected, because the animal can digest only the soft pulp of the berries, and excretes the hard beans unaltered. It has too the habit of repeatedly depositing its droppings in heaps on the same spot—it may be on a path, or rock, or fallen tree-trunk in the jungle ; and the coolies, after gathering the harvest from the estate, hunt for these accumulations and add the recovered beans to their store for the market. Seeds of the peepal, according to Finn, are passed and deposited in the same way. It is probably the attempt to masticate these and other hard vegetable substances that accounts for the manner in which the grinding teeth of this Palm-Civet are not infrequently worn down to the gum even in skulls not noticeably very old. As has been repeatedly told, in districts like Ceylon and S. India for example, where the "Kitual"-palm flourishes and is tapped for its juices, or "toddy," this Civet's habitual robbing of the pots in which the natives collect the sweet stuff has earned for it the title "Toddy-Cat."

As stated above, the animal is active at night. It spends the day curled up asleep in a hollow tree or any suitable sheltered place.

In Ceylon, according to Phillips, the young, three or four to the litter, are born in holes in trees, the "Kitual"-palm, where available, or in recesses under overhanging rocks. They may be found at all times of the year, but more commonly in the latter part before the onset of the north-east monsoon. In India, also, judging from the evidence supplied by ♀ skins with the teats enlarged and the area round them naked, the young may be produced at all months of the year. Skins in this condition were collected in Coorg and Kanara on January 11 and February 9, and in Dharwar on November 3 and December 8 ; at Hazaribagh on March 8, at Dharbanga on July 28, Rajputana on September 15, Kangra on March 28, and Lower Chindwin on June 4. The statement that the litter consists of from four or five to six in India has been repeatedly copied ; but it is unlikely that the number exceeds that of Ceylon.

Some additional observations on this species are of great interest. McMaster ('Notes on Jerdon's Mamm. of India,' p. 44, 1870) recorded that on returning one moonlight night to his garden at Russellkonda in Orissa he found that his dogs, three or four eager, hardy terriers and spaniels, had treed a *Paradoxurus**. Unwilling to shoot the animal,

* He identified the animal as *Paradoxurus grayi* (=*Paguma larvata grayi*, see p. 420), a Himalayan species, and this was accepted by Blanford. But from the locality there is little doubt the Palm-Civet was an example of *P. hermaphroditus nictitatans*.

he sent his attendant up the tree to dislodge it and drive it to the ground. "It did not appear to notice his approach till he was almost within arms' length," whereupon "the man uttered an acute shriek of mingled horror and rage as he was suddenly sprinkled all over with some detestable fluid it discharged at him, so keenly fetid that it disabled him from using hand or eye, and at the same time covered the retreat of the beast as it bolted down the tree past me and through the dogs, driving me back in discomfort, and preventing them from closing with it The stench was vile and abominable beyond any other I have had the ill-fortune to experience, and I am certain that by it the beast saved its life."

For many years this was the only recorded evidence that the Toddy-Cat can discharge from its anal glands a nauseating defensive fluid. This was confirmed by Crump who, at Sevoke, found a pair of *P. h. bondar* in a tree. When shot, "both gave out an intensely fetid odour, and when they were being carried to camp through the forest all the jungle fowl became very excited, and with much cackling flew up into the bushes and trees." *

From these two cases it may be inferred with certainty that all examples of this species of Palm-Civet are similarly protectively endowed. The apparent infrequency with which they make use of the secretion, at all events where man is concerned, is in keeping with the general unwillingness of mammals protected in the same way to employ the secretion except as a last resort.

A note by Col. D. D. Cunningham ('Some Indian Friends and Acquaintances,' 1903) has a bearing upon this subject. He wrote of the Indian Toddy-Cats as "wonderfully fearless animals," adding that "their eyes are strangely luminous in dim light, much more so than those of almost any other animal save death's-head moths." The interest of these remarks lies in fearlessness and conspicuousness being well known attributes of distasteful, poisonous, or nauseously odorous animals; and the knowledge that this Palm-Civet comes into the last category throws light upon its coloration, which, apart from the not always manifest stripes and spots, shows, especially in some races from Ceylon and Hindustan, marked resemblance to that of the typical Polecats (*Putorius*), a resemblance which no doubt suggested that name for the species in Ceylon. In both the legs are blackish, the face has a distinct "mask" of dark and light patches, and the back is covered with long, black-tipped contour hairs which, when erected, display the whitish or yellowish underhair.

* It is not certain whether the perturbation of the fowls was due to the stink or sight of the Palm-Civets.



Photo F. W. Bond.

Burmese Palm-Civet (*Paradoxurus hermaphroditus laotum*).

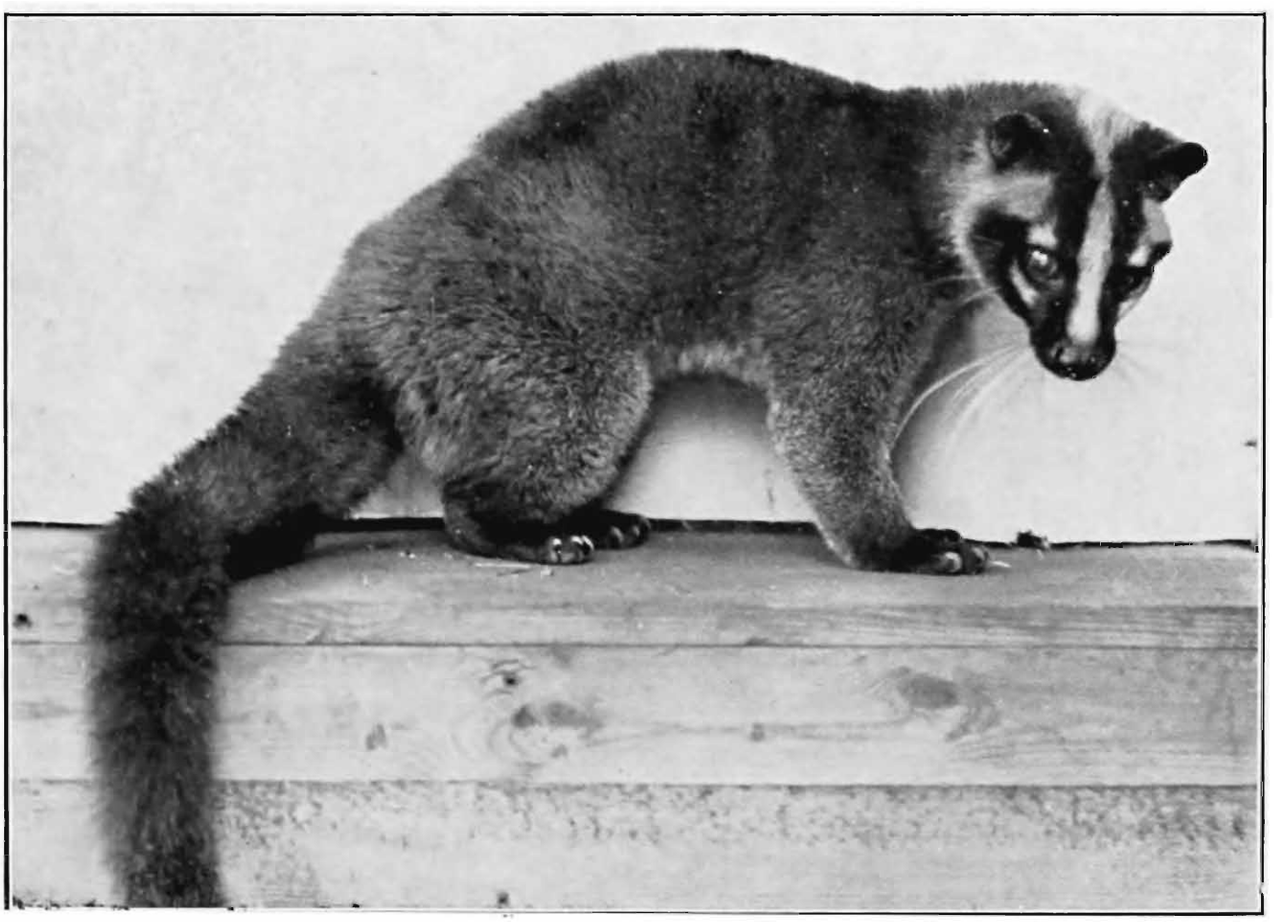


Photo F. W. Bond.

Masked Palm-Civet (*Paguma larvata larvata*) from Szechwan.

In the Polecat this coloration is known to be associated with the protective nauseous secretion of the anal glands, and is believed to have a warning significance, making the animal conspicuous, readily recognized, and avoided by enemies after one or two experiences, precisely as in the Skunks, which are similarly equipped and coloured for advertisement. No doubt the same explanation applies to the colour of this Palm-Civet.

Genus **PAGUMA** Gray.

Paguma, Gray, Proc. Zool. Soc., 1831, p. 94; and of most recent authors, including Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 326, 1934, and Proc. Zool. Soc. 1934, p. 665.
Ambliodon, Jourdan, C. R. Acad. Sci. Paris, v, p. 445, 1837.
Paradoxurus, Blanford, Mamm. Brit. Ind., p. 18 (in part).
? *Osmetectis*, Gray, Ann. Mag. Nat. Hist. x, p. 260, 1842.

Type of *Paguma*, *larvata* Hamilton-Smith; of *Ambliodon*, *jourdanii* Gray; of *Osmetectis*, *fuscus* Gray*.

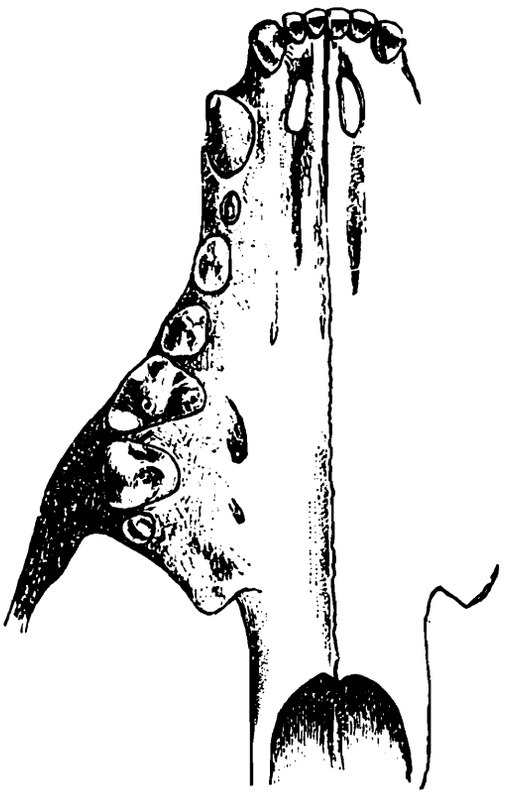


Fig. 97.—Right half of the bony palate of *Paguma larvata grayi*, showing the dentition and the fore part of the mesopterygoid fossa, to compare with fig. 91, p. 380. (From Blanford.)

* By Anderson and Thomas *Osmetectis fuscus* was cited, but obviously wrongly, as a synonym of *Herpestes urva*, the Crab-eating Mongoose. The generic name was given by Gray to a species he had previously figured as *Viverra fusca* (Hardw. Illustr. Ind. Zool. pl. i, 1830). This figure, however, with a long snout, large ears, and cat-like feet, is not the least like any species of Mongoose. It may be a caricature of *Paguma larvata grayi*.

Distribution.—From KASHMIR and Tibet through the HIMALAYAS into China, Formosa, and Hainan, Indo-China, BURMA, the ANDAMAN ISLANDS, Malay Peninsula, Sumatra, and Borneo.

Distinguished from *Paradoxurus* by the entire absence of the body-pattern, except sometimes, at least, in the newly-born young (see p. 430), and by the presence of two pairs of mammæ instead of three. Also by the skull, which has the palate produced posteriorly so as to overlap to a greater extent the anterior portion of the mesopterygoid fossa, and is everywhere less affected by the action of the masticatory muscles, the postorbital area, or " waist," being broad and comparatively unconstricted, and the postorbital processes consequently less salient ; the teeth, too, are reduced in size and less trenchant.

Nearly all the described forms of this Palm-Civet are regarded as local races of a single species, *P. larvata* ; but there is an imperfectly known form which on the available evidence may provisionally be granted specific status.

The two may be briefly distinguished as follows :—

a. Tail about half the length of the head and body ; winter coat woolly and matted	*lanigera* (Hodgs.), [p. 416.
b. Tail over two-thirds the length of the head and body, typically only two or three inches shorter ; winter coat much thinner	*larvata* (Ham.-Smith), p. 417.

46. **Paguma lanigera** (Hodgson).

Paradoxurus lanigerus, Hodgson, Asiatic Res. xix, p. 79, 1836.
Paradoxurus laniger, Hodgson, Journ. As. Soc. Beng. x, p. 909, 1841, and xi, p. 279, 1842 ; Blanford, Mamm. Brit. Ind. p. 114, 1888.
Paguma grayi, Wroughton, Journ. Bomb. Nat. Hist. Soc. xx, p. 50, 1918 (not *grayi* Bennett).
Paguma lanigera, Pocock, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 327, 1934.

Locality of the *type*, " the northern region of Nepal," subsequently said to be Tingree in Tibet.

Distinguished from the other known forms of *Paguma* and from all the species of *Paradoxurus* by the shortness of the tail, which is at most only a little more than half the length of the head and body.

In the only known specimen, the type, an imperfect, no doubt immature skin, without skull (B.M. no. 43.1.12.103), the dorsal coat from the crown backwards is very thick, woolly, and matted, the moult apparently being imminent ; the wool is copiously mixed with fine whitish hairs with curled, frizzled ends hardly projecting beyond the summit of the wool, which is about 40 mm. long ; the hairs of the face, paws, throat, and belly are sleek and comparatively short. General colour pale brown, darker and more rufous on the back than

on the flanks ; the legs and upper side of the tail like the back ; the ventral surface from the throat backwards mostly creamy-white. The tail, which is woolly like the back, is thick at the base and gradually tapers to the point.

A peculiarity of the coloration is the entire absence of black pigment in the pelage, and there is no trace of the " mask " on the imperfectly preserved skin of the head. But the condition of the coat suggests that many of the contour hairs were shed at the time of death, and that those still retained were dead, with the terminal portion broken, the whole coat being no doubt seasonally faded. Probably the fresh summer coat has black and buff or grey contour hairs. Another peculiarity is the thickness of the base of the tail, suggesting an accumulation of fat in the winter months, during which the animal possibly hibernated.

The approximate measurements of the skin are: head and body 20 in., tail, apparently complete, 9½ in., but Hodgson gave its length as 12 in. Possibly Hodgson had more than one example of this species. His unpublished drawings contain three illustrations, and one of them is more richly coloured than the others.

It is doubtful if this species comes within the limits of the fauna of British India, although originally recorded by Hodgson from the " northern region of Nepal." In his second paper he cited Tingree in Tibet as its locality. Of its habits nothing has been recorded.

47. **Paguma larvata** (Hamilton-Smith).

Gulo larvatus, Hamilton-Smith, Griffith's Anim. Kingd. ii, p. 281, pl., 1827.
Paguma larvata, Gray, Proc. Zool. Soc. 1831, p. 94.

Distribution as under the generic name, with the omission of Tibet.

Distinguished from *P. lanigera*, as stated above, by its considerably longer tail and less luxuriantly woolly winter coat.

The typical southern Chinese race of this species, *P. larvata larvata*, which is not known to occur within the limits of the British Indian fauna, is a rather small, thick-coated form, with very conspicuous black-and-white mask, the general colour varying from foxy-red to clear grey, with the tips of the long contour hairs inconspicuously darkened.

Of the British Indian races here admitted, Blanford (Mamm. Brit. Ind. pp. 112–14, 1888) referred specimens representing *wroughtoni*, *grayi*, *neglecta*, and *tytlerii* to *Paradoxurus grayi*. There is no evidence that he was acquainted with *intrudens*, *robusta*, and *janetta*. If he had known them he would, no doubt,

have assigned the first to *Paradoxurus larvatus* and the others to *P. leucomystax*. He regarded the Palm-Civets of this genus, which he did not distinguish from *Paradoxurus*, as belonging to three distinct species—*P. grayi*, occurring in the Himalayas, Burma, and the Andamans; *P. larvatus*, in S. China; and *P. leucomystax*, in Malacca. There is now evidence that these forms intergrade. The reasons for the synonymies given below were fully discussed in my two papers quoted under the subspecific headings, and need not be repeated.

Key to the British Indian Subspecies of Paguma larvata.

a. The preaural crest of hair comparatively close to the ear and some distance behind the eye.	
b. Head mainly black, the pale areas of the mask greatly reduced in extent	[nov., p. 424. *nigriceps*, subsp.
b′. Head not mainly black, pale areas of mask extensive and typically well defined.	
c. Pattern of mask moderately emphasized, the median band confluent on the forehead with the pale area on the cheek, and not continued all along the nape.	
d. Larger, winter coat longer and thicker, pale areas of mask lighter than tint of back.	
e. Nape nearly black, sharply contrasted with grey of crown and darker than back	[p. 418. *wroughtoni* Schwarz,
e′. Nape typically copiously speckled with grey and similar in tint to crown and back	
f. Winter coat longer and thicker.	*grayi* (Benn.), p. 420.
f′. Winter coat shorter and thinner.	*neglecta* Poc., p. 422.
d′. Smaller, winter coat thin and short, pale areas of mask similar to tint of back	*tytlerii* (Tytl.), p. 424.
c′. Pattern of mask strongly emphasized, black and white, the median band bordered throughout with black, not confluent with the pale area of the cheek but continued along the nape	[p. 425. *intrudens* Wrought.,
a′. The preaural crest of hair reaching nearly to the eye and far in front of the ear.	
g. General colour tawny, nape at most pale brown	[p. 426. *robusta* (Miller),
g′. General colour much darker, nape blackish-brown	*janetta* Thos., p. 427.

47 *a*. **Paguma larvata wroughtoni** Schwarz.

Paguma grayi wroughtoni, Schwarz, Ann. Mag. Nat. Hist. (8) xii, p. 289, 1913; Wroughton, Journ. Bomb. Nat. Hist. Soc. xx, p. 51, 1913.

Paguma larvata wroughtoni, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 329, fig. 6, 1934.

Locality of the *type*, Gharial near Murree, Upper Punjab.

Distribution.—KASHMIR and the UPPER PUNJAB, eastward to GARHWAL and KUMAUN, where the race blends with the next.

Mask tolerably well defined, the head dominantly grey above and in front of the ears, with the sides of the muzzle, the area round the eye, the chin, fore-throat, and lower cheek blackish-brown, but relieved by a conspicuous grey patch below the eye; the grey of the crown invading the fore part of the nape more or less as a median streak set off by the generally blackish hue of the rest of the nape and shoulders, which are at most inconspicuously speckled with grey; the back darkish grey, black speckled with grey in front, with buffish-grey behind; tail like the back mostly, but gradually darkening towards the tip; the underside whitish; the legs like the flanks, but with paws dark brown; the dorsal contour hairs of the coat vary seasonally from about 30 to 55 mm., but are usually about 50 mm. (2 inches).

No flesh-measurements of adult specimens are available.

Skins assigned to this race have been collected at Gharial near Murree (H. N. Dunn); at Sopor, near Lake Walar in Kashmir; at Chamba, 6,000 to 9,000 ft. (H. W Wells); at Dharmsala, 5,000 ft. (H. Whistler); and at Simla (A. O. Hume). But the Simla skin approaches the next race, *grayi*, in having the grey of the mask less conspicuous than in typical *wroughtoni*. Of two skins from Salim, near Lansdowne in Garhwal, 2,750 ft. (D. E. Lowndes), one, September, is very like the type of *wroughtoni*, but has the coat shorter, only 30 instead of 45 mm., and the back less speckled with buff, whereas the other, May, has the coat about 43 mm,, the back much more buff, and the nape and shoulders speckled with buff as in *grayi*. Two skins from Dhakuri in Kumaun, 9,000 ft. (Crump), similarly connect the two races, the nape of one being blackish as in *wroughtoni*, in the other speckled as in *grayi*.

The only known adult skull of this race, that of the type, ♂, has a condylobasal length of 125 mm., a little longer than any of the skulls assigned to the next race, *grayi*, and since a young adult ♀ from the same locality near Murree, in the Upper Punjab, is slightly longer than the longest known skull of *grayi*, an old ♀ from E. Kumaun (Stockley), it may be inferred, although the data are scanty, that typical *wroughtoni* is a little larger than *grayi*; but, as in the case of the skins, no doubt the two races intergrade completely in cranial characters.

47 *b*. **Paguma larvata grayi** (Bennett).

Paradoxurus grayi, Bennett, Proc. Zool. Soc. 1835, p. 118.
Paradoxurus nipalensis, Hodgson, Asiat. Res. xix, p. 76, 1836.
Paguma grayi, Gray, Proc. Zool. Soc. 1864, p. 541 ; and of most subsequent writers, at least in part.
Paguma larvata grayi, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 330, 1934.

Locality of the *type* of *grayi*, "India" ; of *nipalensis*, Nepal, mainly in the hilly region (Hodgson).

Distribution.—NEPAL, and thence westwards to KUMAUN and GARHWAL, where the race blends with *wroughtoni*.

Nearly resembling *wroughtoni*, but distinguished from typical forms of that race by the duller, less silvery-grey hue of the pale areas of the mask, by the profuse pale speckling of the nape and shoulders, which, instead of being contrasted by their blackness, are nearly the same general tint as the back and loins ; also the winter coat on the average is fuller owing to the longer thicker underwool, and not so loose, although the contour hairs are approximately the same length.

The flesh-measurements (in English inches) and weights (in lb.) of two examples from Dhakuri in Kumaun are as follows :—

Sex.	Head and body.	Tail.	Hind foot.	Weight.
Ad. ♂	25½	24⅓	4+	11½
Yg. ad. ♂	23½	22½	4—	8¼

The type of this race, ticketed "India, Zool. Soc.," was a menagerie-reared specimen ; but, since it closely resembles one of Hodgson's skins from Nepal, I accept the traditional identification of the specimens that Hodgson named *nipalensis* as *grayi*. Hodgson's skins, seven in number, show considerable individual variation in colour and very marked, apparently seasonal, differences in coat. The specimen I regard as the type of Hodgson's *nipalensis* closely resembles the type of *grayi*, but has the back less buffy, the hind back more speckled with black, and the tail dark in its posterior half, not buffy throughout. Two others are less buffy than the type of *nipalensis*, the pale speckling being grey. The coat of these varies from 40 to 46 mm. long and is thickened with underwool. They are probably early winter skins. A fuller-coated Nepalese skin (Dhuleep Singh) has the coat 50 mm. and the underwool 35 mm. long. Four additional skins collected by Hodgson are moulting and short-coated, the underwool being scanty. They are on the average darker than the full-coated skins. One is speckled above with rusty ochreous, the belly rich ochreous-buff, and even the pale areas of the mask are buffy. Possibly it is artificially stained by smoke or scorching. Blanford thought these skins represented a lowland race, but no doubt the scantiness of the coat is purely seasonal.

In addition to the skins from Kumaun and Garhwal referred to above as intermediates between *grayi* and *wroughtoni*, there is one from Swankot, 3,569 ft. (C. A. Crump), which

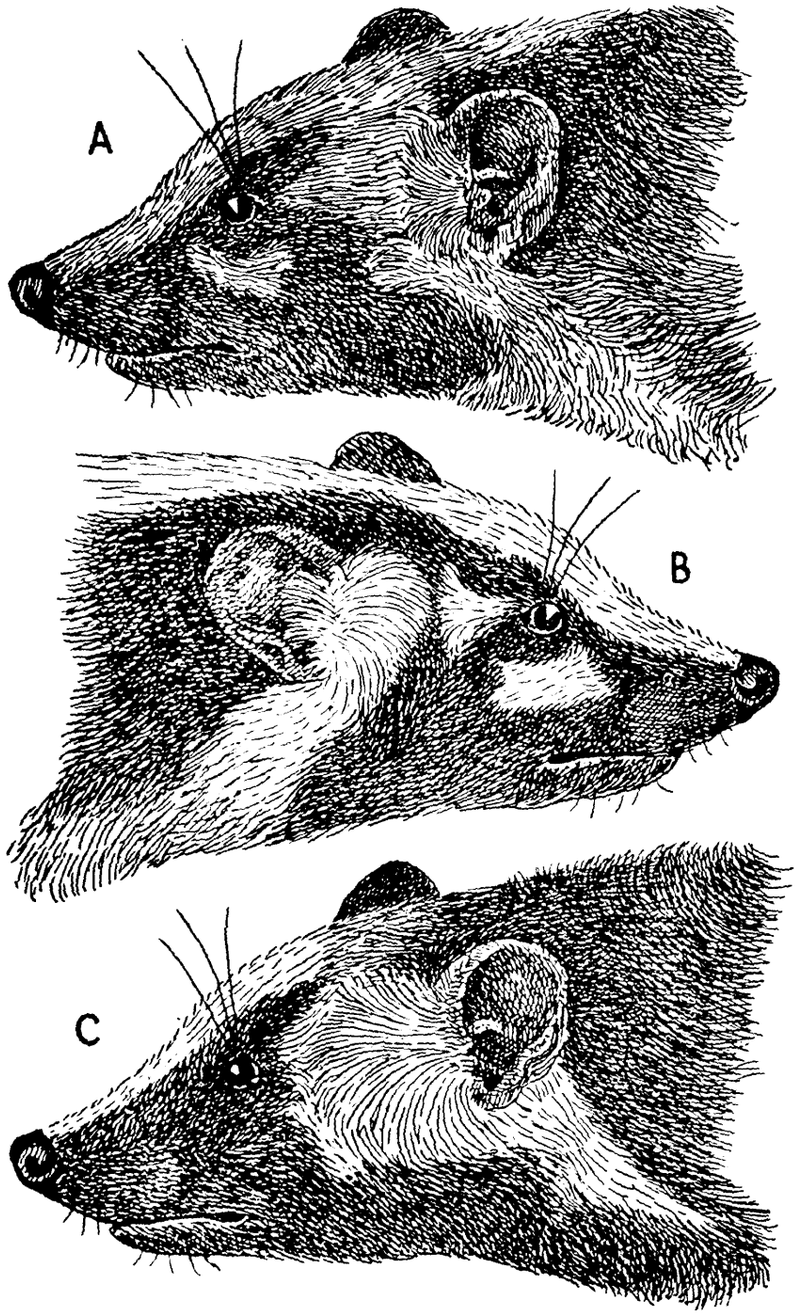


Fig. 98.

A. Head of *Paguma larvata wroughtoni*, drawn from skin from Gharial, near Murree, in the Upper Punjab.
B. Head of *P. l. intrudens*, drawn from skin from the North Shan States.
C. Head of *P. l. janetta*, drawn from skin of type from Bankachon, Tenasserim.

also has the nape blackish, as in *wroughtoni*; but two from Naini Tal (E. A. Smithies) and one from eastern Kumaun (C. H. Stockley) resemble typical *grayi*.

An adult ♂ skull from Dhakuri, Kumaun, is only 114 mm. in condylobasal length, considerably less than the skull of the type of *wroughtoni*. An unsexed skull from Nepal (Hodgson) is 117 mm., whereas an old ♀ skull from eastern Kumaun (Stockley) is 118 mm., the longest observed in the race, and, as stated above, is nearly the same length as a young adult ♀ skull, a topotype of *wroughtoni*.

47 *c*. **Paguma larvata neglecta** Pocock.

Paguma larvata neglecta, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 334, 1934, fig. 6, B ; id., Proc. Zool. Soc. 1934, p. 672.

Locality of the *type*, Mokokchung, 4,500 ft., in the Naga Hills, Assam.

Distribution.—ASSAM, and thence apparently westwards to SIKKIM and the low-lying districts of NEPAL and southwards to the Chin Hills and Arakan in BURMA.

Closely resembling typical *grayi* in having the dorsal surface tolerably uniformly speckled from the crown to the tail and in the pattern of the mask, but differing in having the proximal portion of the tail more ochreous, at least in Assamese skins. Also the winter coat is much shorter and less luxuriant, the contour hairs, when fully grown, being between 30 and 40 mm. long.

Flesh-measurements (in English inches) and weights (in lb.) of some specimens assigned to this race are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Narbong, Darjeeling ; ad. ♂	26—	23½	4+	9½
Hathiban, Nepal ; ad. ♀	25—	25—	4—	11
Garo Hills, Assam ; ? ad. ♂	25—	24	4—	5½

The type, from the Naga Hills (H. W Wells), has the dorsal surface speckled with black and buff, the buff being richer on the hind back and rump than anteriorly, the tail is rich ochreous with the terminal two inches black, the legs are grizzled, and the pale areas of the mask are clear silvery-grey and the tint of the crown blends with that of the nape. A skin from the Mishmi Hills, 2,250 ft. (H. W Wells), is like the type, but the mask is not so white ; another, from Duragiri, in the Garo Hills (H. W Wells), also has the mask duller, the pale speckling on the back greyer and finer, and the tail not so bright. Evidence for the extension of this race westwards to Nepal is supplied by two skins from Hathiban and Thankot (Baptista), which are on the whole more like *neglecta* than *grayi*, and to Darjeeling by a skin from Narbong, 2,000 ft. (Crump) ; but another from the Gopaldhana Valley, Darjeeling (Stevens), is not definitely assignable to either race. Skins

Skull-measurements (in mm.) of the four races of *Paguma larvata* assigned by Blanford to *Paradoxurus grayi*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. l. wroughtoni.									
Murree (type); old ♂	128	126	72	24	25	24	94	8	9½
Murree; just ad.♀	123	121	65	20	22	22½	89	8	9½
P. l. grayi.									
Dhakuri, Kumaun; ad. ♂ ...	118	115	66	22½	23	23	85	8—	—
E. Kumaun (Stockley); old ♀	120	118	64	20	21½	22½	—	8—	—
Naini Tal, Kumaun; ad. ♀	116	114	60	23	21	21½	84	8	9
"India" (type); yg. ad. ♀	115	—	59	23	22	22	82	7	8
Nepal (Hodgson); ad. ♀	114	112	66	23	22	21	—	7	—
P. l. neglecta.									
Naga Hills (type); ad. ♂	123	—	70	23	23	24	92	8	10
Chin Hills; oldish ♂ ?.	123	—	(72±)	22	23	24	92	8½	10
Hathiban, Nepal; ad. ♀	118	116	64	20	21	22	86	8	9
P. l. tytlerii.									
Andamans (Zool. Soc.); old ♂ ?	113	112	68	18	20	21	84	8	10
Andamans (Hume); young ♂	111	108	—	21	21	20	79	8	9
S. Island (Miller); ad. ♂ :..	108	—	61	—	21	—	82	—	—
Rutland Is. (Rogers); old ♀ ..	102	100	62	21	20	21½	76	—	—

from the Chin Hills, 4,000 ft., 150 miles west of Kindat (J. M. D. Mackenzie), attest the extension of *neglecta* into Upper Burma, and no doubt Blanford's record of *grayi* from Arakan referred to this race, which thus has an extended range to the west of the Chindwin and Irrawaddy.

The skull of the specimen above referred to from Narbong, Darjeeling, an adult ♂, has a condylobasal length of 120 mm. The skull of the type, a young adult ♂ from the Naga Hills, and of an old, probably ♂, specimen from the Chin Hills have the basioccipital cut away, but the total length, probably 1 or 2 mm. in excess of the condylobasal length, is 123 mm. These data suggest that the skull of *neglecta* may be a trifle larger than in typical *grayi*, but the evidence is far from satisfactory.

47 *d*. **Paguma larvata nigriceps,** subsp. nov.

Locality of the *type*, Nam Tamai in Upper Burma.

Distinguished from all the other known races of *Paguma* by the nearly complete obliteration of the pale areas of the mask, the head being mainly black apart from a narrow buffy-grey stripe between the eyes, but dying out on the forehead, the merest trace of the patch below the eyes, and a yellowish preaural area ; the nape is blackish, finely speckled with buff : the back has an abundance of black and buff speckling, the general effect being dark brown ; the tail in its basal half is black above, yellowish-brown at the sides, and its terminal half is black.

Although only a single adult skin, collected by Lord Cranbrook in the above-mentioned locality, is available, it differs so noticeably from the other Burmese forms, *neglecta* and *intrudens*, in the general blackness of the head that I do not hesitate to regard it as representing a distinct race of *Paguma*.

47 *e*. **Paguma larvata tytlerii** (Tytler).

Paradoxurus tytlerii, Tytler, Journ. As. Soc. Beng. xxxiii, p. 188, 1864 ; Miller, Proc. U.S. Nat. Mus. xxiv, p. 772, 1902.

Paguma larvata tytlerii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 338, 1934 ; id., Proc. Zool. Soc. 1934, p. 672, fig. 11, A (skull).

Locality of the *type*, Port Blair, S. Andaman Island.

Distribution.—Andaman Islands.

A small race with the coat thin and short, up to about 25 mm. long, and the general colour pale, the dorsal surface from the crown nearly to the end of the tail being tolerably uniformly speckled grey and black and the mask without strongly contrasted hues, the pale areas being grey, like the nape and back, and the dark areas pale brown.

The following are the flesh-measurements (in English inches) of two specimens :—

	Head and body.	Tail.	Hind foot.
Ad. ♂ (Miller)	22	20	$3\frac{1}{3}$
Type (Tytler)	21	20	—

This race was not distinguished from *grayi* by Blanford. Only a few specimens of it are known. The type and the example recorded by Miller were from South Andaman Island. Another was collected in Rutland Island (C. G. Rogers). Probably it occurs throughout the Archipelago.

The only adult ♂ skull known to me, that of an old specimen, differs from the skulls of other races of *Paguma* by having the postorbital area relatively deeply constricted and the postorbital processes salient. These features, associated with a high sagittal crest, combine to give it a resemblance to the skull of *Paradoxurus*. But the specimen came from the Zoological Society, and it is almost certain that the peculiarities are due to rearing in captivity. The old ♀ skull from Rutland Island has the postorbital area parallel-sided and the postorbital processes small, as in typical *Paguma* ; the sagittal area is narrowly lyrate and the muzzle is exceptionally wide outside the first upper molars.

47 *f*. **Paguma larvata intrudens** Wroughton.

Paguma larvata intrudens, Wroughton, Journ. Bomb. Nat. Hist. Soc. xix, p. 739, 1910, and xx, p. 51, 1918 ; G. M. Allen, Amer. Mus. Novit. no. 359, p. 7, 1929 ; Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 259, 1932 ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 340, fig. 6, C, 1934 ; id., Proc. Zool. Soc. 1934, p. 670.

Paguma larvata vagans, Kloss, Journ. Nat. Hist. Soc. Siam, iii, p. 73, 1919.

Paguma larvata yunalis, Thomas, Ann. Mag. Nat. Hist. (9) viii, p. 617, 1921.

Locality of the *type* of *intrudens*, Sima in Myitkyina, Upper Burma ; of *vagans*, Sikawtur, north-west of Raheng, W Siam ; of *yunalis*, Yenyuensien in S. Szechwan.

Distribution.—From S. Szechwan, Yunnan, and N.E. Burma to the Shan States, Siam, Laos, and Tong-king.

Distinguished from the races previously described by the very sharply contrasted black and white pattern of the mask, the median band being bordered throughout by black and passing over the nape as a white stripe which may reach the shoulders or surpass them. Also by the contour hairs of the upper side behind the shoulders being at most a little blackened at the tip, so that the general hue is paler, varying from buffish-grey to foxy-red.

The flesh-measurements (in English inches) and weights (in lb.), where known, of three specimens from British Indian territory are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Myitkyina (type) ; yg. ad. ♀.	24	23	3½	—
N. Shan States ; yg. ad. ♂	27⅕	24½	4½	11
N. Shan States ; imm. ♀	22½	22—	4+	6½

This race is very closely related to typical *larvata* from S. China, from which it only differs in being a trifle larger, the condylobasal length of the skull ranging from 116 to 121 mm., whereas in the typical form it is up to about 112 mm. The characters upon which *yunalis* from S. Szechwan and *vagans* from W Siam were based have been shown to be too variable for the admission of the races.

Up to the present time the only localities within our limits where this race has been collected are Sima in Myitkyina, N.E. Upper Burma (A. W Kemmis), and Pyaunggaung in the North Shan States, 2,794 ft. (G. C. Shortridge) ; but it has also been recorded from Tengyueh, 9,000 ft., in Yunnan, from the Lichiang Range, Yunnan, 11,000–12,000 ft., from Yenyuensien in S. Szechwan, and from Laos and Tong-king in Indo-China (Delacour and Lowe).

47 *g*. **Paguma larvata robusta** (Miller).

Paradoxurus robustus, Miller, Proc. Biol. Soc. Wash. xix, p. 26, 1906.

Paguma larvata robusta, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 343, 1934 ; id., Proc. Zool. Soc. 1934, p. 674, text-fig. 10 (skull), pl. 2, D (head).

Locality of the *type*, Trang in Peninsular Siam.

Distribution.—TENASSERIM, Peninsular Siam, northern Malay Peninsula.

Distinguished from all the preceding races by having the curved preaural crest of hairs reaching beyond the middle of the cheek and nearer to the eye than to the ear. It is also, on the average, slightly larger, and has the coat uniformly short and thin throughout the year. The general colour, hardly differing from that of some examples of *grayi* or *tytlerii*, varies from paler or darker tawny to buffy-grey, the back sometimes showing rusty-ochreous speckling and the nape may be brownish ; the mask has its dark areas brown, the pale patch below the eye is an indistinct grey smear, and the conspicuous median band may stop short on the crown or reach the nape, and is typically confluent with the white of the cheek.

The flesh-measurements (in English inches) of two examples are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Tenasserim (Miller) ; ad. ♂	25½	22½	4
Trang (Brit. Mus.) ; ad. ♂	30+	21¾	4+

The evidence that this race comes into the fauna of British India rests upon the record by Miller of the adult ♂, of which the measurements are give above, which was collected at Telok Besar in Tenasserim. This specimen I have not seen, but the above-given description is based upon five examples collected by Boden Kloss in Peninsular Siam and the northern part of the Malay Peninsula, the measured example from Trang being a topotype.

The skull is well developed, with a tolerably high sagittal crest in the adult and a noticeable depression on the crown close to the crest where the postorbital area passes into the expanded portion of the cranium. It is larger than in the subspecies described above, the condylobasal length in the adult ♂ varying from 126 to 135 mm., and in the ♀ from 120 to about 126 mm.

47 *h*. **Paguma larvata janetta** Thomas.

Paguma robusta, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 710, 1915 (not *P. robusta* Miller).

Paguma leucomystax janetta, Thomas, Ann. Mag. Nat. Hist. (10) ii, p. 101, 1928.

Paguma larvata janetta, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvii, p. 344, 1934, fig. 6, D (head), fig. 7 (skull) ; id., Proc. Zool. Soc. 1934, p. 673.

Locality of the *type*, Bankachon, Victoria Point, S. Tenasserim.

Distribution.—S. TENASSERIM.

Resembling *robusta* in the situation of the crest on the cheek, in its short, thinnish, winter coat, and in cranial characters, but distinguished by its much darker colour, the back being closely speckled with black and ochreous or buff, the pale speckling passing into grey on the flanks but dying out on the shoulders and nape, which are brownish-black with at most some white continued back from the crown in the middle of the nape. The facial pattern varies. In the type, adult ♂, there is no pale patch below the eye, the grey fronto-nasal band is narrowly continuous with the large pale preaural area, and there is no white on the crown or nape. In an immature ♂ the mask is more emphasized, black and white, the median band is more separated from the preaural area, there is some white on the crown and a good deal on the nape. An adult ♀ has a small patch below the eye, and further differs in having the crest on the cheek nearer the ear, thus approaching

the condition seen in *intrudens* and other more northern races ; but possibly this is due to the make-up of the skin.

The flesh-measurements (in English inches) and the weights (in lb.) of an adult ♂ and ♀ from Bankachon (G. C. Shortridge) are as follows :—

	Head and body.	Tail.	Hind foot.	Weight.
Ad. ♂ (type)	26+	—	4½	12½
Ad. ♀	25½	23	4	9¼

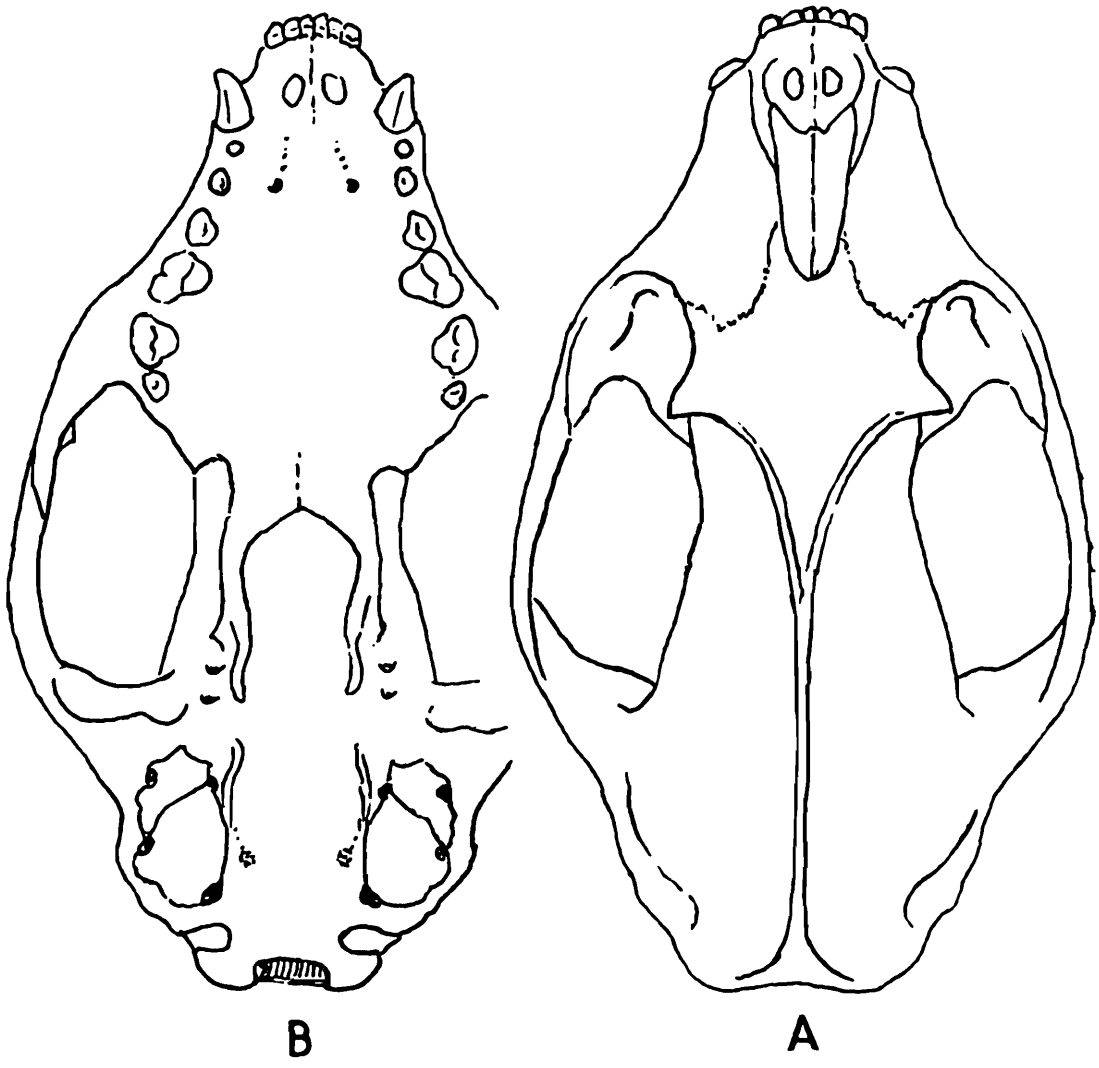


Fig. 99.

A. Upper side of skull of the type of *Paguma larvata janetta*, an old ♂, from Bankachon, Tenasserim.
B. Lower side of the same. Both figures × ⅓.

These dimensions agree tolerably closely with those of Miller's example of *robusta* from Tenasserim ; but the type of the latter, an adult ♀ from Trang, is as large as the adult ♂ (type) of *janetta* and two adult ♂ examples of *robusta*, namely, the one from Trang, above measured, and another from Klong Wang Hip in the Malay Peninsula, which is 29½ in. in head and body, are a good deal larger. These facts suggest that typical *robusta* is, on the average, a larger race, and that the Tenasserim form of it links *robusta* with *janetta*, at all events

Skull-measurements (in mm.) of *Paguma larvata intrudens*, *P. l. janetta*, and *P. l. robusta*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
P. l. intrudens.									
Pyaunggaung, N. Shan States; just ad. ♂	119	121	65	25	23	23	89	9	10
Myitkyina, Upper Burma; yg. ad. ♀	116	—	64	21	22	23—	83	8	9
P. l. janetta.									
Bankachon (type); ad. ♂	124	124	76	27	29	27	94	9	11½
Bankachon (type); ad. ♀	118	118	64	25	24	22	87	8	10
P. l. robusta.									
Trang, Malay Peninsula (topotype); ad. ♂	137	135	77	24	29	27	106	10	11
Klong Wang Hip, Malay Peninsula; just ad. ♂	127	126	73	29	30	25	93	9	11
Trang (type), (Miller); ad. ♀	126	—	69	22+	25½	24	—	—	—

in dimensions. The differences in colour between *robusta* and *janetta* probably indicate a wetter environment for the latter.

The skull has the same depression on the crown at the junction of the frontal and parietal bones as in *robusta*. It is more muscularly developed than in the northern races of *Paguma*, the sagittal crest in the ♂ being high, adjoining the depression. In the ♀ there is no crest, the temporal ridges being about 5 mm. apart.

Habits.—The habits of *Paguma* are very similar to those of *Paradoxurus*. According to Hodgson the race *grayi*, found in Nepal, where it inhabits the mountain forests, is more frugivorous; but it is omnivorous, feeding partly on vegetable, partly on animal food, including birds and small mammals. The dwarf Andamanese race is said to be very destructive to pineapple plantations, and Mackenzie was told that *neglecta*, the race found in the Chin Hills, where it is eaten by the natives, who call it "Sa Gyaw," feeds on fruits and roots. Shortridge found *janetta* very plentiful inland from Victoria Point, Tenasserim, where it is a "great ratter," but is seldom destructive to poultry.

Apparently the only information about the breeding habits in the wild is supplied by Hodgson's statement that in Nepal this Palm-Civet breeds in holes in trees and that a litter of four young was found on one occasion. But a pair of the typical race (*P. larvata larvata*) from Szechwan, which bred in the Zoological Gardens, as I recorded (Proc. Zool. Soc. 1911, p. 621), produced a litter of three in the early summer. In colour they differed from their parents in having the "mask" less emphasized and the general hue of the body greyer, with the underside white. They also showed on the back and sides faint traces of the pattern characteristic of *Paradoxurus*. Their eyes, at first closed, opened on the ninth day after birth. The growth of the young was much more rapid than in kittens and puppies. When only three months' old they almost equalled their parents in size. We also owe to Hodgson the evidence that this animal, like *Paradoxurus*, is protected by the nauseous secretion of its anal glands. A tame specimen, he said, was "very cleanly and its body emitted no unpleasant smell, though when it was irritated it exhaled a most fetid stench, caused by the discharge of a thin yellow fluid from pores on each side of the anal orifice." Nearly all the races have conspicuously marked heads, and this "mask" reaches the maximum of contrast in black and white in typical *larvata* from China and its near ally *intrudens* of Burma. It is significant that it is least conspicuous in the race from the Andamans, where there are practically no carnivorous enemies to be "warned off."

Genus **ARCTICTIS** Temminck.

Arctictis, Temminck, Mon. Mamm. i, Tabl. Méthod. p. 21, 1824; and of all recent authors, including Blanford, Mamm. Brit. Ind. p. 117, 1888; Pocock, Proc. Zool. Soc. 1915, pp. 387–412, and 1933, p. 1015.

Ictides, F. Cuvier, Dents des Mamm. p. 252, 1824; Valenciennes, Ann. Sci. Nat. iv, p. 57, 1825*.

Type of *Arctictis* and of *Ictides*, *binturong*.

Distribution.—The Eastern Himalayas, Assam, Burma, Indo-China, Siam, Malay Peninsula, Sumatra, Java, Borneo, and Palawan.

Essentially like *Paradoxurus* and *Paguma* in general build but more massive, in the length of the tail and legs, and in the structure of the scent-glands † and of the feet, except that the hind foot is naked throughout below, instead of having the heel hairy. The contour hairs of the coat also are much longer and coarser, and the long hairs clothing the whole of the back of the ears project beyond the tip as a definite tuft ‡. The rhinarium is very large and more convex above than in *Paradoxurus* and *Paguma*, the median groove being much narrower above the philtrum. The ear is as in the other genera, except that the anterior flap of the bursa is more widely and less deeply emarginate. The tail is more muscular, especially at the base, and is prehensile at the tip, although hairy throughout §. There are two pairs of mammæ.

The skull in its main features is like that of *Paguma*, having a similar extension of the palate over the anterior half of the mesopterygoid fossa and a long, wide, little-constricted postorbital area, but this area and the area between the postorbital processes is more inflated by air-cells; the extent of the inflation is, however, very variable individually. It differs from the skulls both of *Paguma* and *Paradoxurus* in having the palate less flat; it is a little elevated on each side alongside the larger crushing cheek-teeth and grooved between these ridges. In this respect the skull approaches that of *Arctogalidia* (see p. 441). There is also a resemblance between the teeth of these two genera, but those of *Arctictis* are more decadent and differ a good deal from those of *Paguma*,

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* These two names date from the same year; and, not knowing which was published first, I adopt *Arctictis*, which has been in common use for about a century.

† In 1915, writing from memory, I wrongly stated that the ♀ generative orifice is in front of the glandular area. It is encircled by it, as stated by Carlsson.

‡ This tuft does not arise from the tip of the ear like that of a Lynx, as has been stated.

§ The only other Carnivore which has a truly prehensile tail is the tropical American Kinkajou (*Potos flavus*), a member of the Procyonidæ, which closely resembles the Binturong in habits.

being much less trenchant and less massive. The upper incisors are separated from each other and form a tolerably strongly curved line; the upper canine is very large and sharp, and has a sharp cutting hinder edge; the upper carnassial (pm^4) and the first upper molar have the inner lobe (protocone) more widely rounded than in *Paguma*, and almost as wide basally as the outer part of the crown, which in pm^4 has the posterior cusp very small and hardly larger than the anterior cusp (parastyle); the last upper molar is sometimes absent, and in the lower jaw the first premolar is usually absent, and minute when present.

The genus is represented by a single species.

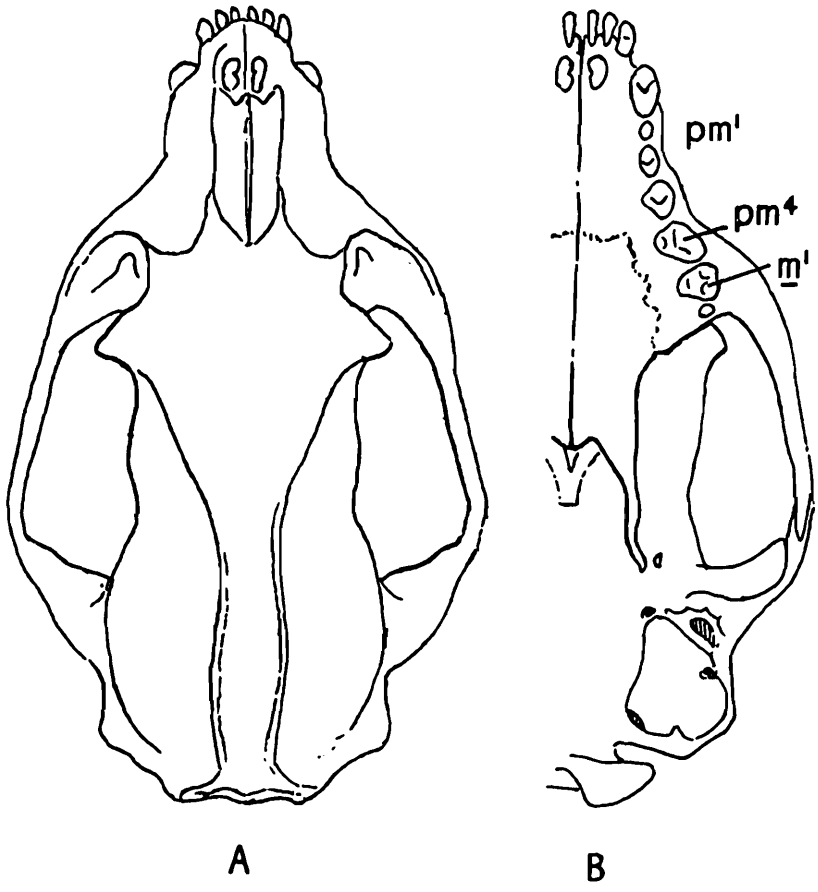


Fig. 100.

A. Skull of adult, probably ♀, specimen of *Arctictis binturong albifrons*, from Sikkim.
B. Left half of underside of the same. pm^1, pm^4, and m^1, first and fourth premolars and first molar.

48. **Arctictis binturong** Raffles. The Binturong or Bear-Cat.

(For principal bibliographical references see under the subspecific headings.)

Main characters and distribution as under the genus. The tail is a little shorter than the head and body, and from about five to six times the length of the hind foot. Colour of the body very variable, generally mostly black, but more or



Photo D. Seth-Smith.

Binturong (*Arctictis binturong*).

fewer of the hairs frequently partly whitish or buff, giving a speckled appearance to the pelage, sometimes so extensively pale that the whole body is mostly straw-coloured or grey, the young being often at all events paler than the adults, but the head is always closely speckled with grey or buff; the long mystacial vibrissæ are conspicuously white, and there is a white rim on the summit of the otherwise black ear. The limbs are typically speckled externally; the tail is generally like the body, but commonly paler at the base beneath, and the glandular area, at least in the ♂, is whitish.

Tentatively the British Indian Binturongs are assigned to two subspecies, a northern and a southern; but, owing to the rarity of the animal, the available material is too scanty to justify more than the provisional conclusion that the two differ in size, the northern being the smaller of the two.

48 *a*. **Arctictis binturong albifrons** (Cuvier).

Paradoxurus albifrons, F. Cuvier, Mém. Mus. d'Hist. Nat. ix, pp. 44–8, pl. 8, 1822 *.

Ictides albifrons, F. Cuvier & Geoffroy, Hist. Nat. Mamm. iii, no. 201, 1824.

Arctictis binturong albifrons, Pocock, Proc. Zool. Soc. 1933, p. 1030, figs. of skull, pp. 1024 and 1027.

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* There has been great confusion in the application of this name, which was given by Cuvier in 1822 to a sketch sent to him by Duvaucel of a specimen living in the Barrackpore Menagerie, Calcutta, which Duvaucel ascertained had been captured in Bhutan. This sketch was reproduced in colour by Cuvier and Geoffroy two years later. The truth of Duvaucel's account of the specimen has been doubted and even denied, but, in my opinion, without warrant. Temminck thought the specimen sketched by Duvaucel was one captured in Malacca and described by Raffles in 1822 as *Viverra binturong*. It is admittedly possible that the owner took it to Calcutta and deposited it in the menagerie after Raffles had seen it, and also that the animal changed from black to grey in the interval. But this opinion leaves unexplained Duvaucel's statement, no doubt derived from the Superintendent at Barrackpore, that the animal came from Bhutan. Cuvier himself was partly responsible for further doubts about the matter, because in 1824, in conjunction with Valenciennes, he identified as *albifrons* an example sent to him from Java; and this was apparently the source of Oustalet's statement (Bull. Mus. d'Hist. Nat. vii, p. 318, 1901) that between 1820 and 1826 Diard and Duvaucel sent the type of *albifrons* to Cuvier from Java. Accepting this view, Kloss (Treub. Buitenz. x, p. 497, 1929) adopted *albifrons* for the Binturong of that island. But the original description of *albifrons* was taken from a drawing, not from a specimen; and since Duvaucel is known to have sent to Cuvier from Assam descriptions and sketches of purely Indian animals, e. g., *Melursus ursinus*, there is no reason to doubt he was in Northern India, and may very well have seen the Bhutan Binturong in Barrackpore, as he stated. The matter is of some importance because Blanford doubted the existence of the Binturong in the Himalayas, although admitting its existence in Assam, and did not consider the original history of the alleged Bhutan specimen described as *albifrons*.

Vernacular.—*Young* (Assamese); *Myouk-Kyá* (Burmese).

Locality of the *type*, Bhutan.

Distribution.—NEPAL, SIKKIM, BHUTAN, ASSAM *, UPPER BURMA, and Tong-king.

Coat very long and shaggy and thickened in winter with abundance of underwool; colour varying from dominantly tawny or grey to jet black, with comparatively few pale annulations on the hairs. Skull small and lightly built.

The figure of the type of this race shows the coat to have been unusually long and wavy, and, with the exception of most of the tail, the ears, and the toes, which are blackish, the colour was mainly pale grey, with some dark streaks where the contour hairs were parted, the forehead being a little lighter and the muzzle a little darker than the body.

An unmeasured skin from Assam has the general colour streaked tawny and black in about equal proportions, the hairs having long, greyish, or foxy-red annulations, with evidence, especially on the rump, flanks, and the base of the tail, of new grey-tipped hairs erupting at the roots of the long old hairs, but there is no appreciable amount of underwool; the short hairs of the face and limbs are similarly tipped, these parts being practically wholly tawny owing to the concealment of the black bases of the hairs by the pale tips; on the upper side of the tail the pale annulations gradually disappear distally, the end being black, but the lower side of the tail and of the body are tawny. The coat is loose, rather harsh and very long, the hairs on the rump being up to about 110 mm. (over 4 in.), and on the shoulders 65 mm. (over 2½ in.). This skin, apparently still carrying its long winter coat, although the wool is moulted, agrees tolerably closely with the figure and description of the type of *albifrons* from Bhutan, except that its general hue is tawnier.

A skin from Indawgyi Lake in Myitkyina, Upper Burma (Capt. J. H. Whitehead), dated February 2, is in full winter coat, and differs strikingly from the Assamese skin by being mainly black and by the presence of abundant long underwool; but the contour hairs of the coat are about the same length; the shoulders, back, and upper side of the tail are wholly black, the hairs being unspeckled throughout their length, but there is some buff speckling on the rump and the top and sides of the head, and the outside of the fore and hind legs, except for the black toes, are finely speckled with grey; the underside from the throat to the belly is black, and the underside of the tail is the same, except that the hairs at its base are grey close to the skin.

* No specimens from these Indian States have been recorded for many years. Gray, apparently on Blyth's authority, stated that the species occurs in Nepal; but Hodgson did not secure it.

The only other specimen I have seen assignable to this race is an immature ♀ from Fouine, Tong-king (Delacour and Lowe), September 19. This is almost a duplicate of the skin from Myitkyina in colour, but the pale speckling on the head and nape is a trifle more buffy and on the nape more profuse, and there is no speckling on the rump, only on the thighs and feet. The coat is very soft, with a tolerable amount of underwool, the long hairs being 60 mm. on the rump and about 50 on the shoulders. The difference between this skin and the one from Myitkyina in the length and luxuriance of the coat is no doubt largely seasonal, but partly due to the age of the specimens.

The only skull of a British Indian specimen I have seen is that of an adult, probably ♀, without skin, ticketed "Sikkim" (R. Lydekker). It is comparatively small, with the muzzle narrow; the temporal ridges are strong, 11 mm. apart at the postorbital constriction and nearly parallel to the occiput behind it; the postorbital area is very little inflated dorsally and laterally, the sides being approximately parallel, with a shallow posterior constriction, and the dorsal profile is less steeply sloped anteriorly and posteriorly from its highest point than in any skull of the genus I have seen. It disagrees entirely with the statement of J. A. Allen (Bull. Amer. Mus. Nat. Hist. xxviii, p. 15, 1910) that "Indian" skulls are larger than Sumatran skulls, but resemble them in the elevation and inflation of the frontal region. In its comparatively small size and low crown it resembles skulls from Palawan, Philippine Islands, described by Allen as *Arctictis whitei* (=*Arctictis binturong whitei*); but at least differs from them in having the inner lobes of pm^4 and m_1 narrowed and not widely rounded.

48 *b*. **Arctictis binturong binturong** (Raffles).

Viverra ? binturong, Raffles, Tr. Linn. Soc. xiii, p. 253, 1822.
Ictides ater, F. Cuvier & Geoffroy, Hist. Nat. Mamm. iii, no. 202, 1824.
Arctictis gairdneri, Thomas, Ann. Mag. Nat. Hist. (8) xvii, p. 270, 1916.
Arctictis binturong binturong, Kloss, Journ. Fed. Mal. St. Mus. vii, p. 293, 1917; Pocock, Proc. Zool. Soc. 1933, p. 1030.

Vernacular.—*Untarong* (Malay); *Beruong* (Malay at Perak).

Locality of the *type* of *binturong* and *ater*, Malacca; of *gairdneri*, Sai Yoke, S.W Siam.

Distribution.—S. Siam, TENASSERIM, Malay Peninsula, and Sumatra.

Distinguished from the northern race, *albifrons*, by its shorter, much less luxuriant winter coat, and apparently by its more consistently blackish colour, the long hairs never

being so extensively and profusely annulated as in the examples of *albifrons* from Bhutan and Assam. The skull also, judging from the available material, is considerably longer, more robust, and more inflated.

Raffles's type of *binturong*, a living specimen seen in Malacca, was black, except on the face and legs, which were brown. Cuvier's type of *ater*, a coloured sketch by Duvaucel of a specimen also seen in Malacca, was very similar, being altogether black, with the upper side of the muzzle yellowish, and some white hairs on the forehead and legs. Kloss described specimens from near Raheng in Siam and from Patani in Peninsular Siam which were also mainly black, but speckled slightly and to a varying extent with grey or buff on the back. Of Malayan specimens in the British Museum the

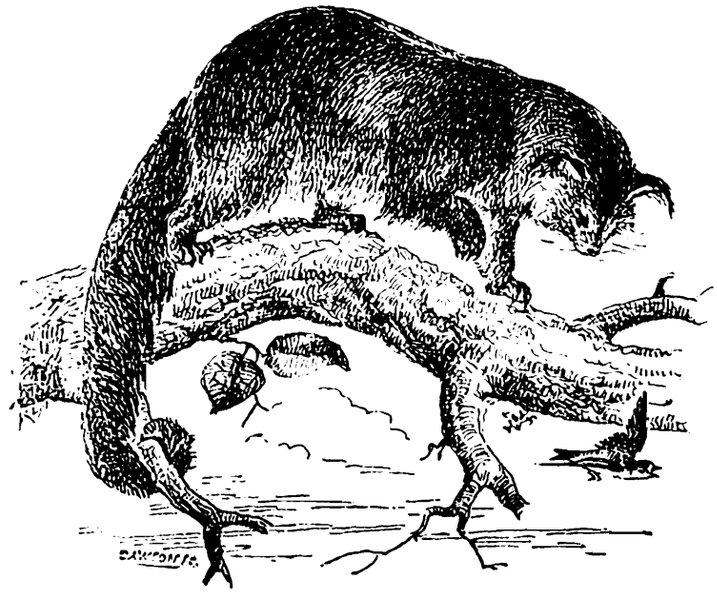


Fig. 101.—The Binturong, *Arctictis binturong binturong*. (From Blanford.)

most interesting is an adult ♂ from Ulu Ifok, Perak (Vernay's coll.), February 29, killed in the same month as the example of *albifrons* from Myitkyina, but differing from it mainly in having the wool of the coat very short and scanty and the hairs on the rump much shorter, only 85 mm., although those on the shoulder are about 75 mm. The colour is nearly the same, but the crown between the ears is richer ochreous-buff, the fore leg is more speckled, but the hind leg and thigh less. No importance is attached to the slight difference in tint, but the difference in the coat is very marked, and at once perceptible to eye and touch.

The only skin from British Indian territory I have seen is one procured by Shortridge from a native near Tenasserim Village. It closely resembles in colour the skins from Myitkyina

and Perak, but is rather more speckled on the fore back and flanks.

An adult ♀ from Sanderam Agong, 2,450 ft., in Sumatra, collected by Kloss and Robinson, attests, as they claimed, the extension of this race to that island.

The following are the flesh-measurements (in English inches) of two of the specimens above referred to :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Ulu Ifok, Perak ; ad. ♂.	30⅘	26	4
Sanderam Agong, Sumatra ; ad. ♀	29	25	4½

The weights of an adult ♂ from Aru Bay, an old ♂ from Pulo Payong, and a young adult ♀ from Sungei Mandan, all in Sumatra, were recorded by Lyon as 25½, 20, and 23 lb. respectively.

Of the skulls recorded in the table on p. 438, that of the ♀ from Sanderam Agong may be compared with the skull of *albifrons*, also no doubt a ♀, from Sikkim. The two differ greatly. The Sumatran skull is considerably longer, although the facial portion in front of the postorbital processes, including the nasal bones, is about the same ; but the nasals and the muzzle are much wider. There is little difference in the width of the postorbital area at its narrowest point, which is remote from the postorbital processes, but in front of the constriction this area both laterally and above in the Sumatran skull is strongly inflated with air-cells, so that it is markedly swollen at the sides and above and is much more steeply sloped anteriorly and posteriorly from its highest point a little distance behind the level of the postorbital processes. Some of these differences may prove to be of subspecific value when the skull of *albifrons* is better known. But skulls of the typical southern race, *binturong*, differ profoundly in shape in the same country owing to the great variation in the extent to which the postorbital area is inflated with air-cells*. These are most highly developed in the old ♂ skull from Sai Yoke in S.W Siam, the largest recorded skull of *Arctictis*, which Thomas regarded as representing a distinct species, *gairdneri*. But I agree with Kloss that this is nothing but an unusually large skull of *A. binturong binturong*. All its peculiarities are foreshadowed in the ♀ skull from Sanderam Agong in Sumatra.

Habits.—The Binturong lives in dense forests, is mainly arboreal and nocturnal, and probably nowhere abundant. Its

* This, I believe, was first pointed out by Lyon in connection with Sumatran skulls (Proc. U.S. Nat. Mus. xxxiv, p. 651, 1908).

Skull-measurements (in mm.) of the two races of *Arctitus binturong* represented in British India.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
A. b. albifrons.									
Sikkim; ad. ♀?	129	129	77	35	30	26	98	6	9
A. b. binturong.									
Sanderam Agong, Sumatra; ad. ♀ . .	142	140	85	37	37	31	105	6	—
S.W. Siam (*gairdneri* type); ad. ♂ ...	153	152	98	41	41	33	117	—	—
Patani, Peninsular Siam (Kloss); ad. ♂	146	144	86	—	37	—	—	—	—
Ulu Ifok, Perak; ad. ♂	139	140	92	39	35	30	105	6½	—

habitat accounts for the infrequency with which it is seen, let alone shot or trapped, by Europeans. The only specimens secured by the collectors for the Mammal Survey of British India were the two skins from near Tenasserim Village, bought from natives by Shortridge, who reported that the species was not at all common, and was quite unknown to many of the inhabitants. The animal, however, has been frequently exhibited in captivity, and I observed the behaviour of several in the London Zoological Gardens. When resting they lie, as a rule, curled up, with the head tucked under the tail. They never leap, but climb skilfully, albeit slowly, progressing with equal ease and confidence along the upper side of branches or, upside down, beneath them, the prehensile tail being always in readiness as a help, and they descend the vertical bars of the cage head first, gripping them between their paws and using the prehensile tail as a check. They feed upon bread and milk, rice, bananas, and other fruits, as well as upon eggs and fowls' heads. When irritated they growl fiercely, and when on the prowl may periodically utter a series of low grunts or a hissing sound made by expelling the air through partially opened lips. In the forest the animal is said to howl loudly. This sound is probably a sexual call, if the story be true. The natural diet, Blanford says, on whose authority I know not, consists of small mammals, birds, fishes, earthworms, insects, and fruits; but it is probably mainly of a vegetable nature, since the Binturong has not the attributes of a predatory mammal, and fishes and earthworms, it seems, can form but an unimportant item in the food of an essentially arboreal species which is neither aquatic nor fossorial.

Subfamily ARCTOGALIDIINÆ.

Arctogalidiinæ, Pocock, Proc. Zool. Soc. 1933, p. 977.

Distinguished from the preceding subfamilies of Viverridæ by the absence in the male of the perfume gland, the long perineal area between the scrotum and the prepuce being continuously hairy, and by the position of the gland in the female in front of the vulva and clitoris, where it is represented externally by two low ridges of naked skin diverging anteriorly, uniting in front, capable of being folded over to meet in the middle line to form a closed pouch for the secretion, and continuous behind with a rim of naked skin surrounding the vulva.

Feet essentially as in the Paradoxurinæ, scansorial and semiplantigrade, but with the pads of the third and fourth

digits of the hind foot unfused, the carpal pads of the fore foot relatively longer and narrower, and the surface of all the pads smooth, not granular or papillate ; the heel of the hind foot hairy.

When I described and figured in 1915 the external features of a ♀ *Arctogalidia*, no male example was available for comparison, and I kept the genus associated with *Paradoxurus*,

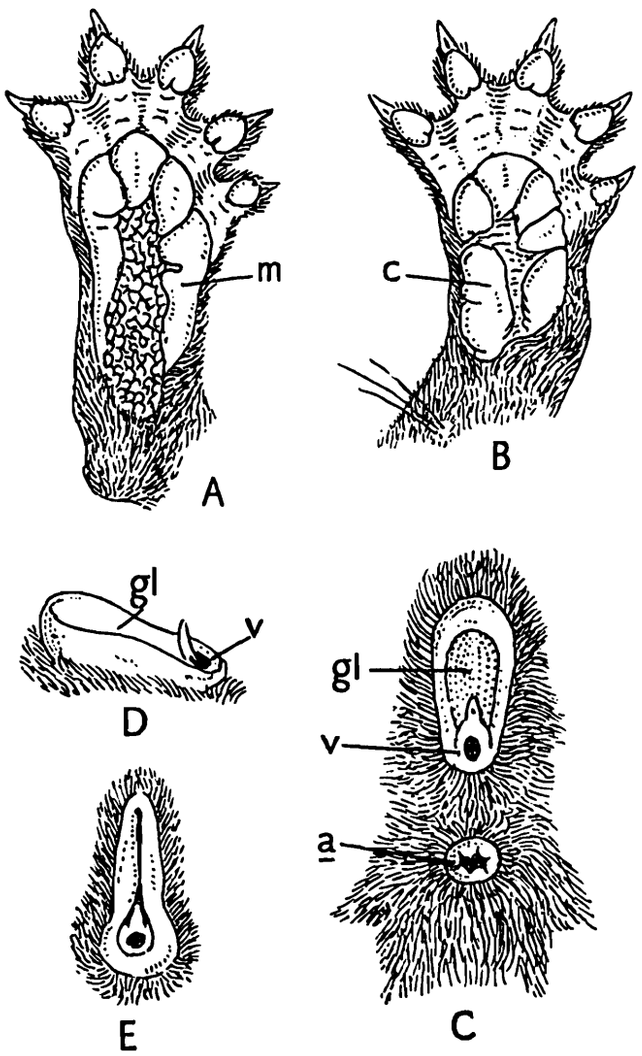


Fig. 102.

A. Lower side of right hind foot of *Arctogalidia trivirgata* from Borneo. *m*, inner metatarsal pad.
B. Lower side of right fore foot of the same. *c*, external carpal pad.
C. Anal and genital area of the same (♀). *a*, anus ; *v*, vulva ; *gl*, expanded glandular pouch in front of vulva.
D. Glandular pouch (*gl*), and vulva (*v*), with clitoris in front of it.
E. The glandular pouch, closed.

as had always been the custom ; but I have since seen many well-made skins of the male, and can confirm Blanford's statement that " there is no bald space in front of the scrotum or round the genital orifice."

Genus **ARCTOGALIDIA** Merriam.

Arctogale, Gray, Proc. Zool. Soc. 1864, p. 542 ; and of subsequent authors, including Blanford, until 1897 (not *Arctogale* Kaup, 1829).

Arctogalidia, Merriam, Science, v, p. 302, 1897 ; and recent authors, including Pocock, Proc. Zool. Soc. 1915, pp. 390–412, and 1933, p. 977.

Type of the genus, *Paradoxurus trivirgatus* Gray.

Distribution.—ASSAM, BURMA, Laos, Tong-king, the Malay Peninsula, and thence eastwards to Borneo.

Closely resembling *Paradoxurus* in external form and in the length of the legs and of the tail. The rhinarium also is very similar, being deeply grooved both in front and above, but it has a wider angular emargination above and the infranarial portions are not so deep. The ear differs in its less well-developed bursa, which has the edge of its posterior flap continuous above and below with the margin of the pinna, the anterior flap less emarginate and not produced into a prominence above and below. In addition to the characters connected with the feet mentioned above under the subfamily, the fore foot is narrower and longer than in *Paradoxurus*, the plantar and carpal pads combined being much longer than wide, and the distal margins of the four elements of the plantar pad form a much less widely curved line ; the area between the plantar and digital pads is naked. The pattern, when present, consists of three dark dorsal stripes and of a white streak on the nose. There are two pairs of abdominal teats.

The skull differs in many respects from that of *Paradoxurus*. It is wider in its mastoid region, has less robust but more salient zygomatic arches, much longer postorbital processes, and the muzzle longer and wider in front above the canines ; the palate is not flat, but has an undulating surface owing to its convexity between the carnassials and first molars of each side ; behind the last molar it is produced into a broad plate defined by a deep notch on the inner side ; the mesoperygoid fossa is long and narrow, and roofed in its anterior half by a backward extension of the palate ; the bullæ are flatter and the divisional line between their two component bones is early obliterated. The dentition too is different, the back teeth being smaller, more crushing, and less trenchant in type. The main cusp of the first three upper premolars is high and pointed, but the crowns as a whole are not compressed, that of pm^3 having a distinct inner lobe. This tooth is only a little smaller than the upper carnassial (pm^4), which has the inner lobe (protocone) nearly as wide basally as the outer portion of the crown, which is three-cusped, with a well-developed parastyle in front, a larger paracone in the middle, and a sharp cuspidate, not blade-like, metacone behind.

The first molar (m^1) is about the same size as pm^4 and is tolerably like it, but has two outer cusps (paracone and metacone) and an inner lobe (protocone) as long at the base as the crown. In the lower jaw the first three premolars have a high, piercing main cusp, the fourth has three cusps in front and a well-developed "heel" behind, the lower carnassial (m_1) is larger than pm_4, and has the normal three anterior cusps and a large cuspidate heel, and the last molar

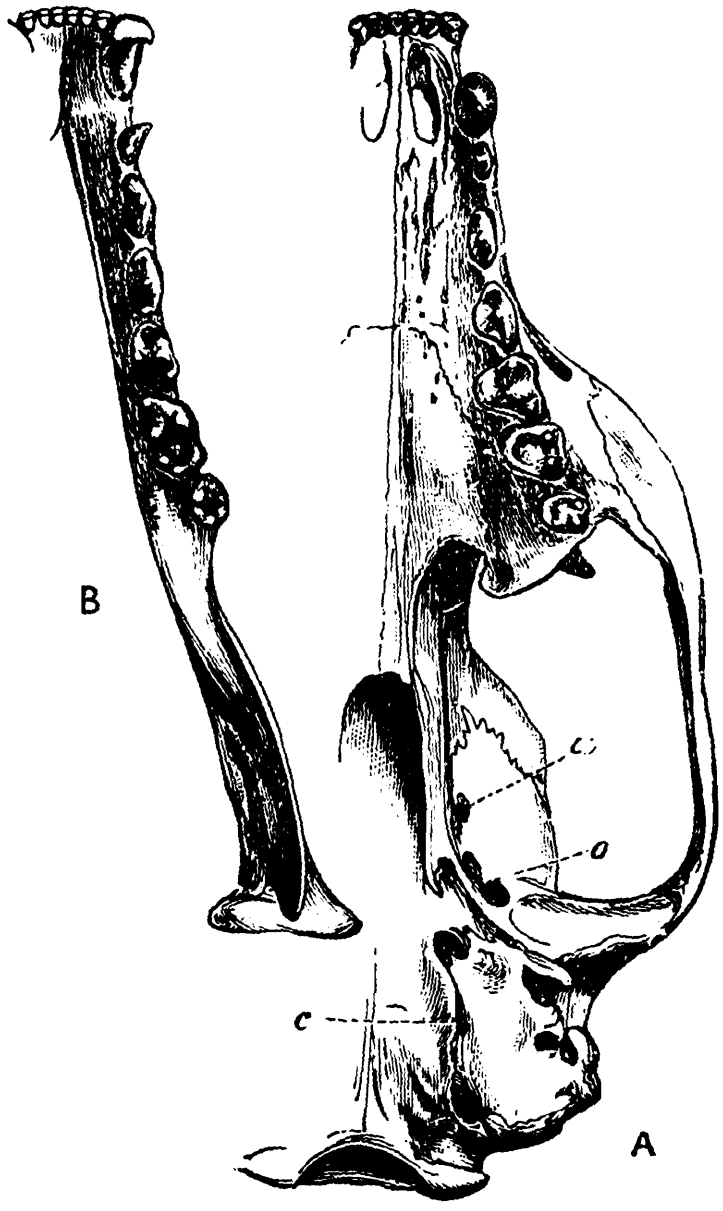


Fig. 103.

A. Left half of lower side of skull of *Arctogalidia trivirgata*. *a*, anterior orifice of alisphenoid canal; *o*, foramen ovale; *c*, carotid foramen.
B. Right half of lower jaw of the same, showing the upper view of the teeth. (From Blanford).

which is four-cusped and irregularly oval, is inserted externally, so that its inner edge is out of line with the inner edge of the first molar. The inner margin of the mandible adjoining this tooth is usually thickened into a crest-like ridge which ends in a low angle behind the level of the last molar.

The shape of the palate in this genus is an exaggeration of the condition seen in *Arctictis*. The reduction in the size of the back teeth is also a point of resemblance between them. But these likenesses are no doubt adaptive and not due to affinity, considering the differences between the two genera in external and most cranial characters.

Probably no Oriental genus of Carnivora abounds in so many nominal forms, mainly insular, to which full specific rank has been given on the evidence of single specimens, as *Arctogalidia*. In my paper above quoted I tentatively reduced the species to two, namely, *A. trivirgata* Gray (Proc. Zool. Soc. 1832, p. 67, and 1864, p. 543), which ranges from the Malay Peninsula to Borneo, and is represented by several local races, many of them found in the smaller islands, and *A. leucotis*, which ranges from Assam and Indo-China to Tenasserim and the Mergui Archipelago, and is the only one represented in British India. Since the differences between them, however, are comparatively slight, and there is evidence of intergradation between them on the mainland of Asia, where their distribution is continuous, I now adopt the view of Blanford that the mainland forms, at all events, may be regarded as representing a single species. Further research may show that some of the insular forms, falling outside the limits of the British Indian fauna, are worth specific status.

In the earliest described form, *A. trivirgata*, found in the Malay Peninsula*, the back of the ear is clothed with black hairs and has its integument pigmented black throughout. In the type of *A. leucotis* from Tenasserim, on the other hand, the upper half of the back of the ear has the integument pink and the hairs clothing it white. This character obtains in all British Indian skins, which differ in this respect from skins collected in numerous localities from the Malay Peninsula to Borneo. But in an example from Raheng in Siam only the upper fourth of the back of the ear is white. It is thus intermediate between typical *leucotis* and typical *trivirgata* in this respect. The most northern locality in the Malay Peninsula whence the black-eared form has been collected is Trang in Peninsular Siam. A specimen from this spot was named *A. major* by Miller (Proc. Biol. Soc. Wash. xix, p. 25, 1906), and the locality is very near the southern limit of the known range of the white-eared form.

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* The type, in the Leyden Museum, was recorded by Gray from the "Moluccas," where the species does not occur. This mistake was probably due to a misprint for "Malacca," or to Gray's misreading of the locality entered on the label. At all events his description exactly fits skins from the Malay Peninsula, and Gray himself in 1843 and later assigned the name *trivirgata* to specimens in the British Museum from Malacca and Singapore.

49. **Arctogalidia trivirgata** (Gray). The Three-banded Palm-Civet.

Paradoxurus trivirgatus, Gray, Proc. Zool. Soc. 1832, p. 67.
Paguma trivirgata Gray, List Mamm. Brit. Mus. p. 55, 1843.
Arctogale trivirgata, Gray, Proc. Zool. Soc. 1864, p. 543 ; id., Cat. Carn. Brit. Mus. 1869, p. 75.

(For bibliography and synonymy of the British Indian races see under the subspecies).

Since only one species is here admitted, its characters and distribution are as entered under the generic heading.

The following three local races, all with white tips to the back of the ears, are represented in the British India fauna :—

a. Size larger, with the three dorsal stripes wide, black, and equally conspicuous — *millsi* Wrought., [p. 447
a'. Size smaller, the three dorsal stripes narrower, the laterals typically less conspicuous than the median and not infrequently broken up into spots.
  b. Size larger — *leucotis* (Horsf.), [p. 444.
  b'. Size smaller — *macra* Miller, p. 446.

49 *a*. **Arctogalidia trivirgata leucotis** (Horsfield).

Paradoxurus leucotis, Horsfield, Cat. Mamm. E. I. Co. p. 66, 1852 ; Blyth, Journ. As. Soc. Beng. xxvii, p. 274, 1858.
Paradoxurus prehensilis, Sclater, Proc. Zool. Soc. 1877, p. 681, pl. 71 (not *Viverra prehensilis* Desm.).
Arctogale leucotis, Blanford, Proc. Zool. Soc. 1885, p. 789 ; id., Mamm. Brit. Ind. p. 115, 1888 (in part).
Arctogalidia leucotis, Miller, Proc. Biol. Soc. Wash. xix, p. 25, 1906 ; id,, Smiths. Misc. Coll. lxi, p. 6, 1913.
Arctogalidia leucotis leucotis, Pocock, Proc. Zool. Soc. 1933, p. 979.

Vernacular.—Kyoung-na-rwek-phyn (Arakan) ; *Thit-Te-Kyee* (Burmese) ; *Taw Hsee* (Karen) ; *Kyoung-na-ga* (Tenasserim) ; *Musang Akar* (Malay).

Locality of the *type* of *leucotis*, Tenasserim ; of *prehensilis*, Assoun Hounderaw River, 90 miles from Moulmein.

Distribution.—Arakan, S. Burma, W Siam, throughout Tenasserim, Mergui Archipelago, and some islands off the north-west coast of the Malay Peninsula ; ? Malay Peninsula.

General colour of the nape, back, proximal portion of the tail, and the outside of the limbs tawny, but varying individually from dusky greyish-tawny to bright ochreous-buffy tawny ; the head usually darker and greyer, but with no definite brown area on the crown at the base of the ears ; the paws, the distal portion of the tail to a varying extent, and the muzzle brownish ; a median white streak on the muzzle and front of the forehead ; the three dark blackish or brownish stripes running backwards from behind the shoulders and

sometimes traceable on the neck, the median complete and distinct, the laterals usually more or less broken up into spots, less clearly defined and occasionally almost obsolete; the proximal portion of the tail obscurely striped transversely; the underside mostly greyish-white or cream-buff, with a whiter, creamy patch variable in size on the chest, and the hind throat richer in tint than the fore throat.

The greatest contrast in colour in this race is shown by two skins from Western Siam. One from Hat Sanuk, near



Fig. 104.—The White-eared Three-banded Palm-Civet, *Arctogalidia trivirgata leucotis*, from Burma. (From Blanford.)

Koh Lak, Rajburi, April 15 (Robinson and Kloss), is brightish ochreous-buff all over the upper side up to the head, and the long hairs have an almost golden sheen; the stripes are brownish. The other, from the Mee Taw Forest, Raheng, 1,200 ft., April 22 (C. S. Barton), is ashy olivaceous-grey on the back, only faintly tinged with buff on the flanks, the pale area of the hairs being clear greyish-white, not golden; the pattern is blacker, and only about one-fourth of the back of the ear is white instead of half of it as in the Rajburi skin.

The skins from British Indian territory are intermediate between these two extremes, with the exception of an old ♂ from King's Island, Mergui Archipelago (Primrose), which very closely matches the skin from Raheng in its general dusky hue. A young adult ♂ from Tenasserim Town, April 30 (G. C. Shortridge), which is tawny-buff, especially on the flanks and the sides of the neck, with the head and cheeks dusky grey and the lower side whitish-grey, comes nearest to the bright-hued skin from Rajburi. Two others from Tenasserim Town, March 7 and 14, are greyer, the three forming an interlinking series between the two Siamese skins. Skins from Lower Burma (J. M. D. Mackenzie), namely, from the Southern Zamayi Reserve, 60 miles north of Pegu Town, March 12, and a pair from 20 miles east of Toungoo, 3,000 ft., May 7, fit in with the Tenasserim skins, except that those from Toungoo show changes in the coat and colour from the moult. One is bleached and paler than the Tenasserim series, and the other has the rump and hind back denuded of contour hairs and covered with pale wool, showing hardly a trace of pattern, but there is a patch of new greyish-buff hair showing pronounced black pattern on the fore back, with a good deal of buff on the shoulders and sides of the neck, and the pattern is visible on the nape.

49 *b*. **Arctogalidia trivirgata macra** Miller.

Arctogalidia macra, Miller, Smiths. Misc. Coll. lxi, p. 6, 1913.
Arctogalidia leucotis macra, Pocock, Proc. Zool. Soc. 1933, p. 982.

Locality of the *type*, Domel Island in the Mergui Archipelago.

Distribution.—Domel Island and possibly Langkawi and Terutau off the north-west coast of the Malay Peninsula.

Distinguished from *leucotis* by its slightly smaller size and shorter tail, the colour and pattern being apparently the same.

I have seen no example of this race from Domel Island. The type and only certainly known example of it is a ♀ distinguished specifically by Miller from a single ♀ example of *leucotis* from Tenasserim. I provisionally assign to *macra* two adult ♂ examples from Langkawi and Terutau (Robinson and Kloss) which resemble the duller-tinted skins from Tenasserim Town, but are smaller, smaller even in their flesh-measurements than the type of *macra*, although a little larger in the skull. They are of interest as being the most southerly representatives of the white-eared type of *A. trivirgata*, which has not been recorded actually from the Malay Peninsula. Judging from the flesh- and skull-measurements recorded on pp. 447 & 448, these three specimens suggest the existence of a small southern insular race of the White-eared Three-banded Palm-Civet.

Flesh-measurements (in English inches) of specimens assigned to these two races are as follows :—

Name, locality, and sex.	Head and body	Tail.	Hind foot.
leucotis.			
Toungoo, Lower Burma ; ad. ♂	21—	22⅗	3⅗
Raheng, Siam ; ad. ♂ ..	20⅗	26⅖	3½+
Tenasserim Town ; yg. ad. ♂	19⅘	24⅕	3½—
Tenasserim Town ; ad. ♀	20⅘	24⅖	3½+
Toungoo ; ad. ♀	20⅖	25⅗	4—
macra.			
Domel Isl. (type) ; ad. ♀	19	21⅘	—
Langkawi Isl. ; ad. ♂	18⅛	20⅓	3½
Terutau Isl. ; ad. ♂	17½	22—	3½

Two young adult ♂ specimens of *leucotis* from Tenasserim Town weighed 4½ and 4 lb respectively, and a gravid ♀ 4½ lb.

49 *c*. **Arctogalidia trivirgata millsi** Wroughton.

Arctogalidia millsi, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 599, 1921.
Arctogalidia leucotis millsi, Pocock, Proc. Zool. Soc. 1933, p. 978.

Locality of the *type*, Mokokchung in the Naga Hills, Assam.
Distribution.—ASSAM, Laos, and Tong-king.

Distinguished from *leucotis* by its larger size, judging from the skull, and by the much more strongly emphasized dorsal pattern, the three stripes being more intensely black and the laterals to all intents and purposes as conspicuous as the median and not broken up into spots on the back, although on the nape they are more or less interrupted and narrower. In the type the general hue of the back is dull tawny, like the duller-tinted skins of *leucotis* ; but in a specimen from Xien Quang Koo, Laos (Delacour and Lowe), which resembles the type in pattern, the ground-colour is more richly tinted with buff, especially on the flanks and sides of the neck.

These two unmeasured skins are the only representatives of this race I have seen ; but there is no reason to doubt that the specimens recorded as *leucotis* from Sylhet by Blyth, from Assam by Sterndale, and from Tong-king by Osgood belong to it.

Habits.—Owing to its being nocturnal and arboreal, and living in dense forest, comparatively few observations have been made on the mode of life of this Palm-Civet. The specimens collected by Shortridge near Tenasserim Village, by Mackenzie at Toungoo and in the Zamayi Reserve, and by Barton at Raheng were killed in trees, the last after it had bolted for safety into a hole in the trunk of a teak. It is an exceedingly active climber. A tame specimen belonging to

Skull-measurements (in mm.) of the three British Indian races of *Arctogalidia trivirgata**.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
A. t. millsi.									
Naga Hills (type); ad. ♂	120	(119±)	68	17	20	22	90	5	8
A. t. leucotis.									
Toungoo; ad. ♂	111	110	61	15	19½	21	84	5	8
King's Isl., Mergui; ad. ♂	107	105	60	16	20	21	83	5	6½
Red Point, Tenasserim (Miller); ad. ♂	105	—	—	17	17	19½	80½	—	—
Tenasserim Town; yg. ad. ♂	104	101	52	14	16	18	77	5	8—
Tenasserim Town; ad. ♀	105	105	59	17	18	19	—	5	—
Toungoo; ad. ♀.	105	103	58	18	18	20	80	5½	8
A. t. macra.									
Domel Isl. (Miller's type); ad. ♀	—	96½	55½	—	17+	19+	75½	—	—
Terutau Island; ad. ♂	104	101	59	18	20	—	77	4½	7
Langkawi Island; ad. ♂	100	99	62	17	19—	20	—	5—	—

* This table shows a gradual diminution in the size of the skull from north to south.

Sterndale would leap from branch to branch of trees with great activity, and was wonderfully agile amongst the ropes on board ship. This specimen attested the omnivorous taste of the species by its liking for most fruits, especially plantains, and for milk ; but on one occasion it pounced on a pigeon and would have killed it if allowed to do so. The Toungoo specimens were eating fruit in a tree when shot, and the intestines of the one from the Zamayi Reserve contained fruit and some *Ficus*. On the other hand, the stomachs of the specimens Shortridge examined contained remains of Squirrels. Incidentally, he remarked in this connection that although to some extent frugivorous, all the Palm-Civets live largely on Squirrels and are a considerable factor in keeping down the numbers of these rodents, which are so destructive to coconuts.

Shortridge's discovery of a couple of fœtuses in the ♀ from Tenasserim Village on May 7 shows that there may be only two young to the litter and that they are born in the early summer. It is not unlikely that a second litter is produced later in the year. From the behaviour of Barton's specimen, above recorded, it seems probable that the young are reared in hollow trees. Although these observations apply to typical *leucotis*, there is no reason to doubt that the habits of all the races are similar.

A representative of the dark-eared races of this Palm-Civet which may turn up in Tenasserim is *Arctogalidia trivirgata major*, described by Miller from Trang in Peninsular Siam (Proc. Biol. Soc. Wash. xix, p. 25, 1906). According to the description of the one known specimen, this race differs from typical *trivirgata* from the southern districts of the Malay Peninsula by its larger size, much shorter tail, and by some details of colour and pattern, the upper side being " light broccoli-brown, with a silvery gloss," the crown and cheeks " clear grizzled grey," the stripes strong and extending nearly to the ears, and the tail marked with ten rings. In typical *trivirgata* the general hue varies from deep brownish smoky-grey to clear ashy- or tawny-grey, and the head is darker than the back ; the stripes vary in distinctness and occasionally extend over the nape, and the basal portion of the tail, when pale, may show a few faint bands. The flesh-measurements (in English inches) of Miller's type, an adult ♂, compared with those of the largest ♂ of typical *trivirgata* known to me, from Singapore, are as follows:—Head and body 27⅖, 23⅖; tail 22⅖, 25⅖ ; hind foot 4—, 3⅘. Probably, however, there is a misprint in the figures indicating the length of the tail in *major*, because no other example of *A. trivirgata* known to me has the tail shorter than the head and body. In the length of the head and body *major* is larger than any of the flesh-measured

examples of the white-eared races found in British India. Probably it was about the same size as *millsi*, although the skull is a little shorter.

A species of the Viverridæ briefly referred to by Blanford on account of the possibility of its future discovery in British Indian territory was *Cynogale bennettii*, the Otter-Civet, which is found in the southern part of the Malay Peninsula, Sumatra, Java, and Borneo. It has not yet been found in Tenasserim ; but the possibility of the genus coming into the British Indian fauna has been increased since Blanford's time by the discovery by Delacour and Lowe of a second species, *C. lowei* Pocock (Proc. Zool. Soc. 1933, p. 1034), in Tong-king. This may turn up in Upper Burma. The genus, representing a special subfamily, Cynogalinæ, does not differ from other Viverridæ by having webbed feet, as has been frequently stated, but very noticeably by its greatly expanded, prominent muzzle, undivided upper lip, flattish rhinarium with dorsal valvular nostrils, but no philtrum, its abundant bristle-like facial vibrissæ, and small ears, all connected with its semi-aquatic fish-eating habits ; also by its short tail, which is about one-fourth the length of the head and body and less than twice the length of the hind foot*.

Subfamily HEMIGALINÆ.

Hemigalina, Gray, Proc. Zool. Soc. 1864, p. 524.
Hemigalinæ, Pocock, Ann. Mag. Nat. Hist. (8) xvi, p. 349, 1915 ; id., Proc. Zool. Soc. 1933, p. 999.

Resembling the Viverrinæ in having the scent-glands present in both sexes and wholly perineal, but differing by their simpler structure, consisting in the ♂ of a shallower, smaller pouch, with less tumid lips, situated mid-way between the scrotum and the penis, but not extending to either, and in the ♀ of a pair of swellings, each with a slit-like orifice, situated one on each side of the vagina and a little behind it and on a common eminence, the perineal area behind this eminence being naked. This description, based on a fresh specimen, does not agree with Mivart's statement that in the ♀ the gland extends from " near the anus to the vicinity of the vagina." The prepuce is long and pendulous. Feet nearly intermediate in structure between those of the digitigrade Viverrinæ and the semiplantigrade Paradoxurinæ, but more like the latter, both the carpal and metatarsal pads being well developed, double, and joining the plantar-pad

* See my papers in Ann. Mag. Nat. Hist. (8) xv, p. 351, 1915, and Proc. Zool. Soc. 1933, p. 1031.



Photo D. Seth-Smith.

Banded Palm-Civet (*Hemigalus derbyanus*)

below, and as wide as it is at the point of contact; but the feet, with the pads, are considerably narrower, the carpals and metatarsals converging and meeting above so that a much larger area of the under surface is hairy; the area between

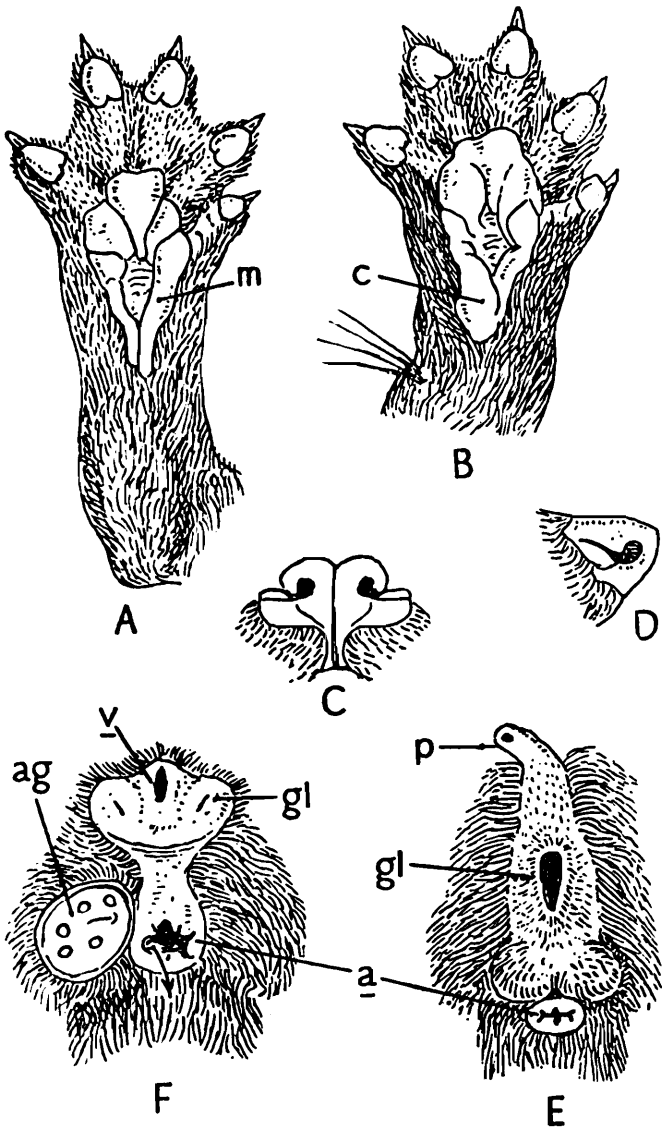


Fig. 105.

A. Lower side of right hind foot of the Banded Palm-Civet, *Hemigalus derbyanus*. *m*, inner metatarsal pad.
B. Lower side of right fore paw of the same. *c*, external carpal pad.
C & D. Front and side views of the rhinarium of the same.
E. Anal and genital areas of young ♂ of the same. *a*, anus; *gl*, orifice of glandular pouch; *p*, tip of penis.
F. Anal and genital areas of adult ♀ of the same. *a*, anus; *v*, vulva; *gl*, orifice of gland on left side of vulva; *ag*, anal gland of right side dissected to show on its inner wall some of the scattered eminences which secrete the creamy fluid, the arrow indicating a bristle passed from the gland through the orifice in the anus.

the four main digits and the plantar pad is covered with short hair, and the pads of the third and fourth digits of the hind foot are separated as in the Viverrinæ, not confluent as in the

Paradoxurinæ ; the retractile claws are not protected by skin-lobes.

The skull and teeth are described under the genus.

To this subfamily belong the three genera *Hemigalus*, *Diplogale*, and *Chrotogale*. The last two have never been examined in the flesh, and the structure of their glands and feet has merely been inferred from the examination of dried skins, not a satisfactory method. *Hemigalus* is the only genus which comes into the British Indian fauna. It was not referred to by Blanford, who never even suspected the likelihood of its occurrence in Tenasserim. Its discovery there was one of the most interesting results of the Mammal Survey.

Genus **HEMIGALUS** Jourdan.

Hemigalus, Jourdan, C. R. Acad. Sci. Paris, v, p. 442, 1837.
Hemigalea, Geoffroy St. Hilaire & Blainville, ibid. p. 595.
Hemigale, Gray, Proc. Zool. Soc. 1864, p. 542 ; and of most subsequent authors till 1915.

Tolerably similar to the other so-called Palm-Civets in shape of body, length of limb and of tail, but more lightly built than *Paradoxurus* or *Paguma*, and with a shorter, thinner coat and more tapering tail. The coloration is very characteristic, the pattern consisting of longitudinal dark bands on the head, a thin median band running from the black muzzle to the occiput and one, broader, on each side extending from the muzzle to the base of the ear on the inner side and interrupted by a white spot over the eye ; of two broad stripes from the nape to the shoulders, where they break up or expand laterally into transverse bands ; and on the back between the shoulders and the root of the tail of five broad transverse bands ; the base of the tail has normally two or three transverse bands, the rest of the organ being black. Everywhere on the dorsal surface this pattern is emphasized by the pale ground-colour, and the legs and underside are pale and without pattern.

The rhinarium is very like that of *Paradoxurus* and *Paguma*, but has the infranarial portion wider ; the upper surface from the front view is noticeably biconvex from the deep median groove, and the angular emargination is even deeper than in those genera. The ear is in no respects degenerate, and has the bursa and the basal ridges and thickenings as well developed as in *Prionodon*.

The skull is long and low, with constricted postorbital area, occasionally a complete but low sagittal crest, frontal postorbital processes angular, but none on the zygomatic arch, palate extending over the anterior half of the mesopterygoid fossa, and tympanic bulla typically low and flat. Dentition not so trenchant as in *Paradoxurus* and *Paguma*, more like that

of *Arctictis* or *Arctogalidia* ; the row of upper incisors curved ; pm^1 conical, one-rooted, main cusp of pm^2 and pm^3 high, compressed, and sharp, the latter with small inner lobe ; pm^4 (upper carnassial) with inner lobe (protocone) nearly as long at its base as the rest of the crown, which has the anterior cusp (parastyle) larger than the posterior cusp (metacone) ; m^1 with inner lobe rounded and as long at base

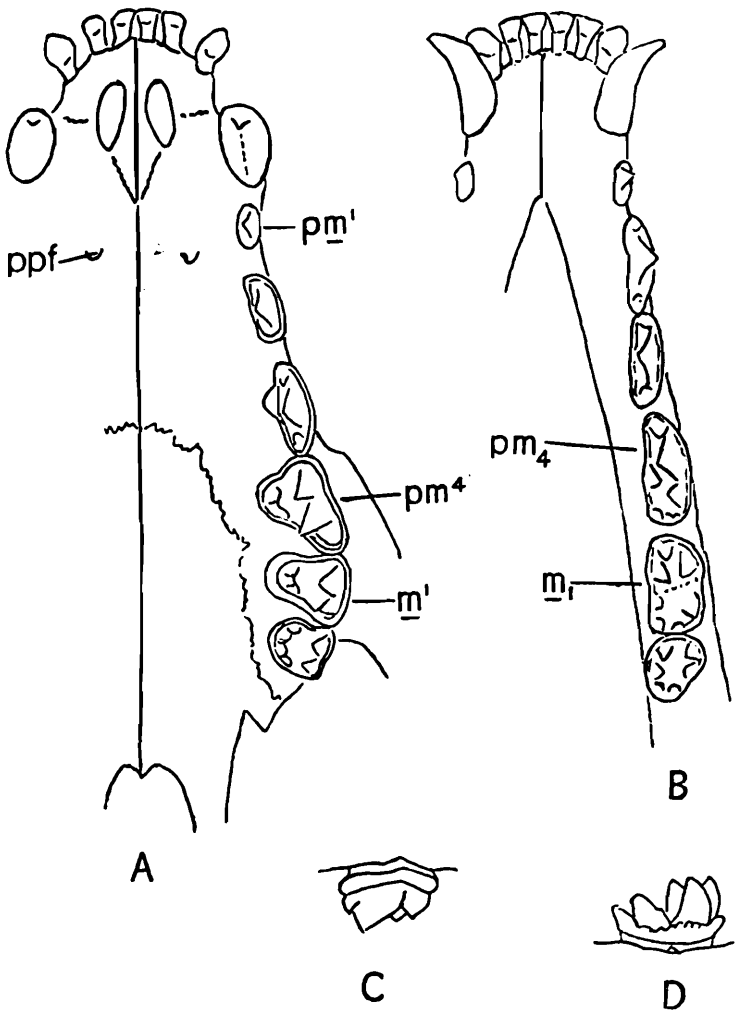


Fig. 106.

A. Left side of bony palate of *Hemigalus derbyanus*. pm^1, pm^4, m^1, first and fourth premolars and first molar ; *ppf*, posterior palatine foramina.
B. Right half of mandible of the same. pm_4, m_1, fourth premolar and first molar.
C. Outer side of upper carnassial (pm^4) of the same.
D. The same of lower carnassial (m_1).

as outer part of two-cusped crown ; m^2 about half the area of m^1. In the lower jaw pm_1 to pm_3 have compressed crowns with high, sharp main cusp ; pm_4 much larger than pm_3 and very like m_1 (lower carnassial), which has the three normal cusps in front and a large " heel " with one outer cusp and

a few smaller inner cusps; m_2 about as large as "heel" of m_1 and with five small cusps.

All the described forms of this genus represent in my opinion a single species.

50. **Hemigalus derbyanus** (Gray). The Banded Palm-Civet.

Paradoxurus derbyanus and *P. zebra*, Gray, Charlesw. Mag. Nat. Hist. i, p. 599, 1837 (Nov.).
Paradoxurus derbianus, Gray, Proc. Zool. Soc. 1837, p. 67 (Jan. 22, 1838).
Viverra boiei, S. Müller, Tijdschr. Nat. Gesch. v, p. 144, 1838.
Viverra derbyi, Temminck, Mon. Mamm. pt. 2, p. 343, 1841.
Hemigalea or *Hemigale hardwickei* or *hardwickii* of most later authors (not *Viverra hardwickii* Gray, Spicil. Zool. p. 9, 1830).
Hemigalus derbianus, Thomas, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 613, 1915.
Hemigalus derbyanus, Pocock, Ann. Mag. Nat. Hist. (8) xvi, p. 160, 1915; id., Proc. Zool. Soc. 1933, p. 1000*.

Locality of the *types* of *derbyanus* and *derbyi*, the Malay Peninsula; of *zebra* "India"; of *boiei*, Borneo.

Distribution.—Tenasserim, the Malay Peninsula, Sumatra, and some of the smaller adjoining islands; Borneo.

Tail about three-quarters the length of the head and body or rather less, and about four times the length of the hind foot. The ground-colour and the pattern are individually very variable. The coat consists of short underwool, varying in hue from nearly white, through various shades of buff, to orange-buff, and of smooth-lying contour hairs which, except on the dark pattern, are mainly whitish, greyish or buffy, those on the back having a small dusky tip. The individual colour variations depend on the intensity and extent of these hues and upon the degree of exposure of the underwool. Individual variation in the pattern is well illustrated by two specimens, ♂ and ♀, collected by Cantor in the Malay Peninsula, very likely in the same locality. In the ♀ the nuchal stripes are comparatively narrow and widely separated and break

* This species has been mostly quoted under the specific name *hardwickii* because of the belief that it was the same as the Malayan animal described as *Viverra hardwickii* by Gray in 1830. But in the first place this name was preoccupied by *Viverra hardwichii* Lesson, 1827, which is a synonym of *Prionodon gracilis* (see, p. 342), preoccupied because the two animals were alike dedicated to General Hardwicke, whom Lesson called Hardwich. In the second place the description of *V. hardwickii*, taken by Gray from a painting by Major Farquhar of a specimen from the Malay Peninsula, disagrees with all the known specimens of the genus in having the basal three-fourths of the tail marked with six or seven dark rings and the terminal fourth black, the others having at most three rings restricted to the basal third of the tail, of which the terminal two-thirds are black. In my paper in 1933 I proposed the name *H. derbyanus invisus* to replace *hardwickii*.

up behind into three or four irregularly paired transverse stripes. Behind these, on the shoulders, is a large isolated scapular band narrowly divided in the middle line. These are followed by five dorsal bands, the last, at the root of the tail, being transversely divided into two narrow stripes. In the ♂ the two nuchal stripes are wide, narrowly separated, both being continuous with the scapular bands, the right being more broken up than the left, which is confluent with the first dorsal band, and all the dorsal bands differ from those of the ♀. In general colour these two specimens also differ profoundly. In the ♀ the dorsal interspaces and the limbs are clear whitish-grey with silvery sheen, only faintly dimmed by brown speckling, and the throat, chest, and belly are decidedly buff. In the ♂ the dorsal interspaces and the limbs are not nearly so grey, being very perceptibly darkened by the deeper, more extensively brown tips of the hairs, the interspaces on the nape and, to a less extent, on the head being so heavily pigmented as partially to obscure the stripes ; the belly is greyer than in the ♀. These two specimens show clearly that differences in the ground-tint and in the shape, width, and degree of disruption of the bands cannot be relied on for the differentiation of races of this species. These features have been used for that purpose.

I am unable to distinguish, even subspecifically, Bornean specimens, described as *boiei*, from the typical form from the Malay Peninsula. Hence the synonymy given above applies to this race, *H. derbyanus derbyanus*. Miller described as representing a distinct species, *H. minor*, some specimens from S. Pagi Island, off the west coast of Sumatra (Smiths. Misc. Coll. xlv, p. 43, 1913). This I regard as a valid subspecies, distinguished by its slightly smaller size and by the indistinctness of the pattern of the head and neck ; but the only race of real importance in connection with the Indian fauna is the following, from Tenasserim.

50 *a*. **Hemigalus derbyanus incursor** Thomas.

Hemigalus derbianus incursor, Thomas, Journ. Bomb. Nat. Hist. Soc. xxiii, p. 613, 1915.

Hemigalus derbyanus derbyanus, Pocock, Proc. Zool Soc. 1933, p. 1000 (in part).

Locality of the *type*, Bankachon, Tenasserim.

Distribution.—Only known from the type-locality.

Distinguished provisionally from the typical race on the strength of some evidence that the tail is a little longer, the teeth on the average a little smaller, and the bulla possibly a little more expanded on the average in its anterior part. The bulla, however, is individually very variable in the species.

The evidence for the admission of this subspecies is not very satisfactory. In my revision of the genus in 1933 I was unable to examine the skull of the type of *incursor*, an adult ♂, and was dependent on the young adult ♂ skull of a topotype. In this the unworn teeth were the same size as in a ♀ specimen of the typical race from Malacca ; and since Thomas had based the race upon some supposed dfferences in the colour and pattern, which do not exist, and upon its smaller teeth, I regarded *incursor* as a synonym of typical *derbyanus*. But in the skull of the type which has come to hand the teeth are decidedly smaller, pm^3, pm^4, and m^1 being about 1 mm. narrower, owing to the reduced inner lobes, than in Malayan skulls. Provisionally, therefore, the Tenasserim specimens may be given the status assigned to them by Thomas.

The external differences relied on by Thomas were the generally lighter, more silvery hue, and the unbroken, continuous nuchal stripes. It is true that the type is slightly lighter and greyer in ground-colour than the greyest Malaccan specimen he examined, but the topotype is decidedly more buffy than in two Malaccan specimens. As for the nape-stripes, they, as stated above, may be either greatly broken up or form broad, uninterrupted bands in the typical Malayan race.

The flesh-measurements (in English inches) and weights (in lb.) of the two examples of this race collected by Shortridge are entered in the following table, together with the measurements of two specimens of the typical race, to show especially the apparently longer tail in the former.

Locality, name, and sex.	Head and body.	Tail.	Hind foot.	Weight.
Bankachon (*incursor* type) ; ad. ♂.	20⅘	15	3⅘	5
Bankachon ; yg. ad. ♂	20⅕	15+	3⅕	4
Pahang, Malay Peninsula (*derbyanus*) ; ad. ♂	19⅘	13½	3⅕	—
Tapanuli Bay, Sumatra (*derbyanus*) (Miller) ; ad. ♀	20⅘	12⅘	3—	—

For the skull- and tooth-measurements of *incursor* and of *derbyanus* see p. 457

Habits.—Of the habits of *Hemigalus* very little is known. In Tenasserim, according to Shortridge, it is apparently not at all plentiful, the Malay villagers at Bankachon having no name for it. It is probably, he thinks, one of the most active of all the Viverridæ*, and is without doubt largely arboreal.

* That it excels *Paradoxurus* and *Paguma* in this respect might be inferred from its lighter build and narrower, more delicate paws ; but it is very doubtful if it similarly surpasses *Prionodon* and *Arctogalidia*.

Skull- and teeth-measurements (in mm.) of *Hemigalus derbyanus incursor* and *H. d. derbyanus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
H. d. incursor.									
Bankachon (type); yg. ad. ♂	100	98	46	15	17	17	68	6½ × 5	6½
Bankachon; yg. ad. ♂	96	—	50	16	17	17	—	7½ × 6	6—
H. d. derbyanus.									
Pahang (Robinson & Kloss); ad. ♂	107	106	51	13	18½	18	75	7½ × 6	7
Johore (Davison); ad. ♂	—	(99±)	49	15	18	17½	70	7 × 6	7½
Malay Peninsula (Cantor); ad. ♂	—	—	54	14½	18	17	72	7 × 6	6½
Malay Peninsula (Cantor); ad. ♀	—	—	48	16½	18	16	69	7 × 6	7½

His specimens, however, appear to have been trapped on the ground. When caught alive it is very savage and growls like a cat; but it has absolutely no smell. Its tongue, he adds, is very rough, much more so than in any other small Carnivore.

Despite Shortridge's observation that the animal is absolutely without smell*, I suggested in 1933 that its very aberrant and striking coloration, which theoretically must have some special significance, may be for advertisement, indicating nauseous protective secretion of the anal glands, such as is known to exist in *Paradoxurus* and *Paguma* (see pp. 414 & 430), although so infrequently detected by collectors. The truth of this surmise was established on a fresh ♀ specimen in which the anal glands showed superficially as a swelling on each side of the anal orifice. Each consisted of large oval sac of which the inner walls were studded with scattered eminences from which a creamy fluid was secreted into the sac, which was filled with a darker, more liquid secretion. This secretion had a most unpleasant "musteline" odour, reminding me forcibly of that of the Stoat (*Mustela erminea*).

Of the other genera of Hemigalinæ, *Chrotogale* Thomas (Proc. Zool. Soc. 1912, p. 47, and 1927, p. 47, and of subsequent authors) may be discovered in Upper Burma, since its only known species, *owstoni*, has been recorded from Tongking and Laos. It resembles *Hemigalus* in its pattern of broad bands on a light ground-colour, but has in addition conspicuous black spots on the sides of the neck, the upper part of the limbs, and a few on the flanks. But it differs essentially from that genus in the peculiar elongation of the muzzle of the skull, accompanied by broad upper incisors, forming a strongly curved line, and other dental pecularities. The other genus, *Diplogale* Thomas, occurs in Borneo, and is not at all likely to turn up in British Indian territory. It differs from the others in being tolerably uniformly otter-brown in hue, when adult, and although the skull in most of its features is like that of *Hemigalus*, it differs in a few structural details as well as in some dental peculiarities. Further particulars about these genera may be found in my paper (Proc. Zool. Soc. 1933, pp. 1009–12).

* A puzzling remark, because from the presence of the perfume-glands it may be inferred with certainty that *Hemigalus* has the ordinary "Civet odour" of the species that possess them.

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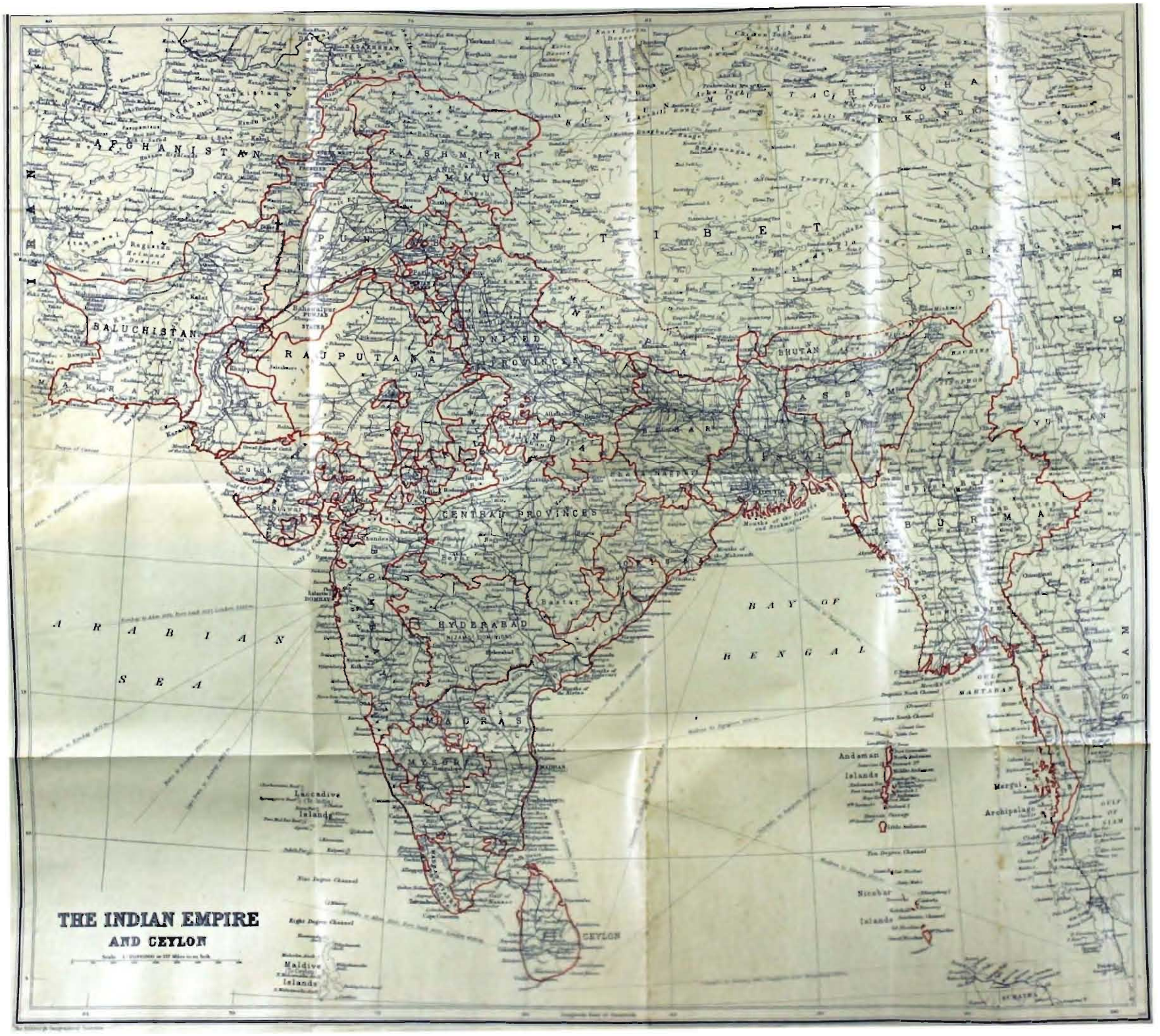
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