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INCLUDING

CEYLON AND BURMA.

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640

MAMMALIA.—Vol. II.

CARNIVORA (continued from Vol. I),
Suborders ÆLUROIDEA (part) and ARCTOIDEA.

ZOOLOGICAL GARDEN
830(a)
CALCUTTA.

BY

R. I. POCOCK, F.R.S

With 12 plates and 115 text-figures. Illustrations by the author, unless otherwise stated.

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ZOOLOGICAL GARDEN
CALCUTTA

AUTHOR'S PREFACE
TO VOL. II.

After the completion of Vol. I of this work, and when the MS. of Vol. II was well advanced, Mr. R. Kaulback was voluntarily and diligently collecting in Upper Burma for the Mammal Survey of British India. His collections were periodically received in instalments. Some of the Carnivora arrived in time to be referred to in the main text of Vol. II, others were too late; and since there were points of interest in most of the skins and skulls he secured before coming home to "join up," an account of them has been given in an Appendix to this volume. A report on another collection containing much interesting material is also included. This was made, after the outbreak of war, in Sind and Assam by Mr. W. J. C. Frost and was presented to the British Museum by Sir John Ellerman. A third collection dealt with in the Appendix contains a fine series of skulls and measured skins of two species of Weasels secured by Mr. W. L. Abbott, mostly in Ladakh and Baltistan. They were apparently lent to the Natural History Museum many years ago for report in the then projected volumes on the Mammal Fauna of British India; but owing to the deaths of Messrs. R. C. Wroughton, T. B. Fry and Oldfield Thomas the collection was set aside, forgotten, and did not come into my hands until it was too late to consider it in the main text of Vol. II. For permission to publish a few notes on the Weasels in question I am greatly indebted to the Smithsonian Institution, Washington.

I was, unfortunately, unable to compare most of the skins and skulls mentioned in this Appendix with those described in the main text of Vols. I and II, because, when the war broke out, steps were immediately and wisely taken to preserve the store-collections in the Natural History Museum from the danger of air-raids by packing them in cases and sending them for comparative safety to various isolated places in the country.

R. I. POCOCK.

August 1941.

CORRIGENDA IN VOL. I.

P. ix, Preface. From the list of voluntary collectors for the Mammal Survey of British India, Dr. P. H. Gosse was inadvertently omitted. Dr. Gosse secured many interesting specimens, principally in the Nilgiri Hills.

P. 24. The footnote marks should be transposed.

P. 136. In the legend to fig. 41, for *Trachypithecus* read *Trachypithecus*.

Pp. 146, 160, 161. For *Presbytis femoralis keatii* read *P. f. robinsoni*. The latter name, given to a partially albino variety, antedates *keatii* by one year, the date 1931 cited for *keatii* being a misprint for 1911. I am indebted to Mr. Chasen for pointing out these oversights.

P. 150. The verb " is " was omitted at the beginning of the last line of the footnote.

P. 170. The final letter of the word " some " is misplaced in the first line of the paragraph on *Habits*.

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CALCUTTA.

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Order CARNIVORA.

(Continued from Vol. I.)

For the sake of convenience the Key to the two suborders of CARNIVORA occurring in British India, printed on p. 190 of Vol. I, is here repeated * :—

a. Ethmo-turbinals very large, occupying the greater part of the nasal chambers and extending forwards over and between the 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 present; at most a small penis bone ..... **Æluroidea.**

a'. Ethmo-turbinals small, 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 its 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, or baculum, present in all Asiatic species..... [p. 74. **Arctoidea,**

Suborder *ÆLUROIDEA*.

Since two of the four families of this suborder inhabiting British India, namely the Herpestidæ (Mongooses) and the Hyænidæ (Hyænas), are dealt with in this volume, the Key to their identification, given on p. 190 of Vol. I, is for convenience reprinted :—

a. Post-palatine foramina 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..... **Felidæ.**

a'. Post-palatine foramina in front of the suture; teeth not so specialized or so reduced in number, the dental formula † being $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{4}{4}$ or $\frac{4}{3}$, $m.\frac{2}{2}$ or $\frac{1}{1}$ the interramal tuft of vibrissæ present.

---

* For the explanation of the technical terms here used see Vol. I pp. 1–10.

† In Vol. I, p. 190, the words " the dental formula $i.\frac{3}{3}$, $c.\frac{1}{1}$ " were inadvertently omitted from this diagnosis.

b. Feet with four toes in front and behind, dog-like in structure; auditory bulla without oblique groove; jaws and teeth very massive ..... [p. 62. **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 naked glandular sac; no bony tube to the auditory orifice ..... **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 a naked glandular pouch; a well-developed bony tube to the auditory orifice ..... [p. 2. **Herpestidæ,**

Family HERPESTIDÆ.

MONGOOSES.

Herpestinæ, a subfamily of the Viverridæ, Blanford, Mamm. Brit. India, pp. 94 & 119, 1888.

Mungotidæ, Pocock, Proc. Zool. Soc. 1916, p. 349, and Ann. Mag. Nat. Hist. (9) iii, p. 515, 1919 *.

Distinguished from the Viverridæ, with which it was formerly associated, by the presence of a naked glandular pouch round the anus and capable of being folded over it, with the anal glands opening into the pouch outside that orifice; by the structure of the feet, which have long, non-retractile, fossorial claws, of the ear, which has no marginal bursa, and of the penis, which, although short, has a well-developed baculum (text-fig. 2, D, E, p. 6). Also differing from all the Viverridæ, except the Prionodontinæ, in the absence of perinæal perfume-glands, in the proximity of the penis to the scrotum and the backward position of the vulva, which is situated just below the inferior edge of the anal pouch.

In the skull the principal difference is the presence in the Herpestidæ of a distinct bony tube to the auditory orifice. Generally also the orbit is completely encircled with bone.

Distribution.—The typical Mongooses, excluding the Mascarene Mongooses of the family Galidictidæ, which differ from them in the possession of perinæal scent-glands and of a marginal bursa on the ear and in the absence of the

* For a few years, owing to the adoption of an error in nomenclature by Thomas, the familiar name *Herpestes* was regarded as a synonym of *Mungos* by English systematic mammalogists. This involved the substitution of Mungotinæ and Mungotidæ for Herpestinæ and Herpestidæ. The error was rectified by J. A. Allen, and *Herpestes* was readopted.

alisphenoid canal in the skull, are found in S.W. Europe, all over Africa except the Sahara, and in southern Asia at least from Persia to Borneo.

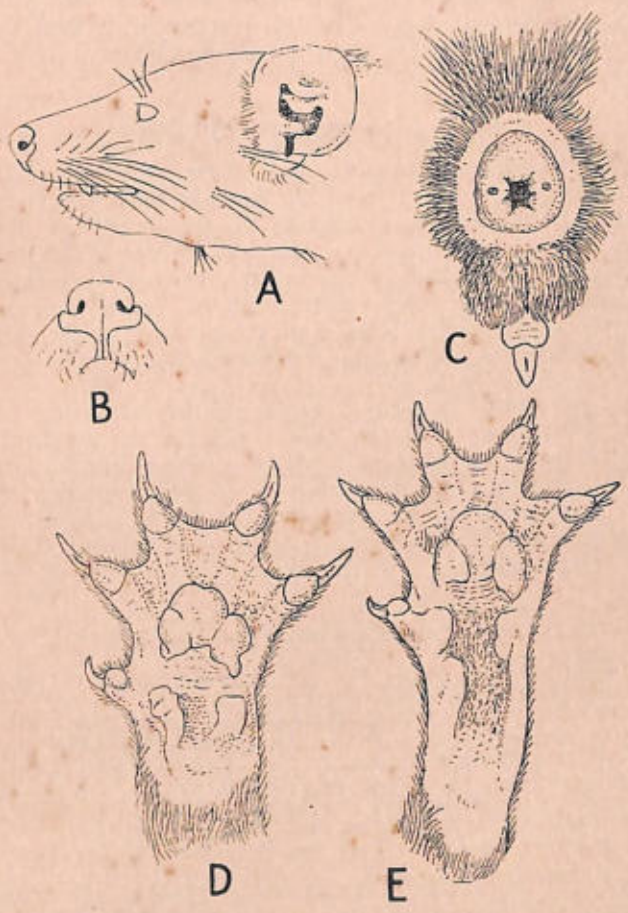


Fig. 1.—Principal external characters of the Herpestidæ.

A. Head of *Herpestes smithii*, showing especially the structure of the ear, the suppression of the bursa and the presence of the two valvular flaps in the upper half.
B. Rhinarium of the same from the front.
C. Anal and genital area of ♂ African Marsh Mongoose (*Atilax*), showing the expanded anal sac, with the orifices of the anal glands on each side of the anus, and the scrotum and short penis.
D. Lower side of left fore foot of *Herpestes smithii*, showing the naked soles and projecting fossorial claws.
E. The same of the left hind foot.

In a paper on the classification of the Mongooses * I divided the family into two subfamilies—the Suricatinæ and the Mungotinæ, now to be called Herpestinæ. The Suricatinæ contained the single S. African genus *Suricata*, which differs from the Herpestinæ in its simplified ears and in some cranial characters the negative of those mentioned below.

Subfamily HERPESTINÆ.

Ears with the supratragus large and valvular and with a secondarily developed valvular flap above it, the two contributing to the complete closure of the cavity of the ear when folded. In the skull the plane of the base of the cranium is nearly parallel to that of the palate ; the auditory bullæ are considerably longer than wide, inflated, and project well below the occipital condyles, and the mastoid ridge does not extend below the lower edge of the auditory orifice on the outer side of the bulla.

This subfamily contains a large number of genera, all of which, with one exception, are restricted to tropical and South Africa, suggesting that Africa was the original home of the Mongooses. The exception is *Herpestes*, which ranges from S. Africa to Egypt, Spain and southern Asia, and is the only genus admitted in this volume as occurring in British India, although most of the species have received generic names.

Genus **HERPESTES** Illiger.

Herpertes, Illiger, Prodr. Syst. Mamm. etc. p. 135 (misprint, but corrected to *Herpestes*, p. 302), 1811.
Mangusta, Horsfield, Zool. Res. Java (unpaged), 1824.
Urva, Hodgson, Journ. As. Soc. Beng. vi, p. 561, 1837.
Mesobema, Hodgson, Journ. As. Soc. Beng. x, p. 910, 1841.
Calogale, Gray, Proc. Zool. Soc. 1864, p. 560.
Calictis, Gray, Proc. Zool. Soc. 1864, p. 564.
Tæniogale, Gray, Proc. Zool. Soc. 1864, p. 569.
Onychogale, Gray, Proc. Zool. Soc. 1864, p. 570.

Type of *Herpestes*, *ichneumon* (Egypt) ; of *Mangusta*, *javanica* ; of *Urva* and *Mesobema*, *urva* ; of *Calogale*, *nepalensis* (=*javanicus*) ; of *Calictis*, *smithii* ; of *Tæniogale*, *vitticollis* ; of *Onychogale*, *maccarthiæ* (=*fuscus*) †.

---

* Ann. Mag. Nat. Hist. (9) iii, p. 522, 1919.

† The synonymy shows that generic status was given by Gray to each of the six species of Mongoose admitted in this volume. The differences between them do not appear to me to justify that classification, and I follow my predecessors in regarding them as representing a single genus. The type-species of Gray's so-called genera were selected by Thomas (Proc. Zool. Soc. 1882, p. 63), who also included as a synonym *Osmetectis* Gray (Ann. Mag. Nat. Hist. 1842, p. 260), erected for *Viverra*

Distribution (in Asia).—From Persia through the Himalayas to S. China, all over INDIA, CEYLON and BURMA and the rest of south-eastern Asia as far as Borneo and Palawan.

Body longish and supple; coat, when in good condition, composed of a varying amount of underwool covered closely with long or longish, often rather harsh contour-hairs banded with pale and darker annulations which give a characteristic speckled aspect to the whole or the greater part of the pelage; apart from the stripe on each side of the neck in two species and a black or pale tip to the tail in the same and other species there is no definite pattern when the coat is smooth, but when it is erected the annulations tend to coincide so as to produce a pattern of alternating dark and light bands. The tail is usually long, sometimes even a little longer than the head and body, only occasionally about half their length, and clothed with hairs like those of the body, but becoming progressively shorter towards the tip, so that the organ tapers distally. The head has the ears shortish, rounded and largely concealed by hair, the facial vibrissæ well developed and normal in the number and position of the tufts, and the muzzle strong but rather pointed at the nose, which has the rhinarium naked, with deep infranarial areas and a narrow grooved philtrum dividing the upper lip. The legs are generally rather short; the paws are pentadactyle, with the first digit, pollex and hallux, short and set above the level of the cushion-like, three-lobed plantar pad, from which the pollical and hallucal elements have moved away with the corresponding digits; carpal and metatarsal pads single or double; the metatarsal area sometimes naked, sometimes hairy, but the area round the pads always naked; the four main digits sometimes with deep, sometimes shallow interdigital webs. There are two pairs of abdominal mammæ.

The skull is longish and low, with the total and condylobasal lengths nearly the same, the orbits encircled by the junction of the frontal and malar postorbital processes, the occipital crest well developed but the sagittal never very high. The post-dental portion of the palate is produced far back halfway over the mesopterygoid fossa, the posterior palatine foramina are about on a level with pm^2, and the division between the two chambers of the bulla is strongly defined. The dental formula is: $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{4}{4}$, $m.\frac{2}{2}$; the teeth are trenchant,

fusca Gray (Illustr. Ind. Zool. pl. 5, 1832), an unidentifiable animal with a preposterously long snout and digitigrade feet with short retractile claws. Most emphatically it cannot be regarded as a Mongoose. All that Gray said about it in 1869 (Cat. Carn. etc. p. 167) when he included it under the Mongooses was that the figure "had been supposed to be *Urva cancrivora*, but does not well represent that species." To me the figure more suggests a Palm-Civet (*Paguma*) drawn from a bad skin which had been hung up by its nose to dry.

pm^1 being small and practically functionless above and below, pm^2, pm^3, pm_2, pm_3 and pm_4 compressed, with a large pointed median cusp and small accessory cusps in front

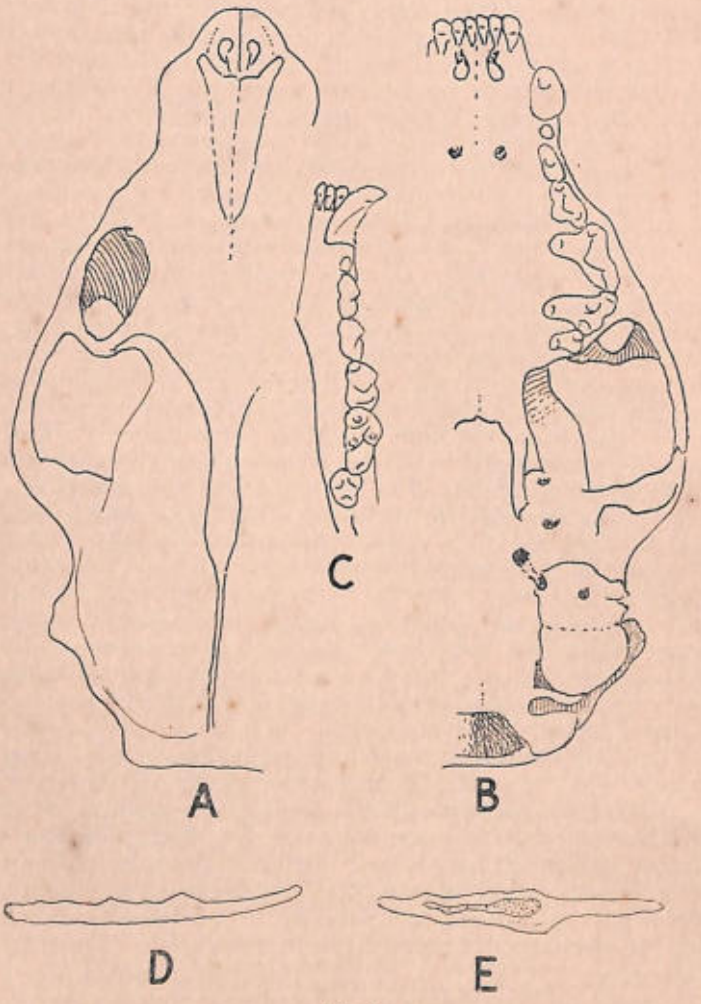


Fig. 2.

A. Upper surface of left side of ad. ♂ skull of *Herpestes urva* from the Ruby Mines, Burma, showing the encircled orbit etc.
B. Lower surface of the same, showing the upper teeth, the palate with its foramina, the bulla etc.
C. Lower teeth of right side of the same.
D. Side view of baculum of *H. urva* from Backan, Tong-king, the apex pointing to the right.
E. Upper or lower view of the same.

and behind; the upper carnassial (pm^4), the dominant tooth of the upper series, is set far back beneath the orbit, has its inner lobe well developed and anterior in position; its posterior end is near the adjoining root of the zygomatic arch and forms an obtuse angle with m^1, which, with m^2, is crowded into the reduced space behind, both these molars being much wider than long, with tubercular crushing crowns; the lower carnassial (m_1) has its anterior three-cusped portion considerably larger than the heel.

Key to the British Indian Species based on External Characters.

a. No stripe on side of neck.
  b. Size tolerably large; contour-hairs, when fully grown, long, many-banded, and usually coarse; legs darker than body.
    c. Tail long, sometimes longer than head and body; hind foot with at most a small area of the heel covered with hair in winter; contour-hairs coarse.
      d. Tip of tail whitish to ochreous ..... *edwardsii*, p. 8.
      d'. Tip of tail extensively black ..... *smithii*, p. 22.
    c'. Tail about two-thirds the length of the head and body; hind foot with about half the sole hairy above; contour-hairs softer .... *fuscus*, p. 35.
  b'. Size smaller; contour-hairs short, soft and with only a few bands; legs not darker than body ..... *javanicus*, p. 28.
a'. A conspicuous stripe on the side of the neck.
  e. Neck-stripe black, extending from behind the ear; tail-tip black; hind foot naked below to heel ..... *vitticollis*, p. 44.
  e'. Neck-stripe whitish, extending from corner of mouth; tail-tip pale; hind foot hairy below nearly to hallux ..... *urva*, p. 51.

Key to the British Indian Species based on Adult ♂ Skull-characters.

a. Skull comparatively narrow and light, with the occipital crest and at least the posterior end of the sagittal crest strongly developed, so that the dorsal profile is not conspicuously depressed behind.
  b. Skull larger; posterior chamber of bulla inflated and projecting below the anterior.
    c. Frontal region elevated, the upper surface of the muzzle more steeply sloped.
      d. Occipital and sagittal crests on the average better developed ..... *edwardsii*, p. 8.
      d'. Occipital and sagittal crests on the average less well developed ..... *smithii*, p. 22.
    c'. Frontal region not noticeably elevated, the upper surface of the muzzle less steeply sloped ..... *fuscus*, p. 35.
  b'. Skull smaller; posterior chamber of bulla less inflated and not or hardly projecting below the anterior ..... *javanicus*, p. 28.

a'. Skull comparatively broad and massive, with the crests less well developed, so that the dorsal profile is depressed behind.
  e. Posterior chamber of bulla much inflated and prominently projecting below; a distinct cingulum on m^1 ..... *vitticollis*, p. 44.
  e'. Posterior chamber of bulla less inflated and prominent; no cingulum on m^1 ..... *urva*, p. 51.

51. **Herpestes edwardsii** Geoffroy*. Common Indian Mongoose

(For the bibliography and synonymy of this species see below, especially under the subspecific headings.)

Distribution.—Northern India from Assam to the North-West Frontier Province, thence westwards into Afghanistan, Baluchistan and Persia, southwards to Cape Comorin and Ceylon.

A medium-sized or tolerably large Mongoose, with no stripe on the side of the neck; the tail long, at most a little shorter than the head and body, sometimes a little longer, with the hairs at its tip pallid to ochreous-red, never black; the legs darker than the body; the contour-hairs of the back harsh and long or longish and marked with many, generally about ten, dark and light bands alternately arranged, giving a speckled aspect to the pelage; the sole of the hind foot generally naked to the heel, but in some cases at least the heel is covered with hair in winter.

The colour is affected by seasonal change in the coat. In normal individuals, without marked erythrism, the fresh, shortish coat is typically iron-grey owing to the black and white banding; with the growth of the contour-hairs the bands increase in length and, later in the season, the black fades to brown, the white loses its brilliance and becomes soiled, so that the contrast of colour is less marked, and the final stage of the coat before and during the moult is very different from the first; the tail goes through changes similar to those of the body, and the legs fade from deep blackish-brown to paler, redder brown.

The skull of the adult has the forehead more or less swollen, so that the summit of the muzzle is somewhat steeply sloped, the dorsal area behind the orbits is depressed and rises posteriorly towards the occiput, where the sagittal and occipital crests

* This species, under the generic names *Herpestes* or *Mungos*, has usually been cited as *griseus* or *mungo*. But Thomas and Wroughton (Journ. Bomb. Nat. Hist. Soc. xxvii, p. 547, 1921) decided that *edwardsii* was its correct specific name. My reasons for agreeing with this decision and for rejecting *griseus* and *mungo* are given at length in my paper (Journ. Bomb. Nat. Hist. Soc. xxxix, p. 214, 1937) and need not be repeated. In the same paper I fully discussed the names and synonymy of the four subspecies into which *H. edwardsii* is divisible, and no repetition is required.

are strongly developed, the dorsal profile being horizontal with a sinuous curvature; the posterior chamber of the auditory bulla is more inflated and projects inferiorly to a lower level than the anterior (text-fig. 3, B, p. 28).

The subspecies into which this species has been divided are by no means always easy to define or determine. Not only do they completely intergrade, but specimens from the centre of the geographical area of one race may be indistinguishable from specimens from the geographical area of another. Nevertheless I have seen no skins in northern India like those of Travancore or Ceylon nor skins of the Ceylonese style in North India.

On the average they may be distinguished as follows :—

a. Winter coat with the contour-hairs longer and more coarsely speckled, the pale speckling more in evidence, with the general hue lighter, red on head etc. more prevalent.
  b. General colour a trifle darker, with less tendency to erythrism. (North and North Central India.) *nyula*, p. 9.
  b'. General colour a trifle lighter, erythrism more prevalent. (Valley of the Indus, north-western deserts, Baluchistan.) ..... *ferrugineus*, [p. 12.
a'. Winter coat shorter, more finely speckled, pale speckling not dominant over dark, general hue darker, with red everywhere less in evidence, sometimes absent.
  c. Speckling on the average coarser. (S. India.) . *edwardsii*, p. 18.
  c'. Speckling on the average finer. (Ceylon.) .... *lanka*, p. 20.

51 *a*. **Herpestes edwardsii nyula** Hodgson. Grey Mongoose, "Common Indian Mongoose"

Mangusta (*Herpestes*) *nyula*, Hodgson, Journ. As. Soc. Beng. v, p. 236, 1836.
Mongos mungo mungo, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 52, 1915 (not of Gmelin) *.
Herpestes edwardsii edwardsii, Thomas & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 547, 1921.
Mungos mungo mærens, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 52, 1915.
Herpestes edwardsii nyula, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 214, 1937.

Vernacular.—Newal, Newala, Nyul, Newar, Dhor, Rasu (Hindi); *Nurlia* (Kathiawar); *Binquidaro, Sarambumbui* (Ho Kol).

Locality of the *type* of *nyula*, Nepal, in the lowlands; of *mærens*, Nimar.

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* Wroughton's diagnosis of this race as having the underfur comparatively very sparse and the hairs on the lower back 40 mm. long was evidently based upon a specimen or specimens from Bengal in summer coat. He could not have examined Hodgson's skins of *nyula*, regarded by him as a synonym of *mungo*. At least one of them has plentiful underwool and the rump-hairs are about 50 mm. long.

Distribution.—Northern India from Nepal to Assam north of the Ganges and from Cutch to Bengal south of the river.

Winter coat composed of long, rather harsh contour-hairs, up to 50 mm. or more in length, and plenty of wool, the general speckling of the body and tail coarse. Colour very variable seasonally, the shorter new coat prevalently silvery, with contrasted black and white speckling, the black fading to brown and the white soiled in the older coat, but even in the new coat the speckling may be brown and buffy or yellowish; hairs of the underside with dark speckling or fading to uniformly pale; typically some red on the muzzle, cheeks and ears, sometimes a little on the crown and nape; the wool varying from dark olivaceous-grey to soiled white; the legs dark or paler rufous-brown and grizzled.

In addition to a series of topotypical but undated skins from Nepal (Hodgson) the British Museum has a very large number collected mainly by the Mammal Survey ranging north of the Ganges from Goalpara in Assam to Kumaun and Rohilkund and south of the river from Hazaribagh in Bengal to Cutch. The range in altitude over this extensive area is from 150 ft. in Darbhanga to 2,500 ft. in Kumaun. These dated skins obtained in most months of the year show the seasonal changes in coat and colour above referred to. In my paper, above cited, they were discussed in some detail from all the localities. It will only be necessary therefore to select a few of the districts to support the claim that the skins represent a single very variable local race.

Hodgson's Nepalese series varies as follows:—The contour-hairs on the rump range from about 40 to 50 mm. and the wool is copious or very scanty. The dark speckling varies from blackish-brown to paler brown, the pale from silvery to dull grey or drab, and the wool from yellowish-olive to pale drab or soiled whitish. The lower side is drabby or greyish, sometimes indistinctly dark speckled; the head has some red at least on the muzzle, cheeks and ears, sometimes on the crown and nape as well; the tail is like the body, with the tip soiled whitish; the legs are dark brown or rufous-brown and grizzled, one skin showing abundance of rusty-red above the hocks. These skins have probably deteriorated in colour with age. None quite agrees with the type, which was described as "mixed rich red-brown and hoary yellow, the long harsh hairs having from 10 to 12 rings of alternate brown and yellow, the ears, face and limbs being redder and the underside pale yellow."

Several skins from Bahgownie in Darbhanga, 150 ft. (Crump), July 25 to October 10, show interesting individual variations.

The coat is from about 30 to 40 mm., according to the earlier or later date, the wool being similarly negligible in amount or fairly plentiful ; the speckling is contrasted black and white in the new short coat, duller and less contrasted in the older longer coat ; the wool varies from olivaceous to yellowish and frequently shows through the contour-hairs, affecting the coloration of the dorsal surface.

A few skins from Haldibari, in Cooch Behar, 150 to 200 ft., April 13 to 20, from Jalpaiguri, a little further north, April 18, and from Goalpara, Assam, fit in with the series from Nepal and Darbhanga.

Skins from Kumaun, 1,100–2,500 ft. (Crump), November and December, are speckled black and white, closely matching one of the Haldibari skins, with the wool buffish-white. Others from Pilibhit, Rohilkhand, 800 ft., March, are like them, but have the wool whiter in accordance with the later season. These were identified as *pallens* by Wroughton (p. 12), and not without reason.

A good series of skins from several localities in Gwalior, dated from June to the end of November, exhibits great seasonal variation in colour. In the late autumn coat (October and November) the contour-hairs, about 55 mm., are speckled black or blackish and clear white, those of the underside being speckled with black ; the feet are dark with hardly any brown tinge and the tail-tip is ochreous or flavous. In the summer coat (June and July) the contour-hairs of the dorsal side are faded, speckled very pale brown and soiled white, there is no dark speckling below, and the legs are much paler and browner ; the underwool bleaches from dark olive-grey to dirty whitish ; there is at most a little red on the muzzle.

The skins Wroughton assigned to *mœrens*, captured between March and December, came from the following localities :— Cutch, 200–500 ft. ; Kathiawar, 200–2,500 ft. ; Nimar, 1,000 ft. ; Berar, 1,500 ft. ; and E. Khandesh. They vary individually and seasonally, but are mostly in good coat with sharply contrasted black and white speckling like the well-coloured skins from Darbhanga and Gwalior.

To illustrate individual variation between specimens captured by Crump at the same time and in the same place may be cited a small series from Sohagpur in Hoshangabad, 1,000 ft., April 10 to 13. The coat varies from 30 to 50 mm. in length. In one skin the speckling is black and white, with the legs very dark brown and some black speckling below : a second is much paler owing to the more extensive pale bands ; there is some red on the back and the wool is whitish : a third has the dark speckling faded to pale brown, the wool drabby and the belly not speckled.

The flesh-measurements (in English inches) and the weights (in lb.) of the largest and smallest specimens of both sexes, with some of intermediate sizes to illustrate variations in the tail-length, are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Guna in Gwalior ; ad. ♂	17½	15⅝	3½	—
Ramnagar, Kumaun ; ad. ♂...	16⅝	14½	3½	4
Bahgownie, Darbhanga ; ad. ♂ .	15⅝	14½	3—	—
Nokania, Cutch ; ad. ♂	15½	15½	3+	3
Ghatigaon, Gwalior ; ad. ♀ ...	15½	14	2⅝	2¼
Kathiawar ; ad. ♀	15½	15½	3	2½
Daltonganj ; ad. ♀	14⅝	14⅜	3—	—
Nokania, Cutch ; ad. ♀	14⅝	13	2⅜	—

The average length of the head and body in 11 ♂♂ is 16½ in., in 8 ♀♀ 15½ in. The weight of ♂♂ varies from 2¾ to 4 lb., of ♀♀ from 2 to 2¾ lb.

The measurements (in mm.) given in the table (p. 13) show the variations in size of the skulls of this Mongoose and the average condylobasal length of several skulls of both sexes.

Habits.—According to Crump's notes this Mongoose was only observed in Kumaun below the foothills, but was very common at Pilibhit. In the Hazaribagh district it was only plentiful around Chainpur ; in E. Khandesh a few were seen in cultivated grounds. In Kathiawar it was common particularly in or near villages, and it was equally plentiful in Cutch, where it lives under rocks and in burrows, is diurnal, very bold and inquisitive, although wary and seldom venturing far from cover. It is a good climber ; but one that attacked a snake coiled round the branch of a tree was kept at bay. The mongoose abandoned the contest and retired out of sight, but later, when the snake came to the ground, the mongoose darted from the bush hard by and seized the reptile by the head. A specimen Crump observed at Nimar had its home in the trunk of a tree, the entrance being a narrow slit some 3 ft. from the ground.

51 *b*. **Herpestes edwardsii ferrugineus** Blanford.

Herpestes ferrugineus, Blanford, Proc. Zool. Soc. 1874, p. 661, pl. 81.
Herpestes andersoni, Murray, Vert. Zool. of Sind, p. 34, 1884.
Mungos pallens, Ryley, Journ. Bomb. Nat. Hist. Soc. xxii, p. 660, 1914.
Mungos ferrugineus and *pallens*, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, pp. 51–4, 1915.
Herpestes griseus montanus, Bechthold, Zeitschr. Säug. xi, p. 149, 1936.
Herpestes edwardsii ferrugineus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 217, 1937.

Locality of the *type* of *ferrugineus*, Larkhana, Sind ; of

Skull-measurements of *Herpestes edwardsii nyula*.

Locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Hazaribagh ; ad. ♂	84	42	11	16	15	56	$7\frac{1}{2} \times 5$	7
Bahraich ; ad. ♂	77	38	14	15	14	50	7×5	7
Average of 12 ad. ♂♂	$80\frac{1}{2}$	—	—	—	—	—	—	—
Nimar ; ad. ♀	80	38	12	15	14	51	7×5	7—
Nepal ; ad. ♀	71	36	12	12	12	46	$7 \times 5\frac{1}{2}$	7
Average of 6 ad. ♀♀	$75\frac{1}{2}$	—	—	—	—	—	—	—

andersoni, Kotree, Sind; of *pallens*, Palanpur, N. Gujerat; of *montanus*, Hazara.

Distribution.—Mainly the desert districts of N.W. INDIA in the Valley of the Indus and Sutlej, and in Rajputana and westwards into BALUCHISTAN, Persia and Mesopotamia.

Distinguished on the average from *nyula*, but completely intergrading with it, by its paler, whiter colour, with less black speckling in the contour-hairs, its paler wool, and by a greater tendency for the replacement of the dark speckling by red or rich ochreous, the replacement being sometimes complete as in the type of *ferrugineus*, sometimes partial as in *andersoni*, whereas in the normal form of the race, represented by the type of *pallens*, there is no red on the body, although the red of the head and limbs is typically more pronounced and contrasted than in *nyula*.

The type of *H. ferrugineus* Blanford, from Larkhana, Sind, was red all over, all the normal black speckling of the coat being replaced by rusty-red, the tail becoming progressively redder towards the tip. Blanford finally regarded it as representing a " variety " of the common Indian Mongoose.

Murray recorded apparently similarly red specimens as *ferrugineus* from Kotree and Karachi in Sind, and at the same time described as *H. andersoni* a partially red specimen from Kotree. This had the contour-hairs of the back banded black and white, with a ferruginous apical or subapical tip, the tail-hairs being mostly white with extensively reddened tips; the forehead ferruginous and rather darker red than the underside; the feet were rufous-brown with black toes, the wool ferruginous at the summit, yellowish-white at the base.

There are no specimens in the British Museum so red as the type of *ferrugineus*; but the occurrence of typical *ferrugineus* and of *andersoni* at Kotree suggests that they merely represent colour-phases of one and the same form. Also the occurrence of specimens evidently closely resembling *andersoni* in the same locality as specimens indistinguishable from *pallens*, as explained below, justifies in my opinion the view that *ferrugineus* and *andersoni* are red or reddish mutants of *pallens*, the normal form. Unfortunately the name *ferrugineus*, given to a hitherto unique specimen exhibiting the extreme phase of erythrism, has to be adopted for this race, as the earliest proposed.

The following account of the skins shows the prevalence of the normal *pallens*-type and the incidence of the *ferrugineus*-mutant in often widely separated localities.

The type of *pallens* from Palanpur in Gujarat, 150 ft. (Crump), March 21, has the coat about 52 mm. long, with some wool, and rather coarsely speckled blackish and white on the body, brown and white on the tail, with the head and feet brownish

and the belly whitish. A female from Danta, Gujerat, 100 ft., January 25, has the coat a little shorter, the speckling blacker, noticeably on the tail, these differences being due to the earlier winter season; but it is a partial albino, as shown by the pure white feet and inside of the thighs and of pure white patches on the belly.

Skins from Mt. Abu, 4,300 ft., in Rajputana (Crump), May 19 to June 5, closely resemble the type of *pallens*, but have the summer coat short and harsh; others from Sambhar (Adam and Hume) are similar but seasonally variable, one, January 25, being speckled black and white; in another, April 27, the black is faded to brown and the white is soiled, the contrast in the speckling being much less pronounced. Another from Jodhpur is darker and agrees with the Nepalese series of *nyula*.

Some skins from Gambat, Khairpur in Sind (Prater), April, have sharply contrasted blackish and white speckling and closely resemble typical *pallens*; but one from Tata, Sind, west of the Indus (McCann), October, is indistinguishable from skins from Cutch, referred by Wroughton to *mærens* but here assigned to *nyula*.

At the following localities in Baluchistan Sir J. E. B. Hotson secured skins of this same pale type, mostly black and white speckled, but some much duller, showing the usual seasonal change:—Mand, 900 ft., December; Gumajgi, 500 ft., 50 miles W. of Turbat, December; Panjgur, 3,200 ft., January and May; Geh on the Perso-Baluchi border, 1,476 ft.; Jelri, 147 miles S.S.W. of Kelat, 3,775 ft., August.

From the Upper Punjab there are two skins from Chaklala, Rawalpindi (Stockley), July, resembling in their summer coats the skins from Mt. Abu in S. Rajputana; and an undated skin in winter coat from Hazara between Kashmir and Peshawar, N.W.F. (Wynne) only differs from the type of *pallens* in its rather longer thicker coat, and consequently rather more extensive pale speckling, and in the dark bands on the tail being black instead of brown. This is the type of *montanus*, and it obviously represents the winter phase of the two summer skins from Chaklala.

A very large number of winter skins from various villages in Kangra, 2,000 to 7,000 ft. (Wells), November to April, and others from Chamba, 3,000 to 3,300 ft. (Wells), January, may be provisionally referred to this race, but, like some of the previously described skins, they are almost as much like those assigned to *nyula*.

Some of the above-described skins, *e. g.*, the one from Hazara, show a faint reddish cast under a good light * and

* This red is a fugitive tint and may have faded in some skins.

Skull-measurements (in mm.) of *Herpestes edwardsii ferrugineus*

Locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Mt. Abu, Rajputana ; ad. ♂	82	43½	12	17	14	53	—	—
Mt. Abu, Rajputana ; ad. ♂	79	41	13	15	13	51	7½	7—
Khairpur, Sind ; ad. ♂	79	40	12	15½	14½	51	8	7½
Palanpur, Gujerat (*pallens* type) ; ad. ♂	79	41	12	15	15—	51	8	7
Sambhar, Rajputana ; ad. ♂	78	40	13—	14	14	51	8	7½
Panjgur, Baluchistan ; ad. ♂	75	40	15	15	15	50	8	7
Sambhar, Rajputana ; ad. ♂	74	39	12	15	14	48	7½	6½
Average cond.-basal length of 7 ad. ♂♂	78	—	—	—	—	—	—	—
Kohat, N.W.F.P. ; ad. ♀	75	37	15	14½	13	48—	8	7
Sind (Karachi Mus.) ; ad. ♀	75	39	12	14	13	—	7½	—
Khairpur, Sind ; ad. ♀	74	37½	10	14	13	49	7	7—
Jodhpur, Rajputana ; ad. ♀	73	38	12—	14—	13	—	7	—
Khairpur, Sind ; ad. ♀	72	36	11	13	13	46+	7	6½
Sambhar, Rajputana ; ad. ♀	71	35	11	12	12	45	7	6½
Average cond.-basal length of 6 ad. ♀♀	73+	—	—	—	—	—	—	—

vary a little in the redness of the head and legs; but the following skins may be at once picked out from them by the noticeably redder head, legs, and tail-tips, and usually more pronounced red cast on the back and tail, all of them resembling or closely approaching the form named *andersoni* by Murray:—One from Sind (Karachi Mus.), probably one of Murray's specimens; two from Gambat, Khairpur, and two from Chak, Sukkur in Sind (Prater); two from Kohat, south of Peshawar, 2,000–2,700 ft., October and March (Whitehead), the October skin, in new coat, being the reddest I have seen and evidently very similar to the type of *andersoni*, the March skin being less red and paler owing to the more extensive pale band in the longer later winter coat. One from Qasrquand on the Perso–Baluchi border, 1,710 ft. (Hotson) *, December, very like the October skin from Kohat, but not quite so red; and one from Sanyala, Kangra, 5,000 ft. (Wells), April, which closely resembles the reddish skins from Sukkur, Sind, except that the tail-tip is flavous as in the *pallens* phase of this race and in *nyula*.

These data show that the pallid and rufous phases occur together at Khairpur in Sind on the lower Indus, in the N.W.F.P. at Hazara and Kohat, and on the Perso–Baluchi border.

The extension of this race into Persia is shown by a skin in the normal pale phase like most of the Baluchistan skins from Shiraz (Hotson); and it was no doubt an example of it that Cheesman described as a large mongoose, and chased, but failed to secure, beyond the oil-fields at Maidan-i-Naptun in Mesopotamia (Journ. Bomb. Nat. Hist. Soc. xxvii, p. 10, 1920).

The flesh-measurements (in English inches) of some specimens † arranged according to size are as follows:—

Locality and sex.	Head and body.	Tail.	Hind foot.
Mt. Abu, Rajputana; ad. ♂	17½	15½	3½
Sukkur, Sind; ad. ♂	16⅝	15⅝	3½
Khairpur, Sind; ad. ♂	15⅝	13⅝	3—
Palanpur, Gujarat (*pallens* type); ad. ♂	15½	16—	3—
Mand, Baluchistan; ad. ♂	15½	14⅝	3+
Danta, Gujarat; ad. ♀	15	14½	2⅝
Sukkur, Sind; ad. ♀	14⅝	15½	3—
Tata, Sind; ad. ♀	14⅝	12⅜	3—
Kohat, N.W.F.P.; ad. ♀	14	14⅜	2⅝
Qasrquand, Baluchistan; ad. ♀	14	14⅜	2⅝

* Apparently the specimen recorded by Cheesman (Journ. Bomb. Nat. Hist. Soc. xxvii, p. 37, 1921).

† Specimens from Kangra and Chamba have not been included in this table because I suspect their alleged dimensions are untrustworthily large. The head and body in a ♂ from Chamba are 20½ in., in the biggest and smallest ♂♂ from Kangra they are 21½ and 18½ respectively.

Only a few weights were recorded. Two ♂♂ from Mt. Abu were 3 and 2¾ lb. respectively; the type of *pallens* was ¾ lb., and the ♀ from Danta 2 lb.

The largest and smallest ♂ skulls from Kangra have a condylobasal length of 83 and 77 mm. respectively, the average of six being 81, a trifle less than in the larger ♂ skull from Mt. Abu. The same areas in the largest and smallest ♀ skulls * from Kangra are 76 and 72 mm. respectively, the average of eight being 74¾ mm.; and two ♀ skulls from Chamba are 77 and 73 mm. These skulls are only a trifle larger on the average than those entered in the table. They agree very closely with the average of the ♂ and ♀ skulls of *nyula* included in the table (p. 13).

Habits.—Nothing seems especially to have been recorded about the habits of this mongoose. According to Crump it is not common at Palanpur in Gujarat, and is replaced near Deesa by *auropunctatus* (=*H. javanicus*, p. 28). On the labels of Whitehead's specimens from Kohat it is said to be "not often seen, but chiefly about orchards," one being "shot in an open field."

51 *c*. **Herpestes edwardsii edwardsii** Geoffroy.

"The Indian Mongoose," Edwards, Nat. Hist. Birds, iv, p. 199, 1751.
Herpestes edwardsii, Geoffroy, Descr. de l'Egypte, ii, p. 139, 1812.
Herpestes frederici, Desmarest, Dict. Sci. Nat. xxix, p. 60, 1823.
Herpestes malaccensis, Fischer, Syn. Mamm. p. 164, 1829.
Herpestes pondiceriana, Gervais, Voy. de la 'Bonite,' i. p. 32, 1841.
Mungos mungo ellioti, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, pp. 51 & 53 (not *ellioti* Blyth).
Herpestes edwardsii carnaticus, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 23, 1921.
Herpestes edwardsii edwardsii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 222, 1937 (not *H. edwardsii edwardsii*, Thomas & Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 547, 1921, for which see above (p. 9) under *nyula*) †.

Vernacular.—*Mangús* (Marathi and Dekhani); *Mungali*,

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the average of nine from this locality being 19⅝ in. The same measurements in two ♀♀ from Chamba are 16⅛ and 15⅝ respectively, and the biggest and smallest ♀♀ from Kangra are 18⅜ and 14½ in. respectively, the average of ten specimens being 16⅛ in. The superiority in the dimensions of these specimens, sex for sex, over those entered in the table is not supported by the skulls. The records nevertheless must be borne in mind, on account of the possibility of the Grey Mongooses of Chamba and Kangra proving to represent another race of *H. edwardsii* distinguished by its larger size from *nyula* and *ferrugineus*.

* One Kangra skull, marked ♀, is 81 mm.; but it has all the characters of a ♂ skull, and probably I think bears a wrong label.

† The synonymy of this mongoose is very involved. As indicated above (p. 9) I disagreed with the opinion of Wroughton and Thomas that *edwardsii* was given to the North India race of this species because

Mungili (Kanarese); *Yentawa*, *Mangisa* (Telegu); *Mungsi*, *Antur* (Waddari and Haran Shikaris); *Kera Hon-Kera* (Coorg); *Koral* (Gond).

Locality of the *type* of *edwardsii*, "East Indies"; of *frederici* and *malaccensis*, Malacca; of *pondiceriana*, Pondicherry; of *carnaticus* (=*ellioti* Wrought.), Dharwar.

Distribution.—Western India south of the Narbada River from Ratnagiri to Travancore and Madura; Eastern Ghats.

Distinguished on the average in its unfaded coat from *nyula* by its darker general tint owing to the blackish or blackish-brown bands in the hairs being more extensive than the whitish or buffy-white bands. The coat also is shorter, about 40 mm. or a little over; the wool is dark, usually olive-grey, but often with a strong ochreous tinge; there is typically some red on the head and ears, but this is variable in amount; the legs are darker or lighter brown and grizzled, the tail-tip is pale ochreous, and the underside is usually, but not always, speckled with black or brown. The skull is the same average size as in *nyula*.

This description applies generally to a large number of skins collected between January and October in the following western localities:—Ratnagiri; Dharwar, 2,000 to 2,500 ft.; N. Kanara, 1,900 ft.; N. Coorg, 3,555 ft.; S. Coorg, 2,000 ft.; Seringapatam, 2,340 ft.; Cochin, 1,500 ft.; Nilgiri Hills, 3,500 ft.; Trivandrum in Travancore; High Wavy Mountain in Madura. Of these the Travancore skins are practically indistinguishable from those of the Ceylon race, *lanka*; and

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Edwards's figure and description agree better with the South Indian race, which consequently takes that name. Desmarest gave the name *frederici* to a specimen from Malacca described and figured as "La Mangouste" by F. Cuvier and Geoffroy (Hist. Nat. Mamm. pl. 189, 1819), which subsequently those authors (Suppl. Tabl. Gén. p 3, 1842, of the same work) named *Herpestes mungo*. Fisher's *malaccensis* was based upon the same specimen. Gervais' name *pondiceriana* was apparently intended for a specimen from Pondicherry mentioned in 1819 by Cuvier and Geoffroy as "La Mangouste" in their work cited above. These three names *frederici*, *malaccensis* and *pondiceriana* antedate the inadmissible name *ellioti* Wroughton, and *carnaticus* which Thomas substituted for it. Blyth, and following him Jerdon, adopted *malaccensis* for the common Grey Mongoose of Bengal as being the oldest name known to them; and Kloss (Journ. Fed. Mal. St. Mus. vii, p. 123, 1917) identified as *Mungos mungos*, a specimen he captured at Larut, near Perak, in the Malay Peninsula, evidently regarding it as referable to the Indian Grey Mongoose. But there is a skin in the British Museum collected by Dr. Cantor in Wellesley Province, and identified by him as *Herpestes griseus*, which I am unable to distinguish from the South Indian race, typical *edwardsii* as I believe. This mongoose is believed to have been imported into the Malay Peninsula from India, probably from Madras. This explanation of its presence there is almost certainly the true one, since no mongoose resembling *edwardsii* has been recorded from Burma.

the skins from Madura are very like typical *nyula*. On the whole skins from the following localities, mostly in the Eastern Ghats, are also paler than those from the Western Ghats, and intergrade with *nyula* :—Kurnool, the Palkonda Hills, 1,500 ft. ; the Vontimitta Range, 325 ft. ; the Dharmapuri Range, 850 ft. ; Tirthamalai, Salem, 3,000 ft. ; the Denkanikota Range, 3,062 ft. ; the Shevaroy Hills, 4,500 ft. ; and the Palni Hills, 3,000 ft.

The flesh-measurements (in English inches) of some specimens, showing the largest and smallest in both sexes and the variations in the length of the tail, are as follows :—

	Head and body.	Tail.	Hind foot.
Dharwar (*carnaticus* type) ; ad. ♂	19½	16⅜	3⅜
Dharwar ; ad. ♂	17½	16	3
Cochin ; ad. ♂	18½	15⅜	2⅜
Kurnool, ad. ♂	17⅜	16½	3½
S. Coorg ; ad. ♂	17	14	3—
Kurnool ; ad. ♂	16½	16⅜	3½
Trivandrum ; ad. ♂	15⅜	13½	2⅜
Kurnool ; ad. ♀	16	14½	2⅜
Dharwar ; ad. ♀	15⅜	15⅜	2⅜
N. Coorg ; ad. ♀	15½	13	2⅜
Palkonda Hills ; ad. ♀	14⅜	14	3—
Trivandrum ; ad. ♀	14⅜	13½	2⅜

The average length of the head and body in 12 ♂♂ is 17½ in., of 10 ♀♀ 15½. The usual weight of ♂♂ is from 3 to 4 lb., of ♀♀ from 2 to 2¾ lb. ; but a ♂ from Madura was 6 lb. and a ♀ from Ratnagiri 4 lb.

51 *d*. **Herpestes edwardsii lanka** (Wroughton). The Ceylonese Grey Mongoose.

Herpestes griseus, Kelaart, Prodr. Faun. Zeyl. p. 41, 1852.
Herpestes mungo, Blanford, Mamm. Brit. Ind. p. 123, 1888 (in part).
Mungos lanka, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv. p. 53, 1915.
Herpestes lanka, Phillips, Man. Mamm. Ceylon, p. 177, 1935.
Herpestes edwardsii lanka, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 224, 1937.

Vernacular.—Mugatiya (Sinhalese) ; *Kiri* or *Kiripulle* (Tamil) ; *Keerie* (Jaffna Tamil).

Locality of the *type*, Cheddikulum, N.P., 177 ft., Ceylon.

Distribution.—Ceylon, confined to the low country dry zone (Phillips).

Very closely resembling the typical S. India race of *H. edwardsii*, but distinguished by the contour-hairs being on the average at least shorter and more finely speckled and by there being on the average less red on the head and feet, and by the wool being less richly tinted in the fresh coat. There is evidence also that i may be smaller and have a shorter tail.

The differences between this race and the South Indian form are too trivial to be granted specific value. The four skins I have seen, namely the type from Cheddikulum (Mayor), November 12; two from Tammanewa, N.C.P. (Mayor), May 3 and 9, and one undated, without special locality, are much alike, varying slightly in the tint of the speckling; the wool is scanty and drabby grey, without the ochreous tinge common in the S. Indian race; there is no trace of red on the head, ears, feet or elsewhere, and the coat is only up to about 30 mm. The similarity in colour and coat in specimens collected in November and May suggests that the seasonal differences are slight or non-existent. Phillips, however, says that the feet and head have a slight tinge of red. The skull is approximately as in *edwardsii*.

The following flesh-measurements (in English inches) were recorded by Phillips :—

	Head and body.	Tail.	Hind foot.
Ad. ♂	18+	13½	3—
Ad. ♀	15¼	12	2⅞
Av. 4 ♀	14	10½	2½

The type of the race, a young adult ♂, is a little smaller than the largest ♀ in the British Museum from Tammanewa, which agrees closely with Phillips's largest ♀.

Habits.—According to Phillips this mongoose is common in the low country dry zone in the island, occurring as far south on the west coast as between Puttalam, N.W.P., 27 ft., and Chilaw and inland at Dambulla, C.P., 500 ft.; but in the east its range extends southwards throughout the Eastern Province, skirting the Uva Hills, to Palatupana, S.P., 20 ft., where, however, it is not common.

In diet it is omnivorous, supplementing its normal food of small living animals of most kinds with carrion and some fruits and roots. Like its Indian allies it is easily tamed when caught young, and is consequently often seen in a semi-domesticated state about bungalows, which it keeps clear of rats and other vermin, or in the hands of snake-charmers to display its prowess in contests with cobras *; but in captivity it has to be kept under restraint on account of destructiveness to the poultry of its owner or of his neighbours.

It hunts more by day than night, and may be seen, either singly or in couples, mostly in the early morning and late evening, in the jungles, open fields, or along hedges and streams. When alarmed it quickly scuttles to shelter in the undergrowth or any convenient ant-hill.

* Phillips's opinion about its snake-killing propensities in the wild is recorded below (p. 58).

There seems to be no regular breeding season. The young, generally two in number, are born in a burrow dug by the parents in a bank or low ant-hill.

52. **Herpestes smithii** Gray. The Ruddy Mongoose.

(For bibliography and synonymy see under the subspecies.)

Distribution.—Central and Southern India ; Ceylon.

Very closely related to *H. edwardsii*, but distinguished by its slightly larger size, the black-tipped tail, generally darker colour and generally more pronounced tendency to redness, although never so red as in the typical *ferrugineus*-mutant of that species. In the slightly larger skull the occipital and sagittal crests are at least on the average less strongly developed *.

The two races, here admitted, may be distinguished as follows :—

a. Tail longer, sometimes longer than head and body ; more grey and less red on the average in the general colour. (India.) ..... *smithii*, p. 22.

a'. Tail shorter, never so long as head and body ; more red and less grey on the average in the general colour. (Ceylon.) ..... *zeylanius*, [p. 25.

52 *a*. **Herpestes smithii smithii** Gray. Indian Ruddy mongoose.

Herpestes smithii, Gray, Charlesw. Mag. Nat. Hist. i, p. 578, 1837 ; id., Proc. Zool. Soc. 1851, p. 131, pl. 30 ; id., Proc. Zool. Soc. 1864, p. 565 (*Calictis*).

Herpestes thysanurus, Wagner, Münch. Gel. Anz. ix, p. 440, 1839 ; id., Säug. Suppl. ii, p. 301, 1841.

Herpestes ellioti, Blyth, Journ. As. Soc. Beng. xx, p. 162, 1851.

Herpestes jerdonii, Gray, Proc. Zool. Soc. 1864, p. 550.

Herpestes torquatus (Elliot MS.), Kelaart, Prodr. Faun. Zeyl. p. 40, 1852 ; Jerdon, Mamm. Ind. p. 136, 1867.

Herpestes monticolus, Jerdon, Mamm. Ind. p. 135, 1867.

Herpestes smithii rusanus, and *canens*, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 25, 1921.

Vernacular.—Konda Yentava (Telegu).

* In 1937 I suggested the possibility of this mongoose being a "habitat-mutant" of the common Grey Mongoose (*H. edwardsii*), its typically darker, ruddier hue being associated with life in denser jungles ; and I stated that in some African mongooses the tail-tip varies individually from black to pale. But having seen no intermediates between the two, I adopted, as in this volume, the prevalent view that they represent distinct species. Nevertheless Dunbar Brander ('Wild Animals in Central India,' p. 275, 1927) wrote of these two mongooses as follows :—"These two animals have the same habits, and although some specimens are easily recognizable, others seem to be intermediate between the two and are difficult to classify. *H. mungo* [=*edwardsii*] is much the commoner." This forcibly suggests that the two kinds actually intergrade in Central India. But until specimens come to hand for examination it seems better to regard them as specifically different.

Locality of *type* of *smithii* unrecorded, but " near Bombay " according to Thomas ; of *ellioti*, the Carnatic ; of *jerdonii*, " Madras " ; of *torquatus*, " S. India " ; of *monticolus*, inland from Nellore ; of *rusanus*, Sambhar, Rajputana ; of *canens*, Mt. Abu, Rajputana.

Distribution.—CENTRAL and SOUTHERN INDIA from Rajputana, eastward to BENGAL, and southwards through the EASTERN and WESTERN GHATS.

In his revision of this species (Journ. Bomb. Nat. Hist. Soc. xxviii, p. 23, 1921) Thomas admitted four races in Hindostan* :—(1) The typical form, *smithii*, with *ellioti* and *torquatus* as synonyms, ranging from Hoshangabad to the Nilgiri Hills in Western India ; (2) *jerdoni*, with *monticolus* as a synonym, from the Eastern Ghats ; (3) *canens* from Mt. Abu in S.W. Rajputana and Hazaribagh ; (4) *rusanus* from Sambhar in Rajputana. A few specimens from the Eastern Ghats have been received at the Museum since Thomas wrote ; but on the available evidence it seems to me that the difference in coloration between his *smithii*, *canens* and *jerdoni* are due to seasonal changes in the coat, a phenomenon which he did not consider ; and his race *rusanus* was based upon a single specimen with a small skull.

As in the last species, there is often a noticeable difference in colour in skins collected at the same or nearly adjoining localities and at the same time of year ; but winter and summer skins differ profoundly in the texture of the contour-hairs, the presence or absence of the wool, as well as in colour, owing to the bleaching of the dead coat before being shed.

In the type, no doubt an early winter skin, the contour-hairs on the rump are about 53 mm. long and there is abundance of dark brownish underwool. The general colour is dark with black and greyish-white speckling and a reddish cast traceable in the hairs of the upper side, particularly on the head, neck and between the shoulders ; the fore leg is dark reddish-brown, speckled, and the hind leg is brighter red.

In three winter skins from Satara (Prater) one from Medha, January 11, very closely resembles the type. Another from the same locality, January 13, is a trifle darker owing to the pale speckling being buffy-grey, and there is no perceptible red cast. The third, from Patan, December 11, is still a trifle

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* He set aside *thysanurus*, given by Wagner to a mongoose with a black-tipped tail, said to have come from Kashmir, because no mongoose with that feature has since been recorded north of Rajputana. In his opinion apparently the specimen might have come from Africa. Wagner's record is worth bearing in mind ; but pending the discovery of such a mongoose so far north in India the name may be added to the synonymy of *smithii*, as was done by Blanford, to get rid of it, at all events temporarily.

darker for the same reason, without appreciable red, and the legs are much darker, brown without any rusty hue. A skin from Khandala, Poona District, 2,500 ft. (Gosse), April 14, is paler than the three from Satara, the pale speckling in the hairs being more extensive and clearer, the coat is longer, about 60 mm. instead of a little over 50, and the underwool scantier ; there is no appreciable red cast and the legs are dark without rusty hue, as in the Patan skin. The differences between this skin and the others may be suspected to be due to its being in late winter coat.

The type of *rusanus* from Sambhar, Rajputana (Adams and Hume), in winter coat, January 13, is inseparable from the Satara series ; but the type and topotype of *canens* from Mt. Abu, Rajputana (Crump), in summer coat, June 2 and 3, are much paler owing to the pale bands in the contour-hairs being more extensive and whiter ; these hairs also are noticeably harsher, and there is hardly any wool at their base. The marked differences between these skins and the one from Sambhar are, I have no doubt, purely seasonal.

A skin from Rorighat, Hoshangabad, 2,500 ft. (Crump), March 9, in winter coat, is like the Satara and Sambhar skins ; whereas one from Lohra, Hazaribagh (Crump), May 2, in summer coat, closely resembles the Mt. Abu skins but has some red on the head and nape.

Two old skins from the hills inland of Nellore, one being the lectotype of *jerdoni* Gray (=*monticolus* Jerdon), are thin coated, apparently summer skins, with the pale annulations soiled, the dark annulations faded, so that they are less sharply speckled than fresh skins. It was upon the evidence of these two skins, with another old one very like them labelled " Madras," that Thomas concluded that representatives of this mongoose from the Eastern Ghats are racially distinguishable from typical *smithii* from the Western Ghats. It is needless to describe individually a large number of skins from south-eastern India, collected mostly by Baptista at Kurnool and in the Palkonda and Vontimitta Ranges, these hills being inland of Nellore, whence the type of *jerdoni* came. Only a few need be noticed. One from Dasarladoddi in the Palkonda Hills, June 26, one from Madhavaran in the Vontimitta Range, August 9, both in summer coat, agree very closely in colour with the skins from Mt. Abu, Rajputana, but are longer and less harsh in the coat. One from Salem, just south of the Shevaroy Hills, April 23, is also very similar ; but one, undated, from the Shevaroy Hills (W. M. Daly) is almost an exact match of the skins from Satara and from Sambhar in Rajputana. Finally, two skins from the Nilgiri Hills (Phythian Adams) are like the last

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. Abu (*canens* type) ; ad. ♂	17½	16⅝	3⅝	4
Mt. Abu ; ad. ♂	17	17⅜	3½	3¾
Hoshangabad ; ad. ♂	16⅝	16⅝	3⅝	3½
Satara, Mehda ; ad. ♂	18½	17½	3⅝	6
Satara, Patan ; ad. ♂	17+	15⅝	3+	6
Poona, Khandala ; ad. ♂	16½	15½	3⅝	—
Kurnool, Diguvametta ; ad. ♂	17½	15	3½	—
Kurnool, Diguvametta ; ad. ♂	16	16⅜	3⅝	2½
Palkonda Hills ; ad. ♂	17½	16½	3⅝	4¼
Vontimitta Range ; ad. ♂	18	18⅜	3⅝	4
Vontimitta Range ; ad. ♂	17½	18⅜	3⅝	3½
Hazaribagh, Bengal ; ad. ♀	15½	16	3+	—
Palkonda Hills ; ad. ♀	17½	15½	3½	3½

This table shows that the tail in this race is about as long as the head and body. It may be as much as about 1 in. longer or 2 in. shorter.

In the following table (p. 26) the skulls are listed to show the range in condylobasal length regardless of geographical distribution. It may be noted that the difference between the skulls of the types of *canens* and of *rusanus*, upon which Thomas mainly relied for distinguishing the two alleged races, is exactly the same as the difference between two ♂ skulls of *H. edwardsii edwardsii* from Kurnool and as two ♀ skulls of the same race from the Vontimitta Range. It also shows that the skulls of typical *H. smithii smithii* are on the average a little larger than the skulls of *H. edwardsii edwardsii*.

52 *b*. **Herpestes smithii zeylanius** Thomas. Ceylon Ruddy Mongoose

Herpestes rubiginosus, Kelaart, Prodr. Faun. Zeyl. p. 43, 1852 (not *Crossarchus* [=*Herpestes*] *rubiginosus* Wagner).

Herpestes smithii, Blanford, Mamm. Brit. Ind. p. 126, 1888 (in part).

Herpestes smithii zeylanius, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 23, 1921 ; Phillips, Man. Mamm. Ceyl. p. 188, 1935 (misquoted as *zeylanicus*) ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 228, 1937.

Vernacular.—*Hötamba* (Sinhalese) ; *Kiri* or *Seng-Kiri* (Tamil) ; *Seng-Keerie* or *Raja-Keerie* (Jaffna Tamil).

Locality of the *type* of *zeylanius*, Mankeni, E.P., Ceylon.

Distribution.—CEYLON, both in the dry and wet zones of the low country and in the hills up to about 4,000 ft. (Phillips).

Distinguishable from the typical continental Indian form by its shorter tail and by being a little darker on the average, never so grey as the greyest skins of the latter, and the reddest

Skull-measurements (in mm.) of *Herpestes smithii smithii* and *H. s. zeylanius*.

Locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
H. s. smithii.								
Satara, Mehda ; ad. ♂	90	45	13	17½	17	60—	8 ×6	7
Mt. Abu, Rajputana (*canens* type) ; ad. ♂	88	46	15	19	18	57	8 × —	—
Satara, Patan ; ad. ♂	86	45	13	16½	17	56	9 ×6	8—
Palkonda Hills ; ad. ♂	86	45	14	17	16	57½	8 ×5	7
Poona, Khandala ; ad. ♂	84	45	17	17	16½	56—	8 ×5½	7
Vontimitta Range ; just ad. ♂	83	40	14	17	16	53	9 ×5	7½
Sambhar, Rajputana (*rusanus* type) ; ad. ♂	82	44—	11	15	16	53½	8 ×5	7
Average cond.-basal length of 6 ad. ♂♂	86	—	—	—	—	—	—	—
Palkonda Hills ; ad. ♀	86	46	14	17	16	56	8 ×6	7
Hazaribagh ; ad. ♀	81	42	15	16	16	52	7½×5	7
Nilgiri Hills ; ad. ♀	80	43	12	16	16	53	8 ×6	7
Average cond.-basal length of 3 ad. ♀♀	82	—	—	—	—	—	—	—
H. s. zeylanius.								
Mankeni (type) ; ad. ♂	89	49	15	19	19	59	9	8—
Matugama ; ad. ♂	86	45	15	17	16	56	8½	8—
Kala Oya ; ad. ♀	81	42	12	15	15	53	9	7½
Mankeni ; ad. ♀	78	42	15	16	—	51	8	7

a little redder, but some skins, both "grey" and "red," are practically indistinguishable in colour from Indian skins.

From the following table of flesh-measurements (in English inches) and the weights (in lb.), taken from skins in the British Museum and from Phillips's records, it may be seen that although the head and body in *zeylanius* are about the same length as in the typical Indian race the tail is on the average shorter, and is always shorter than the head and body, by nearly 4 in. (100 mm.) in some cases. This also applies to several additional subadult specimens, collected by E. W. Mayor, which are not included in the table.

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Phillips's largest ; ad. ♂	18+	14½	3⅜	4¾
Wellegalli, S.P. ; ad. ♂	17⅜	15⅜	3½	4¼
Mankeni, E.P. ; ad. ♂	17½	15	3	3¼
Matugama, W.P. ; ad. ♂	16½	13½	3+	—
Phillips's average of 8 ; ad. ♂ .	16½	12½	3+	3⅜
Phillips's largest ; ad. ♀	16⅜	14⅜	3½	2¾
Ranna, S.P. ; ad. ♀	16½	13½	3+	—
Mankeni, E.P. ; ad. ♀	15½	12⅜	3−	3
Kala Oya, N.W.P. ; ad. ♀	14⅜	13½	3+	2¾
Phillips's average of 2 ; ad. ♀ .	15½	13+	3+	2¾

The dimensions of the skull and teeth recorded in the table (p. 26) are to all intents and purposes the same as those of the typical Indian race. The skulls are on the average a little larger than in the Ceylonese Grey Mongoose (*H. edwardsii lanka*).

Habits.—According to Phillips this mongoose, which may always be recognized in Ceylon by its manner of carrying its black-tipped tail upcurled at the end, is, like its Indian ally, more addicted to thick jungle than most of the other species, but may also be found in paddy-fields and comparatively open country, and has a preference for rocky broken ground, usually taking shelter beneath boulders or in crevices rather than in burrows ; sometimes, to escape danger, it climbs trees when rocks are not near at hand. It hunts, often in couples, both by day and night, mostly in the early morning and late evening, and, like other mongooses, preys upon small animals of all kinds, and, having a liking for carrion, feeds upon putrid carcases it may find in the jungle. In some places, especially Kalutara, it devours numbers of the large snail (*Achatina fulica*), smashing the shells by beating them on stones, apparently in the same way as mongooses in captivity have been seen to break hens' eggs (see p. 60). Of its breeding habits very little is positively known, but Phillips thinks the female probably has two or three young and lies up with them beneath a rock or the roots of a tree.

53. **Herpestes javanicus** (Geoffroy). Javan mongoose

Ichneumon javanicus, Geoffroy, Descr. de l'Egypte ; Hist. Nat. ii, p. 138, 1812.
Herpestes javanicus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 240, 1937.

Locality of the *type*, Java.

Distribution.—From Persia, through NORTHERN INDIA and BURMA to Indo-China, Hainan, Siam, the Malay Peninsula and Java.

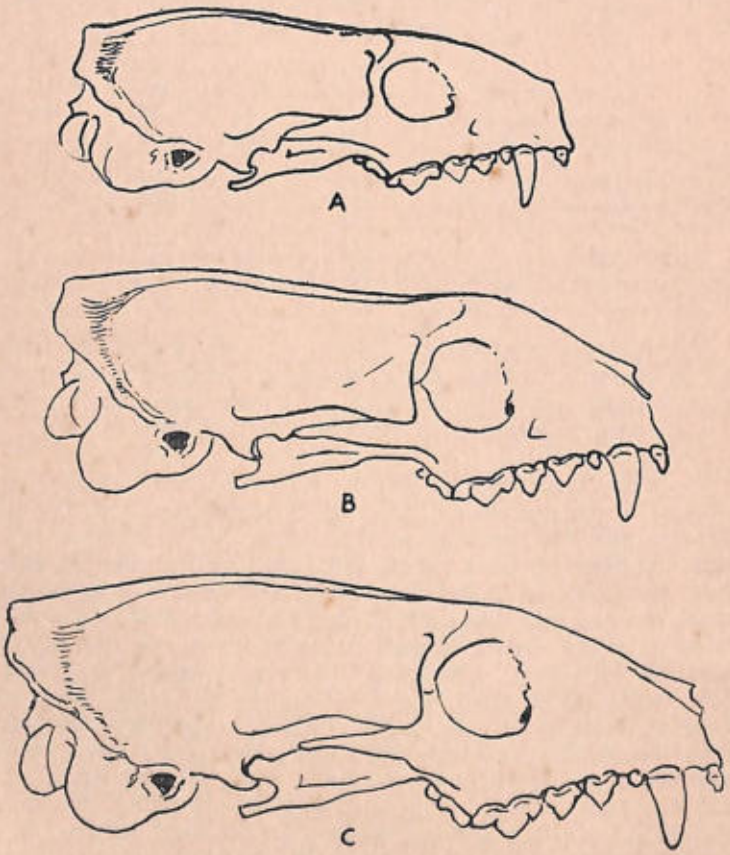


Fig. 3.

A. Side view of skull of adult ♂ *Herpestes javanicus pallipes* from Kandahar.
B. The same of *Herpestes edwardsii nyula* from Nepal.
C. The same of *Herpestes fuscus fuscus* from S. Coorg.

In the British Indian representatives of this species the size is small, with the tail always shorter than the head and body, but usually over two-thirds its length; the coat is always short, up to about 20 mm., and soft, often silky, when fresh, and although the general colour is variable seasonally and individually the speckling is always fine, the contour-hairs having as a rule only five rings, of which two are pale, the subapical being small, the lower large and conspicuous when the coat is raised; the underwool is characteristically yellow at the summit, sooty at the base, and the legs are about the same tint as the body, with the paws often paler.

In its general shape the skull is like that of *H. edwardsii*, without the bulging forehead, but the posterior chamber of the bulla is less inflated and scarcely projects below the anterior (text-fig. 3, A, p. 28).

Although there is a great difference not only in size but in colour between the western race of this species, *pallipes*, and the eastern race, *javanicus*, the two are linked by intermediate forms, the Burmese race, *birmanicus*, coming very near a Malayan race, *perakensis*, which connects it with the Siamese and Indo-Chinese race, *exilis*, the latter being similarly closely related to the typical Javan race, *javanicus*, the largest of all, very nearly as large as *H. edwardsii*. The Indian and Burmese races differ from those found to the east and south-east of Burma in continental Asia by being, except in the Hainan race, a little smaller, by having the crown of the head the same or almost the same tint as the body, and by the complete absence of red in the pelage. In the others the head is at least darker, is nearly always some shade of red, and redness is a very prevalent feature on the body and tail.

53 *a*. **Herpestes javanicus auropunctatus** (Hodgson).

Mangusta auropunctata, Hodgson, Journ. As. Soc. Beng. v, p. 235, 1836.
Herpestes nepalensis, Gray, Charlesw. Mag. Nat. Hist. i, p. 578, 1837.
Herpestes auropunctatus, Blanford, Mamm. Brit. Ind. p. 121, 1888 (in part, excluding *pallipes* and *persicus*).
Mungos auropunctatus auropunctatus and *H. nepalensis*, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, pp. 54–5, 1918.
Herpestes javanicus auropunctatus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 241, 1937.

Vernacular.—*Núl* (Kashmir).

Locality of *type* of *auropunctatus*, Nepal; of *nepalensis*, "N. India" (Hodgson).

Distribution.—Northern India from Kashmir to Bhutan; Assam, Manipur and Bengal, south of the Ganges as far south as the Chilka Lake in Orissa.

A series of skins sent by Hodgson from Nepal attests the individual variations in this race. The greatest contrast lies between one in which the general tint is dark brown, with minute, nearly ochreous speckling, the contour-hairs short, and the scanty wool brownish, and another which is comparatively pale, the pale speckling of the longer contour-hairs being much more extensive and buffy-grey to whitish and the more luxuriant wool greyish-yellow at the summit, dark grey at the base. The first no doubt represents the new summer coat, the second the bleached winter coat. Another phase is shown by a skin which is pale brown, with fine grey speckling. The best coated of the series has the contour-hairs about 20 mm., boldly speckled buffy-yellow and blackish, with the wool ochreous at the summit, blackish-brown at the base ; the tail greyer than the body, the legs like the body, with the paws a little paler and unspeckled ; the underside drabby, the hairs of the abdomen being browner at the base and showing some dark speckling. This skin exhibits, I believe, the unfaded winter coat. The rest of the skins differ in various details, linking those above described ; and the type of *nepalensis* Gray, also one of Hodgson's skins, regarded by Wroughton as represeting a distinct "species," fits in with the shorter coated, more finely speckled examples.

Hodgson's specimens were undated and merely labelled Nepal, but other skins, dated and localized, from various districts show that the differences between them are individual and mostly seasonal. In Nepal the species has been collected at Katmandu, Gorkha and Yodaveri. At the last locality Col. Kennion secured two specimens at 7,000 ft., the highest altitude recorded for this mongoose. In Kashmir Col. Ward collected one at 6,300 ft., others at Kichagkote, 5,500 ft., and Col. Stockley sent one from Tral, 5,800 ft. It has also been recorded from Bhutan Duars, 600 ft., Cooch Behar, North Kamrup, 300 ft., Golaghat, 250 ft., the Jaintia Hills, 3,000 ft., Cachar, Manipur, and south of the Ganges from Hazaribagh, Midnapore and Orissa. Only one or two specimens from these districts call for comment. The skin from Cooch Behar, March, has the pale speckling more silvery than in the palest of Hodgson's specimens. One of a pair from Golaghat is very like it, but has some almost wholly white hairs on the nape and fore back, giving these areas a hoary aspect. The skin from Manipur was identified by Blanford as *birmanicus*, but it only differs from the skin of typical *auropunctatus* from Katmandu, both collected in March, by having the pale speckling lighter yellow. Similarly the skin from Orissa (Chilka Survey), the most southern locality in India for this race, closely matches Hodgson's pale speckled Nepalese skins.

53 *b*. **Herpestes javanicus pallipes** (Blyth).

Mangusta pallipes, Blyth, Journ. As. Soc. Beng. xiv, p. 346, 1845, and xv, p. 169, 1846.
Herpestes persicus, Gray, Proc. Zool. Soc. 1864, p. 554.
Herpestes auropunctatus, Blanford, Mamm. Brit. Ind. p. 121, 1888 (in part).
Mungos auropunctatus helvus, Ryley, Journ. Bomb. Nat. Hist. Soc. xxii, p. 661, 1914.
Mungos auropunctatus pallipes and *helvus*, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, pp. 54–5, 1918.
Herpestes javanicus pallipes, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 242, 1937.

Vernacular.—*Mush-i-Khourma* (Persia) ; *Jeraydee ma'l Nakhala* or *Abu alarrais* (Arabic).

Locality of the *type* of *pallipes*, Kandahar ; of *persicus*, Mohammerah, W. Persia ; of *helvus*, Deesa in Palanpur, N. Gujerat.

Distribution.—The deserts of N.W. India ; Afghanistan, Persia and Mesopotamia.

Distinguished on the average from *auropunctatus* by its paler, generally greyer colour above and usually whiter colour below.

As in *auropunctatus*, the colour is very variable seasonally. Of three skins from Kandahar two (O. B. St. John) are in winter coat, one being dated February 2. The coat is 17 mm. long, the wool bicolor, and the pale speckling conspicuous and whitish ; the third is moulting, has the coat only 10 mm. long, the pale speckling inconspicuous, with the wool short, yellowish-olive, and showing between the thinned contour-hairs. Another skin from Afghanistan (Griffiths) has the coat and wool as in St. John's Kandahar skins, but the colour is much darker, olivaceous, with brownish-black and buffy speckling. The co-types of *persicus* are like this skin of Griffiths, and one from Seistan similarly resembles St. John's Kandahar skins, thus justifying Blanford's opinion that *persicus* is a synonym of *pallipes*.

A number of skins from Khairpur, Larkhana, Jacobabad, the Karachi district and other localities in Sind, as well as one from the Salt Range in the Upper Punjab, fit in with the Afghan and Persian skins and vary similarly. The name *helvus* was given to a series of skins from Deesa, Palanpur, in Gujerat, 450 ft., April 25 and May 5, which are obviously faded with the moult imminent. Some of them closely match the skin from Seistan, and may be described as slightly faded editions of St. John's Kandahar skins. The type of *helvus*, May 5, is one of the most faded of all, and the partial exposure of the wool by the thinning of the contour-hairs helps to give the yellowish appearance on which the race was based. Finally, some skins from Gwalior agree on the whole better with *pallipes* than with *auropunctatus*.

53 *c*. **Herpestes javanicus birmanicus** Thomas.

Herpestes birmanicus, Thomas, Ann. Mag. Nat. Hist. (5) xvii, p. 84, 1886, and Proc. Zool. Soc. 1886, p. 58; Blanford, Mamm. Brit. Ind. p. 122, 1888; Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, pp. 54–5, 1918.

Herpestes javanicus birmanicus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 243, 1937.

Vernacular.—*Mwe-ba* (Burmese).

Locality of the *type*, Pegu.

Distribution.—Lower Burma from Toungoo to Tenasserim.

Distinguished from *auropunctatus* of Northern India and Assam by its slightly larger average size, indicated particularly by the skull.

A series of skins from Toungoo, 100 ft. (J. M. D. Mackenzie), shows great variation in colour, the darker specimens closely agreeing with the type from Pegu. Most of them, dating from May 26 to June 13, have short coats, are dark brown in colour, with fine pale ochreous speckling, the wool scanty and not noticeably bicolor. They closely resemble the skins of *nepalensis* from Godoveri in Nepal; but one, May 23, is much lighter, with less black and paler yellowish speckling almost exactly as in typical *nepalensis*, and another, August 16, is lighter than the last, has a longer coat and consequently more extensive pale speckling, which is also rather brighter yellow, and the wool is beginning to be differentiated into the two normal tints. Finally, one from the Sittang Delta, 40 miles south of Pegu, March 4, is yellower than any, with a longer coat and broader pale bands, normally bicolor wool, in all respects nearly matching the better coloured of Hodgson's Nepalese series.

The following flesh-measurements (in English inches) of the largest ♂ and ♀ examples of the three British Indian subspecies of *H. javanicus* suggests a gradual increase in size from west to east :—

Name, locality and sex.	Head and body.	Tail.	Hind foot.
H. j. pallipes.			
Larkhana, Sind; ad. ♂	12½	9½	1⅝
Palanpur, Gujarat; ad. ♀	11⅛	9⅜	2
H. j. auropunctatus.			
Bhutan Duars; ad. ♂	13½	10½	2⅜
Gorkha, Nepal; ad. ♀	12⅛	9⅜	2⅛
H. j. birmanicus.			
Toungoo, Burma; ad. ♂	14⅛	11⅜	2½
Toungoo, Burma; ad. ♀	12⅛	10	2+

Weights.—A ♂ and ♀ of *pallipes* from Palanpur were 1¼ lb. and 13 oz. respectively; a ♂ of *auropunctatus* from Kashmir and one from Nepal were 2 lb.

Measurements (in mm.) of skulls of the British Indian subspecies of *Herpestes javanicus*.

Name, locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
H. j. pallipes.								
Kandahar (topotype); ad. ♂	66	34	9	12	12	43	7 ×4½	6
Sukkur, Sind; ad. ♂	58	30	9	11—	11—	—	6 ×4	—
Average of 5 ad. ♂♂	64	—	—	—	—	—	—	—
Palanpur; ad. ♀	57	29	8½	10	10	35	6 ×4	5
H. j. auropunctatus.								
Kichagskote, Kashmir; ad. ♂	66	34	10	13	12	42½	6 ×5	6
Khurda, Orissa; ad. ♂	59	30	10	11	10	—	6 ×4	—
Average of 5 ad. ♂♂	63	—	—	—	—	—	—	—
Gorkha, Nepal; ad. ♀	63	31	10½	10½	11	41	6 ×5	6—
Bhutan Duars; ad. ♀	57	30	9	10	10	—	6 ×4	—
Average of 4 ad. ♀♀	61	—	—	—	—	—	—	—
H. j. birmanicus.								
Toungoo, Burma; ad. ♂	71	40	11	13	13½	47½	5 ×5	6
Pegu, Burma (type); ad. ♂	67	34	11½	12	13	44	6½×5	6
Average of 4 ad. ♂♂	68	—	—	—	—	—	—	—
Toungoo, Burma; ad. ♀	65	31	8	11	11	41	7 ×4	6
Average of 3 ad. ♀♀	64	—	—	—	—	—	—	—

There is no appreciable difference between the skulls of *pallipes* and *auropunctatus*, but those of *birmanicus* are a trifle larger. Of other skulls of *pallipes* one adult ♂ from Gwalior has the condylobasal length 65 mm.; the type of *helvus*, a young adult ♂ from Palanpur, is 63 mm., whereas a fully adult ♂ from the same locality is 58 mm. An adult ♀ of *auropunctatus* from Satpara, Orissa, is 63 mm., as large as the ♀ from Nepal and larger than the adult ♂ from Khurda, Orissa.

Intergradation in size of skulls (in mm.) between the British Indian races of *H. javanicus* and those occurring farther to the east is shown as follows :—

	Condylobasal length.	
	Ad. ♂.	Ad. ♀.
nigrifrons from Hainan	64	61–63
perakensis from Malay Peninsula	75	67
exilis from Siam	72–76	66–68
exilis from Annam	78–79	70±
javanicus from Java	80–81	70–73

Of these *nigrifrons* is about the same size as *auropunctatus*, smaller than *birmanicus*, which links it with *perakensis* and *exilis*, the latter intergrading with *javanicus*.

Habits of the British Indian races of javanicus.—J. E. Powell (Journ. Bomb. Nat. Hist. Soc. xxii, p. 620, 1914), who had a captive ♀ specimen of *auropunctatus* at Ghazipur, made some interesting observations on its habits. It cleared his house of snakes and scorpions, and, in addition to these, would eat rats, mice, lizards, centipedes, beetles, hornets, white ants and all kinds of insects except true ants. He thought the creature was immune to scorpion poison, but more probably it escaped being stung by its quickness in killing the Arachnid. Powell's description of the breeding of this Mongoose is repeated on p. 60.

It was formerly held that the mongoose imported to the West Indies to kill snakes and destroy the rats, which were such a pest to sugar-planters, was the larger common Indian Mongoose *H. edwardsii*. But G. M. Allen (Bull. Mus. Comp. Zool. liv, p. 217, 1911) pointed out that it was a representative of this smaller species, *H. javanicus*; and he told the story of the shipment of a consignment from Calcutta to Jamaica. He identified his specimens as *H. birmanicus*. But the British Museum has a number of specimens from Jamaica, St. Lucia, Barbados and elsewhere, and these are referable to *H. javanicus auropunctatus*.

Crump, who collected at Deesa in Palanpur the specimens of *pallipes* described as *helvus*, said that in that locality this mongoose breeds and sleeps in burrows undoubtedly dug by

itself in the ground, and is diurnal. It is generally a rather timid, cautious animal, seldom venturing into the open, and immediately takes cover when danger is afoot, and lies up under bushes, dodging about amongst the undergrowth to escape capture.

Cheesman (Journ. Bomb. Nat. Hist. Soc. xxvii, p. 10, 1920), who recorded *pallipes*, under the name *Herpestes persicus*, as "the common mongoose of the Tigris at least from Fao to Baghdad," says that "the Arab children tame them easily and sell them as pets for a few annas." An adult ♀, killed at Amara, had full-grown young following her in August.

From the discovery of the skull and other bones of this mongoose in the basement of a house in Ur, during the excavation of that extinct city, it seems not unlikely that the ancient Chaldeans took advantage of the docility of the animal to tame it as a pet for keeping down vermin.

54. **Herpestes fuscus** Waterhouse. The Brown Mongoose*.

(For bibliography and synonymy see under subspecific headings.)

Distribution.—S. India and Ceylon.

Size about the same on the average as *edwardsii* and *smithii*, but the tail relatively considerably shorter, only about two-thirds the length of the head and body, the contour-hairs less harsh and the upper half or third of the sole of the hind foot clothed with hair throughout the year. General colour very variable according to the subspecies, ranging from blackish-brown with the dark bands in the contour-hairs extensive and the white very narrow in the typical Indian race, to nearly uniformly ochreous or sandy with the dark bands reduced to fine, comparatively indistinct speckling in two of the Ceylonese races.

In its general form and the shape of the teeth the skull is very like that of *edwardsii* and *smithii*, but it is typically less inflated in the frontal region, so that the upper surface of the muzzle is a little less steeply sloped and may be slightly concave. the anterior tympanic portion of the bulla is smaller, and the external crest a little better developed (text-fig. 3, C, p. 28).

Analytical Key to the Subspecies.

a. On the average a little larger and more uniformly dark brown above and especially below; the tip of the tail not lighter than the rest. (S. India.) ... *fuscus*, p. 36.

a'. On the average smaller and paler or brighter in hue, not so brown especially below; tip of the tail paler than the rest. (Ceylon.)

b. General colour darker, dark speckling conspicuous on the back, flanks and tail. [p. 39.

c. Slightly smaller and less red ..... *flavidens*,

* This name is not appropriate for all the races of the species.

c'. Slightly larger and redder ..... *rubidior*,
b'. General colour not so dark, the dark speckling not so conspicuous on the back, obsolete on the flanks and tail. [p. 41.
d. Darker and redder, dark speckling on back blackish and more conspicuous ..... *maccarthiæ*, [p. 43.
d'. Paler, straw-coloured, dorsal speckling brown and faint ..... *siccatus*, p. 44.

54 *a*. **Herpestes fuscus fuscus** Waterhouse. Indian Brown Mongoose

Herpestes fuscus, Waterhouse, Proc. Zool. Soc. 1858, p. 55; Jerdon, Mamm. Ind. p. 136, 1867; Anderson, Zool. Res. Yunnan, p. 184, pl. 8, figs. 1–2 (skull), 1875; Blanford, Mamm. Brit. Ind. p. 127, 1888, and of subsequent authors.
Herpestes fuscus fuscus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 230, 1937.

Vernacular.—*Sendali-Kera* (in Coorg).

Locality of the *type*, "India."

Distribution.—S. India, typically in the hills from 3,000 to nearly 6,000 ft.

Slightly larger on the average than the Ceylonese races, with a rather longer, fuller coat, the contour-hairs of the rump from about 40 to 60 mm., and on the whole a little darker and less bright in colour, the general hue dark brown or blackish above, relieved by the fine buff or buff-grey speckling, the contour-hairs with a small black tip and a narrow pale penultimate band, and below the latter typically two very extensive black bands separated by a very narrow greyish one, these black bands always much wider than the pale, although the proportion varies individually to a certain extent; the wool olive-brown at the summit, darker at the base; there is no red in the pelage, the head and tail being coloured approximately like the back, although the pale bands of the tail, the tip of which is like the rest, are often greyer and more extensive; the underside brownish, a little paler than the upper and not so speckled.

The skins examined, including the unlocalized type, form on the whole a very uniform series, differing individually a little in tint but a good deal in the length of the coat. They were collected in the following localities:—Virajpet in S. Coorg, 3,000 ft. (Shortridge), an adult ♂ and ♀, January 27 and 30; Ootacamund in the Nilgiri Hills (Gosse), July; Tiger Shola in the Palni Hills, 5,700 ft. (McCann), an adult ♂ and ♀, April 24 and 27; High Wavy Mountain in Madura, 5,000 ft. (Prater); Primerd in Trivandrum, Travancore (Ferguson); and "Madras" (Jerdon).

The ♂ from S. Coorg is dark brown with fine buff speckling; the ♀ is blacker with greyer buff speckling, the contour-hairs

being just over 40 mm. long in both. The Ootacamund specimen is very like the ♂ from S. Coorg, but the coat is much longer, close on 60 mm. In the Palni Hills skins the ♂ is like the ♀ S. Coorg skin in colour, but has the coat 64 mm., whereas the ♀ is like the ♂ S. Coorg skin with nearly the same length of coat. The Madura skin is like that of the ♂ from S. Coorg, with the coat a trifle longer; the Travancore skin has the speckling rather finer and duller than in the others, with the coat about 53 mm. Jerdon's undated skin, labelled "Madras," was marked by Thomas as doubtless from the Nilgiri Hills, where Jerdon obtained specimens. It is rather paler than the others owing to the pale bands on the contour-hairs, which are 40 mm. long, being noticeably wider. In this particular it is rather strongly contrasted with the Travancore skin, and also differs from Waterhouse's type, which closely resembles the ♂ from S. Coorg.

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

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
S. Coorg ; ad. ♂	19½	12⅝	3⅝	6
Madura ; ad. ♂	17½	12½	—	5
Palni Hills ; ad. ♂	16½	12	3	3
Palni Hills ; ad. ♂	14⅝	10	3	3
S. Coorg ; ad. ♀	16½	12	3	3½

These dimensions suggest that Coorg specimens are sex for sex larger than those from the Palni Hills; but the data are insufficient to warrant the conclusion that more than one race is represented. The length of the head and body is larger on the average than in *edwardsii*, and the tail is manifestly much shorter.

The skulls vary comparably to the skins. The two ♂ skulls entered in the table (p. 38) are not quite the largest and smallest in length and width. Actually the longest is the skull of the skin from Madura with a condylobasal length of 89 mm., and the shortest a second skull from the Palni Hills with the same dimension 82 mm. The widest is that of the type with a zygomatic width of 49 mm. and a maxillary width of 18 mm., the condylobasal length being 87, very nearly the same as in the ♂ from S. Coorg.

Habits.—Very little is known about this race of the Brown Mongoose. Jerdon stated that in the Nilgiri Hills it inhabits dense woods. Shortridge, on the other hand, shot his specimens in S. Coorg close to human dwellings; but he reported this mongoose as apparently much more local and less plentiful in that district than the Stripe-necked Mongoose (*H. vitticollis*), Virajpet being the only locality where he heard of it.

Skull-measurements (in mm.) of the races of *Herpestes fuscus*, with the exception of *siccatus*, of which the skull is unknown.

Name, locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
H. f. fuscus.								
Madura, High Wavy Mt.; ad. ♂	89	48	16	18	18	61	9× 6	8
Virajpet, S. Coorg; ad. ♂	88	47	15	18	17	59	8× 6	7
Palni Hills, Tiger Shola; ad. ♂	83	44	15−	—	16	55	8 ×5½	8−
H. f. rubidior.								
Anasigalla (type); ad. ♂	83	43	13	16	15+	54	7 ×5	7
H. f. flavidens.								
Kandy; yg. ad. ♂	79	42	13	15	15	53	7½×5½	7
Mousakanda; yg. ad. ♂	75	38	14	14	15	50	7½×5	7
Kumbukkan; ad. ♀	75	40	13	15	13½	48	7− ×5	6
H. f. maccarthiæ.								
Jaffna (type); ad. ♀ ?	71	37	13	14±	13	—	7½×5	—

54 *b*. **Herpestes fuscus flavidens** Kelaart. Ceylon Brun Mongoose

Herpestes flavidens, Kelaart, Journ. R. As. Soc. Ceylon, ii, p. 323, 1850 ; id., Journ. As. Soc. Beng. xx, p. 184, 1851 ; id., Prodr. Fauna Zeyl. p. 44, 1852 ; Ryley, Journ. Bomb. Nat. Hist. Soc. xxii, p. 106, 1914 ; Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 239, 1924 ; Phillips, Man. Mamm. Ceylon, p. 180, 1935.

Herpestes fulvescens, Kelaart, Journ. As. Soc. Beng. xx, p. 162, 1851, and xxi, p. 348, 1852 ; Blanford, Mamm. Brit. Ind. p. 127, 1888 (in part).

? *Herpestes ceylanicus*, Nevill, Taprobanian, i, p. 62, 1887.

Herpestes flavidens ceylonicus, Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 240, 1924 ; Phillips, Man. Mamm. Ceylon, p. 186, 1935 (*ceylanicus*).

Herpestes flavidens phillipsii, Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 240, 1924.

Herpestes fuscus flavidens, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 231, 1937.

from McCarthy, Mongoose

Vernacular.—*Mugatiya* or *Ram-mugatiya* (Sinhalese) ; *Kiri-pulle* or *Karrang-Kiri*, sometimes *Poo-Kiri* or *Pambu-Kiri* (Tamil).

Locality of *types* of *flavidens* and *fulvescens*, Kandy ; *ceylanicus*, Trincomalee ; *phillipsii*, Gammaduwa, E. Matale, C.P.

Distribution.—Throughout the mountainous districts of the Central Province to over 6,000 ft., westwards to the coast near Colombo in the wet zone and eastward to Uva in the dry zone (Phillips) ; also Trincomalee if *ceylanicus* is a synonym.

A little smaller than the South Indian race, with the coat on the average shorter both on the body and tail and the pale speckling typically, but by no means always, a little brighter, the underside usually not so brown and the tip of the tail as a rule brighter than its more proximal portion, its long hairs being more uniformly ochreous or reddish with obsolete black bands.

It was probably an examination of specimens of this race that induced Anderson to record *fuscus* as occurring in Ceylon. To this Blanford demurred on the grounds that *fuscus* was in his opinion replaced in Ceylon by *fulvescens* (=*flavidens*), which he regarded as a distinct species on account of its much smaller size. He was, however, unacquainted with the smaller specimens of *fuscus* and the larger Ceylonese specimens, subsequently collected, showing complete intergradation between the two in dimensions.

The following specimens in the British Museum, assigned to this race, show considerable variation in colour :—

Kandy. Two examples collected by White are topotypes of *flavidens*. An adult ♂ from the " neighbourhood of Kandy " (no. 77.11.1.1) is dark brownish in general hue, the pale speckling of the contour-hairs being almost ochreous, this tint becoming dominant towards the end of the tail, which has

the tip reddish. This specimen possibly resembles a specimen from Newera Eliya which Kelaart recorded as a "much darker variety than the one from Kandy."

Another ♂ (no. 77.3.14.3), labelled "Kandy," is much paler, because the black in the contour-hairs is not so dark and the pale speckling not so richly tinted and a little more extensive. Both these skins are undated; but the difference between them may be seasonal.

Pattipola, C.P., 6,210 ft. Two adult ♂ (E. W. Mayor), March 2 and 14, were identified by Thomas as *flavidens*. They closely resemble the second of the two Kandy skins recorded above, but are a little darker and have the pale speckling a trifle finer, in both these respects coming a little nearer the first of the topotypical examples.

Mousakanda in Gammaduwa, E. Matale, C.P., 3,000 ft. An adult ♂ (W. W. A. Phillips), August 20, is very like the specimen from Pattipola, but has the pale speckling greyer, not so yellow, and the tail is not so reddish at the end. This example is the type of *phillipsi* Thos.; but according to Phillips *phillipsi* cannot be maintained because the pale olivaceous tint on which it was based is purely an individual feature. Probably the difference between it and the specimen from Pattipola is seasonal and due to bleaching of the Gammaduwa skin. A second specimen, November 12, from the same locality, tolerably closely resembles the Pattipola skins, but is a trifle darker.

Kumbukkan in Uva. An adult ♀ (E. W. Mayor), July 20, very closely matches the first described darker specimen from Kandy, but is a trifle darker, the two being more alike than are the two skins from Kandy except that the tip of the tail in the Kumbukkan skin is like the rest of that organ and not dominantly reddish-ochreous. This specimen was identified by Thomas as *ceylanicus* Nevill, the type of which came from Trincomalee. Phillips, unfortunately, was unable to examine specimens either from Kumbukkan or Trincomalee *. He therefore followed Thomas and reproduced Nevill's description of *ceylanicus*. I can find nothing in Nevill's description of *ceylanicus* to distinguish it from *flavidens*; but the final relegation of *ceylanicus* to the synonymy of *flavidens* must await the discovery of additional examples from Trincomalee. At all events the Kambukkan skin is more like the darker Kandy skin than are the skins from Pattipola and Gammaduwa.

The following are the flesh-measurements (in English inches) and weights (in lb. and oz.) of some specimens in the British

* He stated that this mongoose "would appear to be uncommon in that neighbourhood as none has been seen there recently."

Museum, supplemented by others taken from Phillips's volume :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight. lb. oz.
Gammaduwa ; ad. ♂	16½	11⅜	3—	2 2
Pattipola ; ad. ♂	15	11½	3—	—
Pattipola ; ad. ♂	14⅜	10⅝	2⅝	2
Average 5 ♂♂ (Phillips)	15	10	3—	2½
Largest ♂ (Phillips)	16½	12—	3—	3½—
Kumbukkan ; ad. ♀	13⅜	11½	2⅜	2½
Average 4 ♀♀ (Phillips)	13	9+	2½	1 11
Largest ♀ (Phillips)	14	9⅜	2⅝	1¾

The largest of these specimens are only a little smaller than the smallest of the South Indian race.

Habits.—According to Phillips this is the well-known mongoose of the tea-planting districts ; but it does not seem to lend itself to domestication like the Ceylonese Grey Mongoose (*H. edwardsii lanka*). It mostly frequents small patches of jungle or brushwood and grass-fields on the edge of cultivation, and is only a moderately good climber. It hunts both by day and night, preying upon rats and other small mammals, birds, eggs, snakes, lizards, frogs, insects, and perhaps on fruits and roots. Although a great pest to poultry keepers, from its custom of killing all the fowls it can at a time, it is a very beneficial vermin killer on cultivated estates. The Tamils in some districts accuse it of eating the fruit of cardamom. It breeds in burrows beneath rocks and tree-roots, mostly early in the year, but apparently has no restricted season. There are usually three or four young to the litter.

54 *c*. **Herpestes fuscus rubidior** Pocock. Thos. McCarthy's Mongoose ?

Herpestes flavidens maccarthiæ, Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 239, 1924 (in part) ; Phillips, Man. Mamm. Ceylon, p. 184, 1935 (not *maccarthiæ* Gray).
Herpestes fuscus rubidior, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 233, 1937.

Vernacular.—*Mugatiya* (Sinhalese) ; *Kiri* or *Kiri-pulle* (Tamil).

Locality of the *type*, Anasigalla, Matugama, C.P.

Distribution.—" Throughout the . . . south-west of the island generally from about Panadura, 50 ft., in the Western Province to Matare and Tangalla in the Southern Province," and very probably throughout the greater part of the southern portion of the Western Province (Phillips).

Distinguished from *flavidens* by being on the average a little larger and heavier and redder in its general colouring.

The one well-preserved specimen known to me is the type, an ad. ♂ from Anasigalla Matugama, 100 ft. (W. W. A. Phillips), January 25, which was wrongly identified by Thomas as *maccarthiæ* Gray. The coat is full and longish, thicker if anything than in any of the above recorded skins of *flavidens* from high altitudes in the hilly region of Ceylon, and the general colouring, speckled red and black, is redder owing to the red rings in the contour-hairs being a little more extensive and chestnut in hue; the tail is reddish at the end and the limbs are dark with fine pale speckling. The only other specimen assignable to this race that I have seen was collected at Yatiyantota, 500 ft., in the Southern Province (E. W. Mayor). It is a young, undated skin, faded and moulting, with many of the contour-hairs shed, especially on the belly. Hence the pale reddish speckling is not so conspicuous as in the type and is rather less extensive, but the general hue is redder brown and paler than in the skins identified as *flavidens*.

In the adoption of this race I follow Phillips, to whom it was well known; but, misled by Thomas, he identified it as *maccarthiæ*, the type of which came from Jaffna and represents apparently a distinct race, as recorded below.

The following flesh-measurements (in English inches) and the weights (in lb.) of the type of this race are supplemented by others extracted from Phillips's records :—

	Head and body.	Tail.	Hind foot.	Weight.
Matugama (type); ad. ♂	16¾	11⅝	3	4
Largest ♂ (Phillips)	17½	12⅝	3⅛	4
Average of 10 ♂♂ (Phillips) ..	16	11—	3+	3¼
Largest ♀ (Phillips)	14½	10½	2½+	2½
Average of 5 ♀♀ (Phillips)	13½	10+	2½	2

It will be noted that Phillips's largest ♂ is as large on the average as ♂ examples of the S. Indian race and that his largest ♀ is about the size of the smallest ♂ of that race from the Palni Hills. The table also bears out Phillips's statement that *rubidior* is on the average a trifle larger than *flavidens*.

The skull of the type, the only one I have seen, is just adult, the nasal and maxillary sutures being still open. It is nevertheless well developed, with complete orbits, a relatively high sagittal crest and a constricted postorbital area. As the table of measurements (p. 38) shows it is practically as large as the ♂ skulls of typical *fuscus* from the Palni Hills.

Habits.—This mongoose, according to Phillips, closely resembles the last in its general habits; but it shows a special liking for the mounds of the white ants, or termites, that are plentiful in places it frequents, and when breeding apparently uses them as shelters for itself and for its young.

54 *d*. **Herpestes fuscus maccarthiæ** (Gray).

Cynictis maccarthiæ, Gray, Proc. Zool. Soc. 1851, p. 131, pl. 31.
Onychogale maccarthiæ, Gray, Proc. Zool. Soc. 1864, p. 570.
Herpestes flavidens maccarthiæ, Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 239, 1924 (in part).
Not *Herpestes flavidens maccarthiæ*, Phillips, Man. Mamm. Ceylon, p. 184, 1935 (see above).
Herpestes fuscus maccarthiæ, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 234, 1937.

Locality of the *type*, Jaffna, the northern point of Ceylon.

Distinguished from the preceding races by its generally more uniformly dark, reddish-ochreous hue above and below, the dorsal contour-hairs being only indistinctly speckled with blackish, whereas those of the flanks, belly and tail show no dark speckling; legs darker, dark brown with pale speckling; underwool yellowish-brown, nearly the same colour from base to summit.

No flesh-measurements are available.

No doubt it was the peculiar coloration of this mongoose, very different from that of other species of *Herpestes*, which induced Gray to assign it originally to *Cynictis*, a South African genus with a tolerably uniform, unspeckled tawny pelage. His subsequent reference of it to a special genus, *Onychogale*, was based upon the exceptional length of the claws. But this character was due to the animal having been kept in confinement in the Zoological Gardens, as pointed out by Anderson (Anat. Zool. Res. Yunnan, p. 178, 1878). Neither Anderson nor Blanford paid any heed to the peculiarites of this mongoose, dismissing them apparently as untrustworthy on account of the animal having been kept in captivity. Blanford also seems to have doubted the truth of Gray's statement that it came from Jaffna; but it is highly improbable that either Gray or the collector, Mr. McCarthy, invented that locality. Thomas, unfortunately, overlooked or ignored the record. If he had known of it he would probably have detected the differences between Gray's type and the specimen from south-west Ceylon which he identified as *maccarthiæ* (see above), and its resemblance to his type of *siccatus*, which he believed to be from Mannar.

The skull of the type and only known specimen is comparatively small and poorly developed, although fully adult. The orbits are incomplete behind, and there is no sagittal crest, the temporal ridges forming a narrow lanceolate area on the fore part of the crown and a very low median ridge behind. Possibly the development of the skull was arrested by captivity conditions; but it shows none of the modifications which normally affect the skulls of mongooses and other carnivores when reared from cubhood in a menagerie.

Nothing has been recorded of the habits of this mongoose.

54 e. **Herpestes fuscus siccatus** Thomas.

Herpestes flavidens siccatus, Thomas, Ann. Mag. Nat. Hist. (9) xiii, p. 240, 1924; Phillips, Man. Mamm. Ceylon, p. 187, 1935.

Herpestes fuscus siccatus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 234, 1937.

Locality of *type* possibly Aripo near Mannar, N.P.

Most nearly resembling *maccarthiæ*, but the general colour nearly uniformly sandy or straw-like with very faint brown speckling in the pelage of the back, but more pronounced on the nape and head; the flanks, cheeks, belly and tail without dark speckling; the underfur dark, greyish-brown at the base, much darker than the yellowish hue of its summit; legs darker than the body, brownish speckled with yellow.

The only known specimen, which has no skull or flesh-measurements, was collected by Holdsworth and labelled Kandy; but since it is quite unlike other mongooses from that district Thomas suggested that it probably came from Aripo near Mannar on the north-west coast of Ceylon, where Holdsworth is known to have secured other natural history material. This view is supported by the generally pale hue of the pelage, which suggests an arid habitat. The skin looks like a bleached edition of the type of *maccarthiæ* except for the sharp contrast between the dark base and the yellow summit of the underwool. In my opinion it is not unlikely that the types of these so-called races will prove to represent seasonal phases of a northern Ceylonese race, a view favoured by the locality of the type of *maccarthiæ*; but I know of no other instance of such a marked seasonal difference in *Herpestes*.

Of the special habits of this race nothing is known *.

55. **Herpestes vitticollis** Bennett. The Stripe-necked Mongoose. (Pl. I.)

(For bibliographical references see under the subspecific headings and elsewhere in the text.)

Distribution.—The Western Ghats and some of the adjoining hills of S. India; Ceylon.

One of the largest of the Oriental mongooses, invariably distinguishable by a black stripe, composed of soft underfur and emphasized by the pale tips of the contour-hairs above and below it, that runs along the sides of the neck from behind the ear to the shoulder. The tail, as in *fuscus*,

* From the account of the Ceylonese races of the so-called Brown Mongoose (*H. fuscus*) given above it is clear that there is still much to be found out about those that inhabit the northern districts of the island and the neighbourhood of Trincomalee.



Stripe-necked Mongoose (*Herpestes vitticollis*).



Crab-eating Mongoose (*Herpestes urva*).

is only about two-thirds the length of the head and body, but, unlike that species, the tip of the tail is black; the hind foot is naked below to the heel at all seasons, and the contour-hairs are long and coarse, 70 to 80 mm. on the rump, and variegated with from five to ten coloured bands, usually a combination of whitish, black and chestnut-red, the red

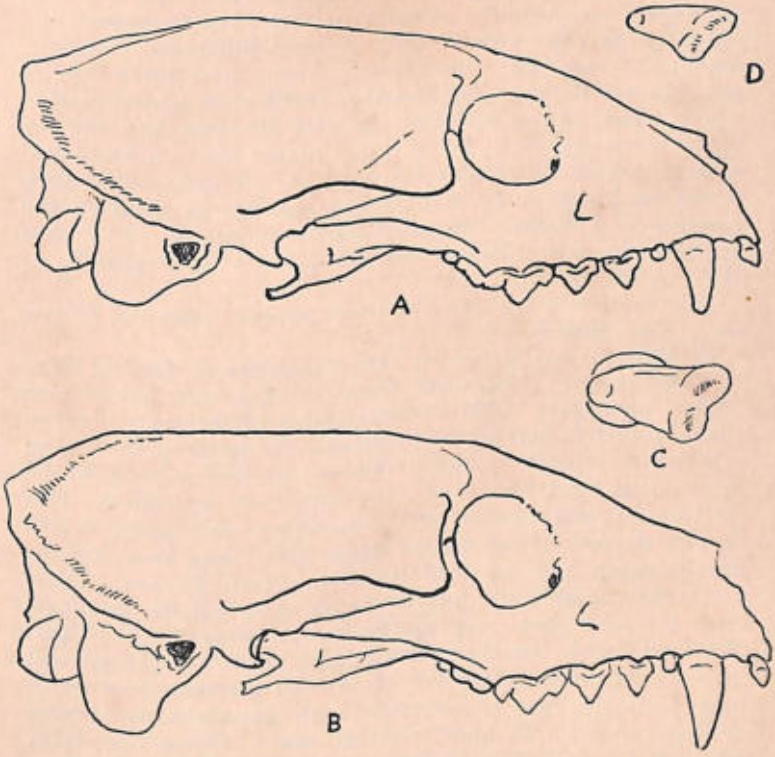


Fig. 4.

A. Side view of skull of adult ♂ of *Herpestes urva* from the Ruby Mines, Burma.
B. The same of *Herpestes vitticollis* from S. Coorg.
C. First upper molar of left side of *H. vitticollis*, showing exceptionally large cingulum on inner lobe.
D. The same tooth of *Herpestes urva*, without cingulum on its inner lobe.

especially prevalent and extensive on the tips of the dorsal contour-hairs, but variable racially and individually in its incidence and extent. The muzzle is typically blackish, the head black but grizzled; the chin and throat dusky and

grizzled ; the belly brownish or reddish, sometimes with grizzly specklings ; the legs are mostly blackish ; and the wool of the back may be olivaceous-grey throughout or buff at the summit and black at the base.

The skull is considerably larger and altogether more robust, with deeper zygomatic arches, than that of the foregoing species ; but the occipital and sagittal crests are less well developed, so that the dorsal profile is more depressed and convexly curved behind. The greatest difference, however, lies in the large size, more conical shape, and lower inferior projection of the posterior chamber of the bulla, a modification which results in the occipital condyles, the hamulars and the upper carnassial teeth being raised higher above a horizontal surface, when the skull rests upon it. A unique character of the teeth, which are more robust and less trenchant, is the presence of a distinct cingulum on the inner lobe of the first upper molar (m^1). There is also a trace of it on m^2 (text-fig. 4, B, C, p. 45).

This species is the type and sole representative of Gray's genus *Tæniogale* (see p. 4).

In 1937, in my paper on the Mongooses of British India already quoted, I refrained from dividing this species into named local races. But re-examination of the skins suggests that two such forms are distinguishable—a southern, the typical race, characterized by the dominance of chestnut-red on the neck, body and tail, and represented by specimens from Travancore and Ceylon, and a northern race, characterized by the absence of red on the upper side, apart from a tinge on the rump and tail, and found in North Kanara. These two races completely intergrade in intermediate localities, both red and dark grey specimens occurring in the Nilgiri Hills and Coorg. On the evidence there appears to be a gradual increase in the development of the red pigment from north to south, which may be associated with increase in the average annual rainfall. Blanford noticed that "Ceylon specimens seem more rufous than Indian." This is true on the average.

55 *a*. **Herpestes vitticollis vitticollis** Bennett.

Herpestes vitticollis, Bennett, Proc. Zool. Soc. 1835, p. 67 ; and subsequent authors, including Blanford, Mamm. Brit. Ind. p. 128, 1888, Phillips, Man. Mamm. Ceylon, p. 190, 1936, and Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 235, 1937 (in part).

Crossarchus rubiginosus, Wagner, Schreber, Säug. Suppl. 2, p. 329, 1841.

Vernacular.—Quoki-Balu and *Kati-Kera* (Coorg) ; *Gal-Mugatiya* or *Locu-Mugatyia* (Sinhalese) ; *Malam Kiri* (Tamil).

Locality of *type* of *vitticollis*, Travancore ; of *rubiginosus* *, "East Indies."

Distribution.—The WESTERN GHATS and other hill tracts at least from Coorg to Travancore ; CEYLON.

Distinguished by the prevalence of chestnut-red tips to some at least of the contour-hairs of the upper side from the neck backwards, the hue increasing in intensity and extent on the hind quarters and largely or wholly concealing the annulations of the lower parts of the hairs ; the tail typically similarly affected.

The following account of some of the skins in the British Museum shows the colour-variations of the specimens assigned to this race.

The type †, procured by Philip Poole in the forests about 20 miles inland from Kolun or Quilon in Travancore, is reddish above from the nape backwards ; on the fore body the hairs are extensively red at the tip, speckled brown and whitish below, but on the rump they are mostly red throughout with pale but no dark banding. Another from Travancore (Fry, no. 86.9.6.1), in good coat and colour, is, like the last, red from the nape to the black tail-tip but not so extensively, the base of the hairs being banded black and yellowish, the black subapical band being conspicuous.

An adult ♂ from Shambaganur, 6,000 ft., in the Palni Hills (McCann), differs from Fry's Travancore skin in having much less red. Hence the black and white speckling of the lower part of the contour-hairs is everywhere more apparent.

Further north great individual variation in colour is shown by skins from the same locality. In a series of eleven skins sent to me by Phythian Adams, from the Nilgiri Hills, the brightest is as intensely and extensively chestnut-red as the skins from Travancore. The dullest is a grey skin, speckled with black and grey over the greater part of the upper side, the grey becoming slightly buffy on the rump ; and on the middle of the loins above and down the back of the thigh the hair-tips are reddish, but not sufficiently extensively to conceal the speckling beneath. The rest of the series show every gradation between these two skins in the development or suppression of the red.

Two additional skins from the Nilgiri Hills (Davison), one from Kotagiri, are about the average tint of Phythian

* As stated above (p. 25) this name was adopted by Kelaart for the Ceylonese Ruddy Mongoose, and Blanford, following him, set it in the synonymy of *H. smithii*. Both these authors, however, overlooked Wagner's statement, detected by Thomas, that his specimen had a black spot on each side of the neck. Not uncommonly in some skins the stripe is apparently reduced to a large spot when its two ends are concealed by the overlapping of the pale hairs above and below.

† Fraser gave a fairly good figure of the type in Zool. Typ. pl. 8, 1846.

Adams's series. The grey skins of this lot are hardly distinguishable from the skins from N. Kanara described below. It is noticeable that in them the black neck-stripe is thrown into relief by whiter hairs above and below it.

An adult ♂ and ♀ from Wottekolle, S. Coorg, 2,000 ft., January 2 and 5 (Shortridge), differ almost as much as the extremes of the Nilgiri series. The ♂ is speckled ochreous and black from the nape backwards, but on the hind quarters and tail and along the sides of the belly the hair-tips are extensively bright red, and there are bright red hairs above and below the black neck-stripe. The ♀ is much greyer, speckled pale buff and black all over the upper side, with some long reddish tips to the hairs on the hind quarters and tail, but nowhere concealing the speckling; the neck-stripe is set off by an ochreous tinge. The capture of these two specimens at the same time of the year shows that the colour-difference between them is not seasonal. The grey ♀, like the grey skins from the Nilgiris, come very near the Kanarese skins (p. 49). A skin from Haleri, N. Coorg (Graham), February, differs mainly from the ♂ skin from Wottekolle in being speckled grey and black, and not so bright a red on the hind quarters.

Several Ceylonese skins, mostly from Gammaduwa, C.P., 3,000–3,4000 ft. (Phillips), vary a good deal in the amount of redness on the upper side, but agree in a general way with the more extensively reddened Indian skins, particularly with Fry's Travancore skin, but on the average the black subapical bands on the contour-hairs appear to be more extensive and more visible as black streaks when the coat is disarranged; the tail also on the average seems to be less extensively reddened, quite commonly showing very little of that colour, but in other skins, particularly one from Gammaduwa and one from Nuwara Eliya (Holdsworth), it is extensively and brightly red. There is apparently no record of grey specimens from Ceylon.

A young cub from Gammaduwa (Phillips) has no red, but is dark tinted all over, brownish on the fore part of the body, blackish on the hind part, but everywhere sparsely speckled with grey or whitish.

Some flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
South Coorg; ad. ♂	20½	13½	4+	7½
South Coorg; ad. ♂	20½	12⅝	4+	6½
Ceylon (Mousakanda); ad. ♂ .	20⅜	11⅞	3⅝	5¾
Ceylon (Mousakanda); ad. ♂ .	20	12⅜	3½	6¾
South Coorg; ad. ♀	19½	12⅘	3⅜	6
North Coorg; ad. ♀	20	10	3½	—
North Coorg; ad. ♀	17	12	3½	—
Ceylon; ad. ♀	19⅝	12½	3¾	3¾
Ceylon; average of 2 ♀♀	18½—	12—	3½	—

In this list the measurements of the ♀ Ceylonese specimens are taken from Phillips's volume. The largest ♂ he recorded had a head- and body-length of 20 in., and the average of 4 ♂♂ was 19 in.; but there are two adult ♂ skins in the Museum sent by him from Gammaduwa and Mousakanda both of which measure 20⅜ in. in length of head and body. The dimensions exceed those of the previously described species, apart from some specimens of *H. edwardsii ferrugineus* from Kangra and Chamba, which are probably exaggerated. The weights also indicate a much more robust species, as might be expected from the size of the skull, of which the dimensions are given below.

55 *b*. **Herpestes vitticollis inornatus**, subsp. nov.

Mangusta vitticollis, Elliot, Madras Journ. x, p. 103, 1839.

Locality of the *type*, Chipgeri, N. Kanara, 16,000 ft.

Distribution.—KANARA, but blending southwards with the typical form.

Very dark grey all over the upper side from the head to the loins, the contour hairs, which are about 80 mm. or more in length on the loins, having small dull buff tips and being otherwise banded black and white, a little red setting in on the rump and spreading over the grizzled part of the tail and down the inner side of the thighs; the underwool, which is tolerably plentiful, is sooty at the base, buff at the summit; the tail-tip, legs, muzzle and neck-stripe are normally black: the neck-stripe is not set off by red, but the hairs just above and below it have more white in them than elsewhere, thus helping to emphasize the stripe.

This description is taken from the type, a ♂ collected by Mr. A. G. Edie, I.F.S., on December 23rd at the locality mentioned above. Its flesh-measurements are:—Head and body 16 in., tail 14 in., hind foot 2½ in. It is obviously a young specimen judging from the lengths of the head and body and hind foot. The measurement of the tail, which is exceptionally long, must have included the hairs at the end. In the made-up skin the tail seems to be of about average length.

There are two additional skins in the British Museum. One is ticketed "Bombay" (Zool. Soc.*), the other is the

* Although entered in the Register as from "India," I have no doubt that it was this specimen of which Fraser (Zool. Typ. pl. 6, 1846) wrote:—"The Bombay specimen in the Society's Collection differs from those shot in Travancore in having the whole of the body grey and in this respect agreeing with Mr. Elliot's specimen." It was probably shipped from Bombay, but killed farther south on the western side of India.

example figured by Elliot. This skin, not measured in the flesh, but a good deal bigger than the type, seems to be about the average size of the species. Like the example received from the Zoological Society it very closely resembles the type in colour, but is evidently a summer skin, since it has only an inappreciable amount of underwool.

This race is distinguished from typical *vitticollis* from Travancore by the general absence of red almost all over the upper side of the body.

North Kanara is probably the northern limit of the range of *H. vitticollis*. In his note on its habits and occurrence in Coorg Shortridge said :—"Although recorded from North Kanara by Elliot, *vitticollis* is probably a rare straggler as far north as that district." According to Elliot his specimen was "procured in the thickest part of the ghat forest by accident. It is very rare, inhabits only the thickest wood, and its habits are little known."

Habits.—In Coorg, according to Shortridge (Journ. Bomb. Nat. Hist. Soc. xxii. p. 501, 1913) this mongoose is "not uncommon but is very much less plentiful and more local than *M. mungo* (=*Herpestes edwardsii*). Unlike most of the small South Indian Carnivora, *vitticollis* seems to be less plentiful in the neighbourhood of habitations, and is probably a typically forest form that has not learnt to become parasitic on village poultry and house-rats. Like the common species it hunts a lot by day. One was shot crossing a jungle track midday." He noticed that in the living animal the snout has a slight but characteristic upward curve.

Shortridge also made the interesting observation that the "sack-like depression beneath the tail is very large and conspicuous," more so than in *H. fuscus* and *edwardsii*. This has an important bearing on a note by Phythian Adams (Journ. Bomb. Nat. Hist. Soc. xxxiv. p. 1054, 1931) about a specimen killed by his dogs in thick bush on the bank of a stream at 7,500 ft. in the Nilgiri Hills. "After the tussle I found the coat of all three dogs reeking with a musky scent, which lasted for some time in spite of their rolling in the water." Phythian Adams attributed this to discharged urine. No doubt it was due to the secretion of the anal glands ejected to deter the dogs. As recorded below (p. 56) *H. urva* also has this habit, and both species are distinctively marked with a stripe on the neck, suggesting that this mark is for ready recognition. Kinloch, who watched a pair of *H. vitticollis* in the Nelliampathy hills, described the black neck-stripes as "very conspicuous" (Journ. Bomb. Nat. Hist. Soc. xxix. p. 553). Not improbably the bright chestnut-red colour of most skins of this Mongoose serve the same end.

In Ceylon, where it is called the Badger Mongoose, this species, according to Phillips, occurs exceedingly locally botb in the wet and dry zones of the hills and low country, up to 7,000 ft. in the Horton Plains, 3,000 ft. around Gammaduwa, both in the C.P., and as low as 20 ft. along the banks of the Menikganga, near Yala, S.P., where it is not uncommon. It has also been recorded from near Kanthalai, 50 ft., in the N.C.P., and one was shot in the Kalutara District of the W.P.

It is seldom seen anywhere near human dwellings, and is often found on the banks of rivers or near swamps, seldom far from water, and spends much of its time grubbing about in soft, damp soil. It preys upon mouse-deer, hares, bandicoots, rats, jungle-fowl, small birds and their eggs, reptiles, insects, certain roots, and probably, Phillips thinks, on frogs, fish, and freshwater crabs.

A female with three cubs, just able to move, was discovered on May 22, suckling them on a dry patch of earth under an overhanging rock amongst a mass of boulders in the jungle. The young stay with the parents until well grown.

55 *c*. **Herpestes urva** Hodgson. The Crab-eating Mongoose. (Pl. I.)

Gulo urva, Hodgson, Journ. As. Soc. Beng. v, p. 238, 1836.
Urva cancrivora, Hodgson, Journ. As. Soc. Beng. vi, pp. 561–4.
Mesobema cancrivora, Hodgson, Journ. As. Soc. Beng. x, p. 910.
Herpestes urva, Anderson, Zool. Res. Yunnan, p. 189, pl. 9, figs. 5 & 6, 1878; Blanford, Mamm. Brit. Ind. p. 129, 1888; and subsequent authors, including G. M. Allen, Amer. Mus. Novit. no. 359, p. 8, 1929.
Urva hanensis, Matschie in Filchner's Exp. China-Tibet, p. 190, 1907.
Herpestes urva annamensis, *formosanus*, and *sinensis*, Bechthold Zeitschr. Säug. xi, pp. 150–2, 1936.

Vernacular.—*Arva* (Nepalese); *Mwe-ba* (Burmese).

Locality of *type* of *urva* and *cancrivora*, Nepal; of *hanensis*, Hankow; of *annamensis*, Phu Qui, Annam; of *formosanus*, Formosa; of *sinensis*, Kuangtung.

Distribution.—Nepal, Assam, and Burma to S. China including Formosa and Hainan, Laos, Tong-king; also Annam and the northern part of the Malay Peninsula.

A large mongoose, with a comparatively short tail, not more than two-thirds the length of the head and body, a stripe of white contour-hairs extending from the corner of the mouth to the shoulder, and the sole of the hind foot hairy nearly down to the hallux. General colour above black and white, the contour hairs white at the tip to a varying extent, when extensive giving a badger-like appearance to the pelage, the subterminal band extensively black, the under hair ochreous or rusty, dark grey close to the skin; tail with its base like

Skull-measurements (in mm.) of *Herpestes vitticollis* and *H. urva*.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
H. vitticollis.								
S. Coorg, Wottekolle; ad. ♂	103	58	19	22	22	72	10 × 7½	9+
N. Coorg, Haleri; ad. ♀	98	54	20	21	21	70	9½ × 8	9½
Ceylon, Gammaduwa; ad. ♂	100	57	19	23	21	71	10 × 7	9
H. urva.								
Naga Hills, 5,600 ft.; old ♂	98	55	13	20	21	66	9	9
Burma, Ruby Mines; ad. ♂	98	56	17½	20	20	67	9 × 6½	9+
Burma, Toungoo; ad. ♂	97	56	15	21	21	69	9 × 7	9−
Nepal, Gorkha; ad. ♀	95	54	13½	18	19	65	9 × 6½	9−
Nepal, Gorkha; ad. ♀	90	52½	15	20	19	63	9 × 7	9

the back but becoming progressively ochreous or flavous towards the tip ; head blackish or brown, speckled, contrasted with the brown muzzle ; belly brown, speckled, some black on the chest and hind throat, but fore throat, chin and lower cheek white ; legs black with very little speckling.

Skull much more robust than in *edwardsii*, *smithii*, and

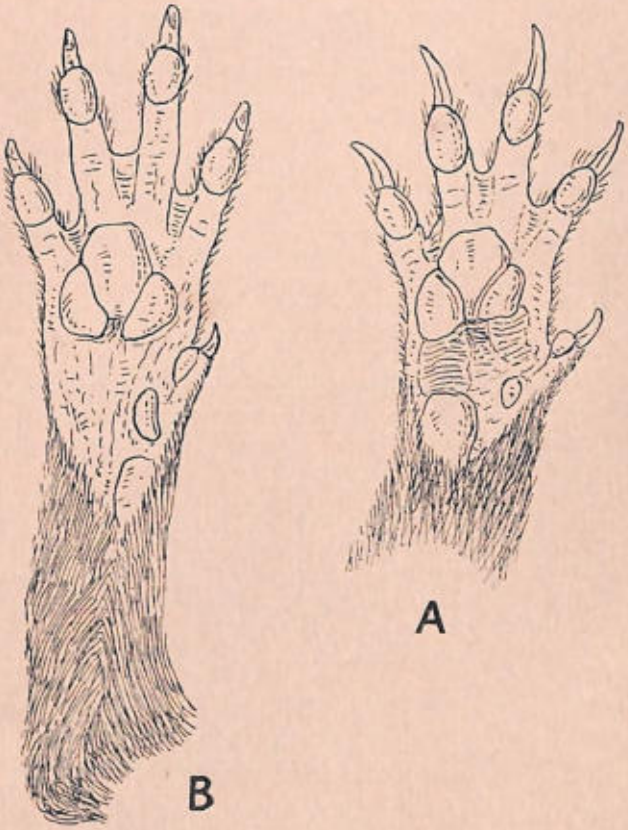


Fig. 5.

A. Lower side of right fore foot of *Herpestes urva*.
B. The same of right hind foot.

(Drawn from dried skin from South China.)

fuscus, its dorsal profile very like that of *vitticollis*, the occipital and sagittal crests being weak so that it is sloped posteriorly, but the bullæ and teeth, although the teeth are a little larger, much as in the three first-mentioned species (text-fig. 4, A, D, p. 45 ; also fig. 2, p. 6).

The following notes on skins in the British Museum are added to show the individual variation, seasonal and otherwise, and to justify the synonymy given above.

Nepal. Four of Hodgson's specimens show great variation in colour. One is well coloured, the contour-hairs, 58 mm. long, being black and whitish, the plentiful wool bright buff, or ochreous at the summit, dull brown at the base; the hairs of the ventral surface are brown turning to grey at the base; the legs blackish with a little pale speckling above the paws; the tail like the back at the base, becoming more and more ochreous towards the tip, but the hairs are short and broken here and may have been grey-tipped. A second, marked "cotype," is a moulting skin in dead coat, with the wool quite pale yellowish-white at the summit and tail not nearly so ochreous. A third, also a co-type, is like the last, but has the legs chocolate and the dark bands of the contour hairs deep brown, not so black. The last offers the greatest contrast to the first, there being no yellow in the contour-hairs or in the wool which is sooty grey; the hairs of the tail are yellowish-grey at the base, then black with a grey tip.

Of two from Gorkha, N.W. Nepal (Baptista), one, November 26, agrees closely with Hodson's first, the other, December 20, has the white tips of the contour-hairs more extensive, and the wool not quite so rich. Another from Nepal (Inglis) is duller in its wool, like Hodgson's co-types.

Darjeeling. A skin from Pashok (Crump), 3,000 ft., October 6, is like the Gorkha skin of December 20. One from Hasimara, Bhutan Duars, 600 ft., February 23, closely matches Hodgson's richly coloured skin; but one from Rajapara, S. Kamrup, 600 ft., November 17, has very little bright tint except on the tail-tip, and fits in with Hodgson's duller skins. So also does one from Tura in the Garo Hills, 1,300 ft., the date being uncertain.

An old ♂ from the Naga Hills, Assam, 6,500 ft. (Frost), February, is dark grey, the hair-tips being whitish, the under-colour ochreous and the tip of the tail rusty ochreous, the coat being 70 mm.

An undated skin from Sadya, N.E. Assam, has a full long coat, about 70 mm., and has the rich ochreous under-colour of the Darjeeling skin, but the tips of the contours are more extensively white.

Burma. An undated skin from north of Mogaung, near the source of the Chindwin River (Capt. Abbey), is well coloured like the skin from Sadya, but has the under-colour darker almost rusty ochreous, a yellow wash on the tips of the contour-hairs of the back and the hairs of the tail mainly ochreous. One from the Chin Hills, November 13 (Hopwood), is very different from the last, being dull coloured with the wool

drabby and the white tips of the contours small. One from 20 miles N.W. of Kindat, 600 ft. (Mackenzie), April 19, is apparently moulting, there being no wool on the back but abundance on the flanks and purplish-grey in colour. An adult ♂ from Thaudaung, near Toungoo, 4,500 ft., April 7, is very like the skin from Sadya, with a similar faint yellow wash and almost ferruginous-tipped wool. This skin also resembles the brightest of the Nepal series: but one from Tharawaddy agrees very well in colour with the duller Nepalese skins, although the coat has only a little greyish wool. Finally, a skin from Rangoon, March 7, has the contour-hairs black and white and 70 mm. long, and the wool rather dull, greyish-buff.

The above described skins ranging from Nepal to S. Burma in British Indian territory are, broadly speaking, so much alike, and show so many cross resemblances in localities remote from each other, that it is impossible to sort them into local races. The same applies to all the other skins in the British Museum from adjoining countries outside these limits. One from Xien Quang Koo, Laos, Jan. 10, five from Backan, Tong-king, 500 ft., December 17 to January 11, one from Phu Qui, Annam, 100 ft., the type of *annamensis*, Bechth., all collected by Delacour and Lowe, and correctly, in my opinion, identified by Thomas and Osgood (Field Mus. N. H. Zool. xviii. p. 260, 1912) as typical *urva*, are in well-coloured winter coat and are inseparable from N. Indian and Burmese skins. Also the following Chinese skins, one undated from Tengyueh, Yunnan (Howell), and one from Foochow, March, one from Fokien, January 7, one from Chung Yang, S. Hupeh, January, one from Chinteh, Anhwei (Nyanhwei), May, and three from Bankoro, Formosa, fit in with the Indo-Chinese, Burmese, and Indian skins. The Chinese skins have a bearing on the synonymy I have given of *H. urva*. Hankow, the type-locality of *hanensis* Matschie, lies between Hupeh and Anhwei, and the likeness between my skins from these two districts and Indian and Burmese skins of typical *urva* confirms G. M. Allen's opinion that the alleged distinctive characters of *hanensis* have no systematic value. My two skins from Fokien, whence Allen had a good series, also support this view that the Crab-eating Mongoose of that district is inseparable from typical *urva*; and the agreement between the Fokien and Tong-king skins hardly admits of a doubt that the Kuang-tung skins, described by Bechthold as *sinensis*, represent the same Mongoose. Three skins from Formosa in the British Museum I am unable to distinguish by any reliable character from Hodgson's Nepalese series. The alleged difference in the coat, on which Bechthold relied when describing *formosanus*, is probably seasonal, if existent. At all events in

immature specimens from Formosa the contour-hairs of the rump are 65 mm., whereas in two adult Nepalese specimens in good coat they are respectively 62 and 72 mm.

To the following table of flesh-measurements in English inches of the few British Indian skins of which the dimensions were taken have been added those of some examples from Indo-China.

Locality and sex.	Head and body.	Tail.	Hind foot.
Naga Hills ; ad. ♂	23½	16⅜	4
Backan, Tong-king ; ad. ♂	22	12⅛	4—
Toungoo, Burma ; ad. ♂	20½	13⅜	4+
Gorkha, Nepal ; ad. ♀	20⅜	12½	4+
Gorkha, Nepal ; ad. ♀	18⅜	12⅛	4—
Toungoo, Burma ; ad. ♀	19½	12½	4+
Backan, Tong-king ; ad. ♀	20⅛	12½	4—
Phu Qui, Annam ; ad. ♀	18⅝	11⅜	3⅛

There is very little difference between the sexes. It may be noted that the two ♀ specimens from Nepal agree respectively very closely with the two from Indo-China. Of the latter the one from Annam is the type of *annamensis*, Becht.

The weight of one of Mackenzie's Toungoo specimens, a ♀ with the head and body 18 in., was 4½ lb. The weight of an adult ♂ would perhaps be about 6 lb.

Habits.—Although this Mongoose is reported to live in holes in the ground, and no doubt lies up in rock crevices or similar places providing shelter, it is more aquatic in its habits than other species, and feeds chiefly, according to Hodgson, upon frogs and crabs which "abound in the Himalayan and Burmese streams." That it must also be a diver and swimmer, fearlessly entering water in pursuit of fish, is proved by Crump's repetition of Mr. Lister's verbal report to him that at Pashok in Darjeeling a specimen repeatedly visited a tank stocked with gold-fish. It took many of the fish, and must have dived from the side of the tank to secure them (Journ. Bomb. Nat. Hist. Soc. xxiv, p. 484, 1916). Like other mongooses, however, it probably preys upon any mammals, birds, and reptiles that it can overcome, and upon eggs and possibly insects as well. Since Crump failed to get even a sight of the species, although he kept a sharp look out for it in the low valleys in Sikkim, it may be inferred that it hunts mainly by night.

Since a ♀ with two young was brought to Mell in S. China, it may be inferred that the litter is small as in other mongooses.

To Hodgson we owe the interesting observation that this mongoose makes use of the secretion of the anal glands in the same way as the skunk and many of the weasel family.

He described the secretion as "aqueous, horribly fœtid, and projectile to a great distance by the living animal," the direction of the squirted jet being obliquely backward and outwards, so that its odour is spread as widely as possible *.

Since this protective faculty is associated with the badger-like whitish-grey hue of the exposed upper side of the body and of the whole of the tail, accompanied by the conspicuous white stripe on the side of the neck, it can hardly be doubted that this mongoose, as I suggested in 1911 †, comes into the category of the Carnivora that are coloured for visibility and ready recognition, commonly called "warningly coloured." This phenomenon is rare in the Æluroid species of the order, although occurring in some of the Civet family (see vol. i, pp. 413, 430, 458), but is manifested by many of the British Indian representatives of the Weasel group.

Fearlessness, such as is shown by the skunk, for example, is a common characteristic of such animals. Mr. C. H. Pope's remark, quoted by G. M. Allen ‡, that by the Chinese at Futsing this mongoose "is sometimes called 'blind cat' in reference to its apparent nearsightedness, for it may be approached more readily than most wild animals," is corroborative evidence of its fearlessness and warning coloration, not of its nearsightedness. Possibly the habit, also recorded by Pope, of several specimens when alarmed dashing about "in circles, one following close behind the other," is also associated with advertisement. Such behaviour is quite unlike the bolting to cover practised by most defenceless mammals when danger is afoot.

General Habits of British Indian Mongooses.—Although some special notes regarding the occurrence and mode of life, mostly recorded by collectors for the Mammal Survey, have been inserted in the foregoing pages under their appropriate headings, the following summary of their habits in general may be added.

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* From Hodgson's description (Journ. As. Soc. Beng. vi. p. 563, 1837) it might be inferred that this species has no glandular anal sac such as he described in his *auropunctatus*, *nepalensis*, and *nyula*; and Dr. Campbell, who on the following page of the same volume described in some detail the structure of the normal anal glands, each of which had a large orifice, was as "large as a cherry," and secreted a "whey-coloured, fœtid fluid," did not mention the sac. I have had no opportunity of examining a fresh specimen; but in all the well-made skins I have seen the anus is surrounded by a wide area of naked skin forcibly suggestive of the sac.

† Ann. Mag. Nat. Hist. (8) viii, p. 756.

‡ 'The Mammals of China and Mongolia,' p. 445, 1938. Mr. Pope's further remarks cited by Allen about this Mongoose being commonly found near streams in this district and being called the loach-cat in allusion to its supposed fondness for these fishes indicate identity in feeding habits between British Indian and Chinese specimens.

With a few modifications due to differences of environment the habits of the British Indian Mongooses, at all events of the commoner kinds, appear to be very similar. Judging from the large number of specimens collected by the Mammal Survey, they are a dominant feature in the Carnivore fauna of the country; and of all the Æluroid Carnivores they are the species which most closely resemble in mode of life the stoats and weasels of the Arctoid section, being alert, active, usually fearless creatures, with the habit of sitting erect on their hind quarters to increase their range of vision. Although able to climb trees to a certain extent, they seldom do so, but spend most of their time on the ground hunting by day as well as by night, generally singly or in pairs, and lying up for repose or breeding in burrows they dig for themselves in the ground or in termite mounds or in natural shelters like rock crevices. They will eat fruit or other vegetable substances to a small extent, but are mainly predatory, preying upon any mammals, birds, or reptiles they are capable of killing, upon the eggs of the last two classes and upon insects, scorpions, and other invertebrated animals. They have deservedly earned for themselves a reputation for vermin killing; and in this respect they are superior to cats, because they can enter the burrows of their prey or dig it out, and fearlessly attack snakes and other noxious pests which cats will seldom deal with. If captured young enough they can be easily tamed, and when given the run of bungalows prove most efficient agents in keeping the place free of rats, snakes, scorpions, centipedes, and other objectionable intruders. They have been similarly used for clearing rats from ships, and the small north Indian species (p. 34) was in 1872 introduced by Mr. Esperit into Jamaica to combat the pest of rats which was inflicting great damage on his sugar-cane plantation. So successful did the experiment prove that planters in adjoining islands subsequently adopted the same policy.

In India they are especially valued for keeping down the numbers of poisonous snakes like the cobra, krait, and Russell's viper. Naturally they kill snakes of all kinds, and Sterndale records that a tame specimen in his possession seemed to know instinctively the difference between venomous and non-venomous species. Combats between mongooses and cobras, which are often staged by itinerant showmen, have been repeatedly observed and described, and the general opinion of eye-witnesses is that the apparently invariable success of the mongoose is due to its extreme activity in dodging the snake's stroke by means of side leaps and pouncing upon it before it has time to recover its defensive attitude. But there are certain discrepancies in the accounts and opinions of these encounters. Phillips, for instance, when

writing about the Ceylonese race of the Common Grey Mongoose, expressed his doubts as to its often attempting to kill large cobras under natural conditions, although admitting that in captivity it may be encouraged to do so. In his description of such a fight staged at the Colombo Museum between one of these mongooses and a very large cobra he remarked that the mongoose did not " appear to be particularly concerned in avoiding the stroke of the snake or in seizing it close to the head. It bit the snake whenever opportunity offered, and at one time held it by the lower mandible." In some similarly arranged fights in southern China between cobras and the Red-fronted Mongoose (*H. rubrifrons*), which, in my opinion, is merely a subspecies of *H. javanicus*, Pope, as recorded by G. M. Allen (Mamm. of China and Mongolia, p. 442, 1938), noticed that the mongoose attacked the snake head-on, fearless apparently of being bitten on the head, but took care to keep its body out of reach of the fangs. It showed no desire to pounce on the back of the snake's head, but seized it by the muzzle as it struck, so that the jaws of the two combatants were often interlocked, the mongoose holding on and every now and then giving a vicious shake, until it succeeded in crushing its adversary's skull.

It is a habit of mongooses when enraged to erect the long hairs of the body and tail so that their apparent bulk is more than doubled ; and, when a cobra is attacked, this has the effect of presenting to the snake's aim a large area through which the fangs will pass harmlessly. It is noticeable, too, that when the coat is raised in this way the coloured bands run together into alternate dark and light stripes, which when the mongoose is in rapid movement no doubt blur its outline and generally decrease its visibility so as to render the snake's aim less certain. Fischer (Journ. Bomb. Nat. Hist. Soc. xxviii, p. 274, 1921) noticed that a tame example of *H. edwardsii edwardsii* he had at Triplicane, Madras, looked twice its natural size with its coat raised. When three months old it killed and ate several frogs, always seizing them by the head, at least one rat, several scorpions and centipedes, besides abundance of insects. It showed a preference for frogs, rats, scorpions, and fat locusts. It took no precautions when attacking scorpions and centipedes, and on one occasion seized and carried about a scorpion whose sting was pressed against its cheek. It was, on the contrary, very friendly with the dogs and human beings of the household.

At Porbander, in Kathiawar, E. O'Brien (Journ. Bomb. Nat. Hist. Soc. xxvi, p. 660, 1919) saw a mongoose (*H. edwardsii nyula*) attacking a hedgehog. It kept on scratching and biting at its rolled-up prey, and after a long time eventually succeeded in getting hold of some part of it and gradually

forced the hedgehog to unroll. Thereupon he dragged it under a bush and finally ate it, beginning with the head.

Fischer concluded that his mongoose was immune to the poison of scorpions and centipedes. But mongooses are not immune to snake's venom. This has been proved experimentally, and might be inferred from the care they habitually take to avoid being bitten at least in a vulnerable part; but, as is the case with some other carnivores, there is less susceptibility to the poison than is shown by many other mammals, including man. As Blanford remarked, there is, of course, no truth in the belief, probably still prevalent in India, that a mongoose when bitten by a cobra retires to the jungle to look for a plant known as *manguswail*, which, when eaten, acts as an antidote to the venom.

Despite their value to man as vermin killers, mongooses often cause considerable loss to poultry owners by breaking into hen-coops and wantonly killing all the occupants. Tamed mongooses, it seems, cannot be cured of this natural instinct.

According to Sterndale, his tame specimen of the Common Mongoose, already referred to, dealt with eggs by holding them between its fore paws, making a small hole in the narrower end, and sucking out the contents. In the London Zoological Gardens I never saw hen's eggs managed in that way. The method was to grasp the egg in the embrace of the fore legs, to lift it some inches by rearing on the hind legs, and smash one end of it by banging it on the floor of the cage.

Special protective significance of the anal glands is recorded above in the case of the Stripe-necked Mongoose and the Crab-eating Mongoose (pp. 50 and 57). There is no evidence that other British Indian species are similarly endowed; but I have frequently seen Indian mongooses in the Zoological Gardens rub the anal sac against the walls of the cages, as if with the object of scenting the place with their own perfume, a habit also practiced by Civets and Palm-Civets, as recorded in Vol. I.

Two somewhat detailed accounts of the breeding of two species of Indian mongooses may be taken as probably applicable in a general way to the rest, allowance being made for variation in the gestation period.

Powell, as recorded above (p. 34), kept in 1914 a tame ♀ example of *H. javanicus auropunctatus* at Ghazipur. She paired with a wild ♂ on July 11 and produced a litter of three on August 23, the period of gestation being 43 days, or just over six weeks. The mother, perfectly tame at other times, was savage both before and for some time after the birth of the young, and Powell concluded that under natural conditions the male leaves the female to herself after pairing and takes no share in the protection of the young.

The second account by Frere (Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 428, 1929) relates to the other species, *H. edwardsii edwardsii*, of which he had a ♀ captured when young at Cannanone, N. Malabar. In February 1927, when about 9 months old, she took to wandering away from the bungalow, and in the following May gave birth to a pair of young in the roof of the dwelling, the period of gestation being at least 60 days. Some ten days after the birth she carried one of the young, a ♂, down to the room beneath, and subsequently appeared with the other, a ♀. This soon died; but the ♂ stayed with his mother until, in September, when he was about half grown, a second pair of young was produced in the roof. In this case again the ♀ died, leaving two young ♂♂ with the mother. At the end of October and the beginning of November the older of the two ♂♂ was seen to couple with his mother on several occasions, and at Christmas a third litter of two, ♂ and ♀, was born, the period of gestation being again about 60 days. During the first four days of April 1928 the mother and the first ♂ were seen to couple again, half a dozen times or more at intervals of a few minutes; but on April 28 she coupled in the same way with the younger ♂, and produced a pair of young on July 5th, the gestation period in this case being at least 65 days *. The ♀ produced her fifth litter on October 28 or 29, 1928. She thus bred no fewer than five times in a little over a year and a half, and showed that she had no definite breeding season.

There is considerable difference in the period of gestation between the two species, according to these accounts—six weeks in the case of the smaller *javanicus* and about nine weeks in the larger *edwardsii*. Possibly it is over nine weeks in the still larger species *vitticollis* and *urva*.

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* Frere, curiously enough, attributed this litter to the coupling at the beginning of April, and was puzzled by the coupling of the ♀ nearly a month later, when he thought she was already in young. His statement that the number of days from April 4 to July 5 is 60 was clearly an error—it is over 90.

Family HYÆNIDÆ.

Distinguished from the other families of Æluroid Carnivores by the sum of a number of important characters, external, cranial, and dental. The ear is large, high and pointed, with simple basal ridges, but no marginal bursa; the tufts of facial vibrissæ are normal in number, but the vibrissæ are not long; the rhinarium is large, convex above, with rather deep infranarial portions and a distinct philtrum dividing the upper lip. The tail is from about one-fourth to one-third the length of the head and body; and the hind quarters are lower and less powerfully developed than the fore quarters. The legs, especially the fore legs, are longish and slender; the completely digitigrade feet, with only four toes on each, are compact and like those of the typical Canidæ, the claws being short, blunt, and not retractile, the toes symmetrically paired, webbed up to the pads, and held together by the thickened elastic edge of the webs; the pads themselves are not oval but broad and truncated behind, narrowed at the tip, with the outer edge lightly convex, the inner lightly concave; the area between these pads and the plantar pad, which is narrow and cordate, obscurely trilobed and rather deeply and widely emarginate behind, is very sparsely covered with short hairs on the webs; the fore foot is long from the wrist, the carpal pad, which is small, rounded and nearly median in position, being set high above the plantar pad, the area between them being clothed with longish hairs; the hind foot is covered with hair from the hock downwards, there being no trace of metatarsal pads (fig. 7, p. 64).

There are no perinæal scent-glands, but above the anus there is a capacious pouch of naked skin into which the enlarged anal glands open remote from and some distance above the anus, and numerous supplementary enlarged sebaceous glands occupy the dorsal area of the pouch between the orifices of the anal glands and externally to them *. In the genital organs of the ♂ the scrotum is represented merely by a naked obscurely

* This pouch and its glands in the three species of Hyænas were described by Daubenton in 1761, by Murie (Tr. Zool. Soc. vi. p. 505), Watson (Proc. Zool. Soc. 1877, p. 369, and 1878, p. 416), Mivart (Proc. Zool. Soc. 1882, pp. 198 & 201), and myself (Ann. Mag. Nat. Hist. (8) xvii. p. 330, 1916).

bilobed area of naked skin just below the naked tract surrounding the anus, and the penis, which is boneless, very long and protrusible, has its prepuce situated far in advance of the scrotum. The ♀ external genitalia vary in the two genera of this family, as recorded below.

Skull characterized by its short massive jaws and compressed cranial portion, which becomes gradually carinate from below dorsally to the summit of the sagittal crest;

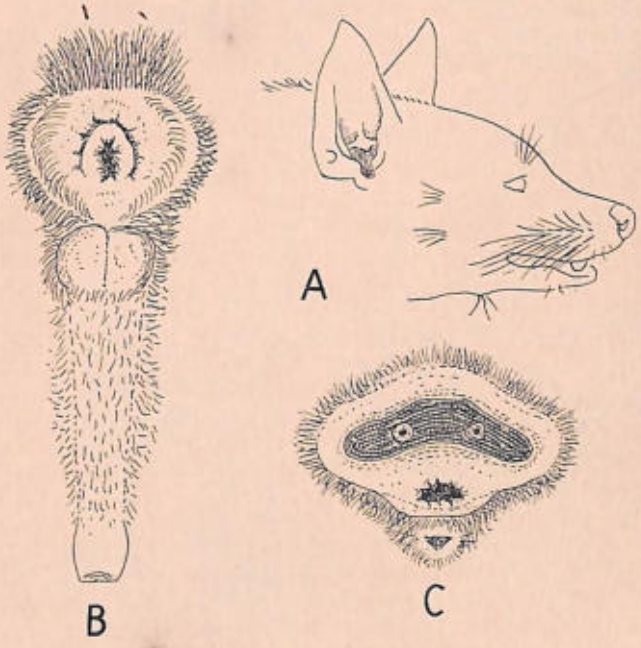


Fig. 6.

A. Head of Striped Hyæna (*Hyæna hyæna*), showing especially the large pointed ears with the greatly reduced crescentic bursa.
B. Anus and external genitalia of ♂ Striped Hyæna, showing the anus sunk in the closed glandular sac, the small scrotum with the prepuce far in advance of it.
C. The same of the ♀, with the glandular sac expanded above the anus and the apertures of the two anal glands in the sac above the orifice with the vulva just below it.

the occipital area also narrow and triangular, with a median vertical bony crest; the alisphenoid canal, with the foramen rotundum opening into it, sometimes complete, with its posterior orifice, when present, generally very small, but more usually closed, the variation being the same as in *Viverricula*; the external auditory bone with a tubular bony orifice, as in

the Herpestidæ, but the bullate portion evenly swollen and without trace of groove marking the position of the partition, which lies far back and is horizontal, the entotympanic portion being very small, smaller than in any family of the Æluroidea * ; the paroccipital process large, projecting below

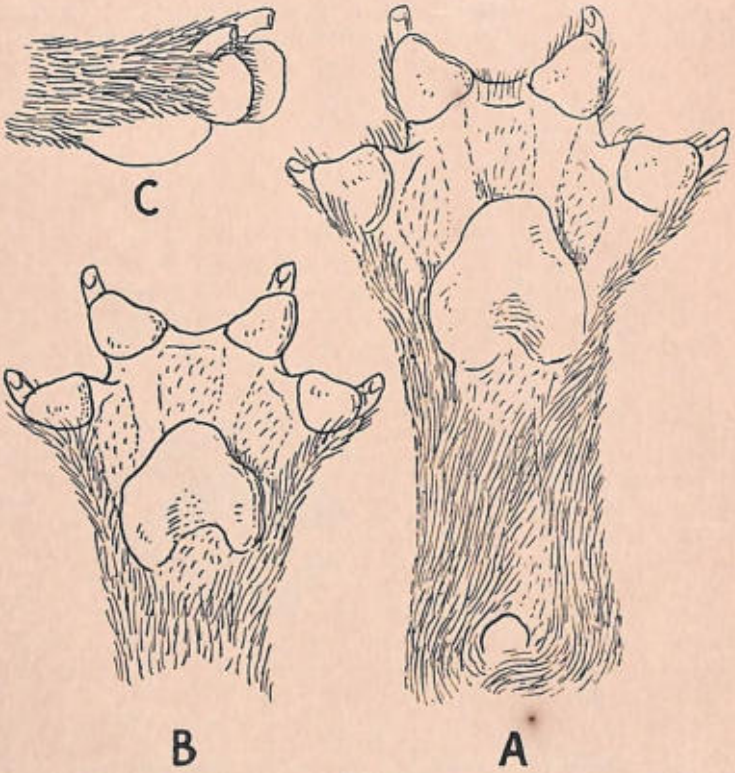


Fig. 7.

A. Lower side of left fore foot of Striped Hyæna, with the digits spread, showing their symmetrical arrangement and the extreme digitigrade condition of the foot.
B. The same of left hind foot.
C. Side view of left hind foot with digits in contact.

* Blanford, following the text-books of his time, said the alisphenoid canal is absent and the bulla undivided in the Hyænas. Cuvier, however, stated, quite correctly, in 1837 that the canal may be present or absent. This I confirmed in 1916 (Proc. Zool. Soc. 1916, p. 442), and in the same volume (p. 303) I had previously shown that the bulla in all Hyænas is divided into a larger outer or anterior chamber and a smaller inner or posterior chamber by a strong partition which only differs from that of other Æluroid Carnivora in being set far back and horizontal in direction.

the bulla ; the prepalatine foramina set forwards on a level with the second premolars.

Teeth highly specialized and adaptively approaching those of the Felidæ in number, position, and other particulars, the upper and lower carnassials (pm^4 and m_1) being set far back at the point of maximum efficiency of the jaw, and the inner lobe (protocone) of the upper jutting inwards at right angles to the axis of the outer portion of the tooth which carries three large cusps, the first and second stout and conical, the third or posterior blade-like ; the premolars in front of the carnassials are much stouter, less compressed and trenchant than in the Felidæ; the first upper premolar, however, is comparatively small and functionless, and the first lower absent ; the canines are relatively smaller and less piercing than in the Felidæ. The dental formula is $i.\ \frac{3}{3}$, $c.\ \frac{1}{1}$, $pm.\ \frac{4}{3}$, $m.\ \frac{1\text{ or }0}{1}$ (fig. 8, p. 66).

Genus **HYÆNA** Brisson.

Hyæna, Brisson, Reg. Anim. ed. 2, xiii, p. 169, 1762 ; and of all recent authors (*sensu stricto*).

Type, *Canis hyæna* Linn.

Distribution.—South-western Asia and INDIA ; North Africa as far south as Tanganyika ; South Africa.

A long crest-like mane extending from the head to the root of the tail ; pattern, when visible, consisting mainly of vertical dark stripes on the body and transverse bars on the upper parts of the legs ; newly born cubs like the parents in colour and pattern. Vulva normal, situated just beneath the naked anal area, from which it is separated by a narrow tract of hairy skin. The upper molar retained, about three times as wide as long and situated, as in the Felidæ, on the inner side of the hinder end of the upper carnassial and axially at right angles to it ; lower carnassial with a distinct conical internal cusp (metaconid) and a small but quite distinct " heel," which closes against the upper molar.

This description distinguishes *Hyæna* from the only other genus of the family, *Crocuta*, represented by the so-called Spotted Hyæna of Africa. In *Crocuta* there is no differentiated dorsal mane, the pattern consists of spots, and the newly-born cub is uniformly blackish-brown, this tint being gradually replaced by tawny as age advances, the spots being the remnants of the original tint. The vulva is elongated and penis-like *. The upper molar is absent or very small and

* This peculiar modification is the source of the idea that the Spotted Hyæna is hermaphrodite.

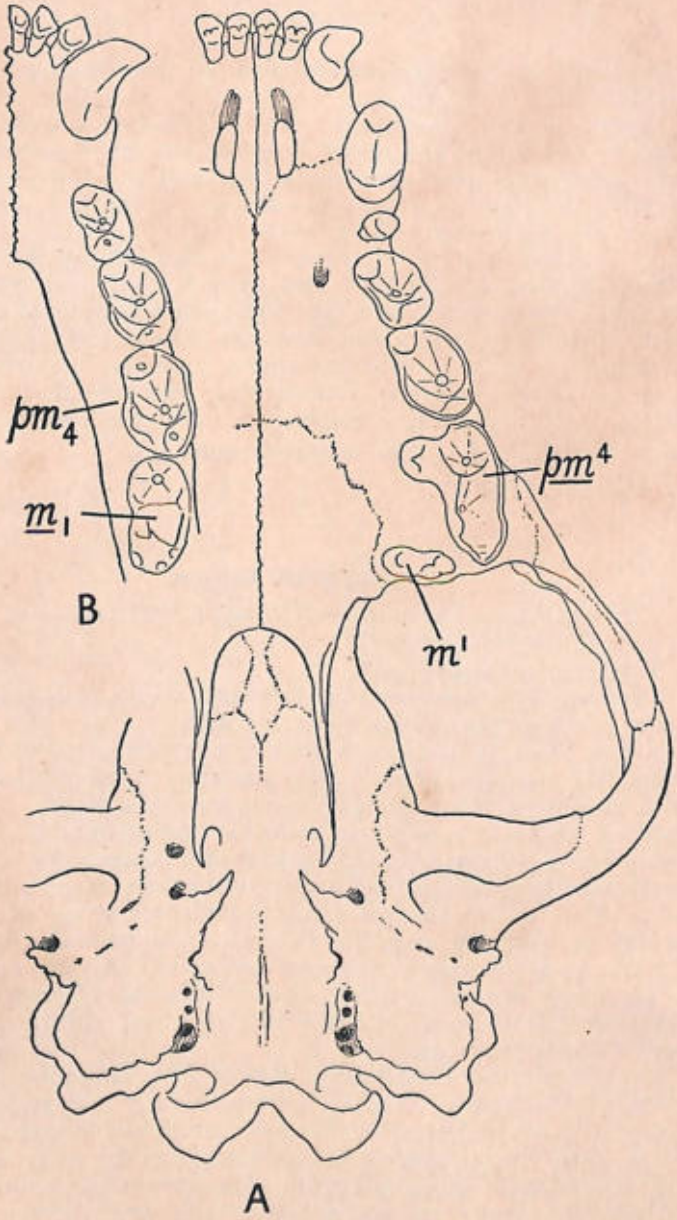


Fig. 8.

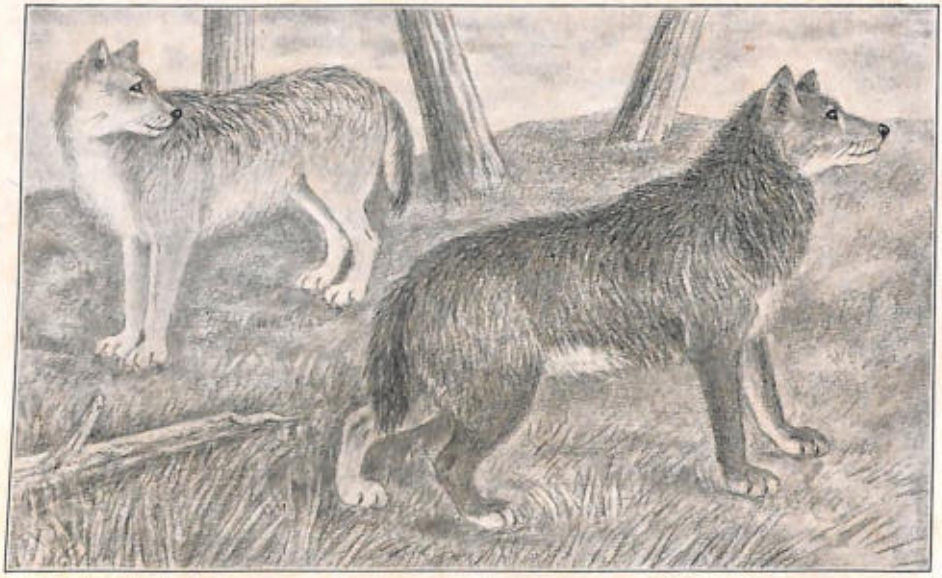
A. Lower surface of skull, with the right side of the face omitted, of Striped Hyæna (*Hyæna hyæna*), showing the palate, bulla etc. and massive dentition, with pm^4 the upper carnassial and m^1 the reduced and only upper molar.

B. Lower teeth of the right side of the same, with pm_4 the fourth premolar, the first being absent, and m_1 the lower carnassial.


CALCUTTA



Striped Hyaena (*Hyaena hyaena*).



Woolly Wolf (*Canis lupus chanco*).
Normal pale phase from Ladakh ; black phase from Tsomoriri Lake, Kashmir.

functionless, and the lower carnassial has no cusp on its inner surface, and the heel is reduced to a narrow ridge-like thickening. It is quite clear that the genital and dental differences between the Striped and the Spotted Hyænas are much too great to admit of the inclusion of the two in the same genus. Equally clearly *Crocuta* is the more highly specialized of the two.

56. **Hyæna hyæna** Linnæus. The Striped Hyæna. (Pl. II.)

Canis hyæna, Linn., Syst. Nat. ed. x, p. 40, 1758.
Hyæna striata, Zimm., Spec. Zool. Geogr. p. 366, 1777.
Hyæna orientalis, Tiedemann, Zool. p. 350, 1808.
Hyæna fasciata, Thunberg, Sv. Vet.-Akad. Handl. i, p. 59, 1820.
Hyæna antiquorum, Temminck, Ann. Gen. Sci. Phys. iii, p. 51, 1820.
Hyæna virgata, Ogilby, Royle's Illustr. etc., p. 46, 1840 *.

Vernacular.—Lakar-bagha, Lakar bágh, or *Lakra, Jhirak, Hondar, Harvágh, Taras* (Hindi in various districts); *Taras* (Mahratta and Sindhi also); *Cherak* (Sindhi); *Aptan* (Baluchi); *Renhra* (Gond); *Hebar Kula* (Ho Kol); *Derko Tud* (Paharia of Rajmahal); *Dhopre* (Korku); *Kirba* and *Kut-Kirba* (Kanarese); *Dúmul gúndu* (Telegu); *Kaluthai-Korachi* (Tamil).

Locality of the *type*, Benna Mountains in Laristan, S. Persia.

Distribution.—Northern Africa, South-Western Asia, INDIA.

Dorsal crest sharply differentiated by its much longer hairs from that of the rest of the coat, which is shorter, often very short and thin, with little or no underwool. The general colour varies from pale brown to tawny, buff or white; the stripes are typically sharply defined, although sometimes obscure when the coat is longish and disarranged, and the neck is approximately the same tint as the head and body. There are three pairs of mammæ.

This description distinguishes *H. hyæna* from the other species of the genus, *H. brunnea*, the Brown Hyæna of S. Africa, which has the whole body more uniformly covered with long hairs, so that the crest is not so sharply differentiated, the general colour darker brown, the stripes less distinct, and the neck greyish or buffy and contrasted with the dark body and head. The skull and teeth are also larger than in *H. hyæna*.

56 *a*. **Hyæna hyæna hyæna** Linnæus. The Persian and Indian Hyæna.

Canis hyæna, Linn., Syst. Nat. ed. x, p. 40, 1758.
Hyæna virgata (Hodgson MS.), Ogilby, Mem. Mamm. Himal. in Royle's Illustr. etc., p. 41, 1840 (general name for all Striped Hyænas).

* The names quoted in this synonymy were apparently all introduced as substitutes for *hyæna* Linn., mainly to avoid identity between the generic and specific names (see Matschie, SB. Ges. Nat. Fr. Berlin, Jan. 1900, and Pocock, Proc. Zool. Soc. 1934, p. 801).

Hyæna hyæna indica, Blainville, Osteogr. Mamm. ii, Des Hyènes, expl. of pl. 6, p. 82, 1844; Pocock, Proc. Zool. Soc. 1934, p. 815.

Hyæna striata, Zimmermann, Geogr. Gesch. ii, p. 256, 1780; and of Blyth, Jerdon, Blanford, and most writers on the Indian fauna. (General name for the species.)

Hyæna vulgaris zarudnyi, Satunin, Mitt. Kank. Mus. ii, p. 14, 1905 *.

Vernacular.—*Lakar bagha*, *Lakar bagh*, or *Lakra*, *Jhirak*, *Hondar*, *Harvagh*, *Taras* (Hindi in various districts); *Taras* (Mahr. and Sind); *Cherak* (Sind); *Aptar* (Baluchi); *Renhra* (Gond); *Hebar Kula* (Ho Kol); *Derko Tud* (Paharia of Rajmahal); *Dhopre* (Korku); *Kirba* and *Kut-Kirba* (Kanarese); *Dúmul gúndu*, *Korna gúndu* (Telegu); *Kaluthai Korachi* (Tamil).

Locality of the *type* of *hyæna* and of the two substituted names *virgata* and *striata*, Benna Mountains, Laristan, S. Persia; of *indica*, "India"; of *zarudnyi*, Karun River, S.W. Persia.

Distribution.—At least, apparently, from E. Mesopotamia, through Persia and Baluchistan to INDIA; in INDIA from Sind

* The original description of *Canis hyæna* Linn., as Thomas pointed out in 1911, was taken from the figure and description of a specimen from the Benna Mountains in Laristan, S. Persia, seen and recorded as *Hyæna veterum* by Kæmpfer (Amœn. p. 411 and pl. facing p. 407), who also referred to a specimen from Ispahan. The only discrepancy between the figure and description is the statement in the latter that the tail is banded, a statement copied by Linnæus but not borne out by the figure. Linnæus, using the term "India," as was commonly his custom, in a comprehensive sense, cited that country as the home of *Canis hyæna*, and before Thomas's correct designation of the type-locality both Matschie and Satunin had accepted India as the typical locality of the species, and Matschie, copying Linnæus, wrongly diagnosed the Indian Hyæna as characterized by having the tail striped. The tail is not striped in any of the numerous skins from Asia and Africa that I have seen. In 1934, in my paper above quoted, I suggested that the hyæna described by Satunin as *H. vulgaris zarudnyi* from the Karun River in S.W. Persia would prove from its locality to be referable to typical *hyæna* from Laristan. At that time, having seen no skins from any part of S.W. Asia between Syria and India, I provisionally adopted *indica* Blainv. as a racial name for the Indian animal. Since then an undated but tolerably thickly coated skin from Jabal Hamvin, some 90 miles north of Baghdad (Cox, Cheesman), and one scantily hairy summer skin from "Ur of the Chaldees" in southern Babylonia (Livesey), June, have come into my hands, and since I am unable to distinguish these skins from summer and winter skins from India I feel confident that the two Mesopotamian and the Indian skins, as well as Satunin's from the Karun River, alike represent typical *Hyæna hyæna*, the range of which will be at least from eastern Mesopotamia to India—not a surprising distribution. Satunin also described as *H. bilkiewiczi* a specimen from Askabad and as *H. bokcharensis* three specimens from Bokhara. These names may also prove to be synonyms of typical *hyæna*. At all events the alleged diagnostic characters have no systematic value; but I have been unable to examine any material from those more northern districts.

to Lower Bengal and from Lower Kashmir and the Nepal Tarai probably to Cape Comorin, but very rare in Travancore *. Absent from CEYLON, ASSAM, and BURMA.

Coat very variable in length and thickness according to the season. In winter it is full, soft and thickened with wool, the contour-hairs on the average being from about 2 to 3 in. on the flanks, 6 to 9 in. on the crest, and 6 on the tail; in the summer it is short, harsh, scanty and without wool. The general tint of the body varies from straw-colour to buffy grey or dirty white, being brighter as a rule when the coat is new than when bleached, with the black faded to brown before or during the moult; the muzzle to the eyes, the chin, and the backs of the ears are dusky, sooty, or greyish-brown; the crown and cheeks are usually tawny, and there is almost always a large black patch on the throat separated by a pale strip from the dark chin, but running up on to the cheek, where there are some spots above it; there are also some spots just in front of the shoulder, a short stripe and a spot or two close to the nuchal crest, and the shoulder itself is marked with a conspicuous long stripe descending obliquely downwards and forwards from the crest; the fore leg is transversely banded and spotted outside and inside to the wrist, the foot itself being pale, although frequently a little darker than the body; behind the shoulder the flanks show an irregular pattern of darker and lighter blotches, tending to run in vertical lines; but on the thigh there are three or four well-defined vertical stripes running into transverse stripes above the hocks, but below the hock in front the pattern is at most represented by blackish mottling; there are a few pale spots on the inside of the thighs and on the belly; the hairs of the crest, when unfaded, have an extensive black tip set off by an equally extensive white or greyish-white area below it; close to the skin the hairs are whitish and above this area they are soiled grey, each hair having four alternating darker and lighter areas; the long hairs of the tail above are generally like those of the crest, having black tips, but are not so noticeably banded; the end of the tail is black, but the underside is white.

The newly born young is covered with short, silky hair and has no trace of the dorsal mane or of the long hair on the tail characteristic of the adult. The general colour is clean white, but the muzzle is grey, and there is a dusky broad spinal stripe which fades away on the withers and loins; the tail is all white; the pattern is strongly defined, consisting mainly of a black longitudinal stripe on the upper part of the neck and of some eight vertical stripes between the shoulders and the

* In 1893 Ferguson recorded the killing of one 15 miles north of Quilon. It was unknown to the natives.

loins, with some obscure spots between them, and of the bands on the legs.

The following table of flesh-measurements attests equality n size between the two sexes :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Ear.
Nokania, Cutch (Crump); ad. ♂.	43⅛	13½	8⅜	6½
Bhuj, Cutch (Crump); ad. ♂ ..	40⅜	10¾	8⅜	6½
Khairpur, Sind (Prater); ad. ♂.	40½	12	8½	6
Thodaogan, E. Khandesh (Crump); ad. ♂	40	13½	8½	6
Hewra, Nimar (Crump); ad. ♂.	39⅜	12	8+	6½
Kurnool (Baptista); ad. ♀	43½	11¾	8	6
Khairpur, Sind (Prater); ad. ♀.	42	12	7½	6
Palkonda Hills (Baptista); ad. ♀	41	11¾	8	6½
Buj, Cutch (Crump); ad. ♀....	38⅜	11	7⅜	6
Hewra, Nimar (Crump); ad. ♀.	38½	10½	9	5½

Prater recorded the height at the shoulder * of the ♂ from Khairpur as 30 in. and of the ♀ as 26 in. The weight of the ♂ according to Dunbar Brander is about 85 lb., of the ♀ about 75 lb.

The skull-measurements arranged in the table in accordance with the condylobasal length attests approximate equality in size between ♂ and ♀, although the difference between the largest and smallest ♂ is only half as much as between the largest and smallest ♀, *i. e.*, 10 against 20 mm. In addition to those entered, the British Museum has a number of unsexed skulls, the largest being one from Bhagalpur, with a total length of 258 and a condylobasal length of 228 mm., and the smallest one from the Nepal Tarai (Hodgson), in which these measurements are 236 and 209 mm. respectively. There are others from Palamau and Singhbum in Chota Nagpur (Walker) and from Puri in Orissa which, fitting in with the rest, show that the skulls agree in dimensions throughout the range of the species in Hindostan, although I have seen none from the area south of the Palni and Nilgiri Hills and the Billigirirangan Range, Coimbatore.

It is noticeable that in the pair of skulls from Coimbatore, the Nilgiri Hills, and Berars the condylobasal length of the ♀ exceeds that of the ♂ ; in the pair from S. Chanda the two are equal, whereas in the pairs from Cutch, Sind, and Kumaun that length in the ♂ exceeds that of the ♀.

Habits.—The habits of the Indian Hyæna are well known and have often been described. The following account is taken mainly from Dunbar Brander's summary, which is supplemented by observations of his own on the animal in Central India.

* This is the length from the shoulder to the fore paw of the dead animal lying on its side.

Skull-measurements (in mm.) of the Indian Hyæna.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Kumaun Tarai (B. B. Osmaston ; ad. ♂	250	221	154	36	50	54	169	30½	21
Khairpur, Sind (Prater ; ad. ♂	244	220	164	37	49	54	171	31	22
Buj, Cutch (Crump) ; ad. ♂	250	219	159	35	47	54	172	30	21
Berars, C.P. (Crump) ; ad. ♂	244	215	155	37	49	53	167	31	21
Hewra, Nimar, C.P. (Crump) ; ad. ♂	247	216	153	39	49	53	165	30	20
Buj, Cutch (Crump) ; ad. ♂	247	215	159	38	48	53	166	31	20
Nilgiri Hills (Davison) ; ad. ♂	243	212	154	39	49	51	166	29	19
S. Chanda, C.P. (Pitman), ad. ♂	233	211	152	37	48	52	—	30	—
Coimbatore (Morris) ; ad. ♂	240	210	149	35	47	52	162	29	20
Berars, C.P. (Crump) ; ad. ♀	248	210	155	37	48	55	171	29	19
Coimbatore (Morris) ; ad. ♀	245	220	156	39	47	53	170	30	20
Nilgiri Hills (Phythian Adams) ; ad. ♀	242	220	153	35	47	53	169	30	23
Maispat, Rajput. (H. H. Kumar Sahib) ; ad. ♀.	245	216	156	37	47	54	—	30½	—
Kumaun Tarai, 1,000 ft. (B. B. Osmaston) ; ad. ♀	243	215	154	40	50	51	163	30	20
Palkonda Hills (Baptista) ; ad. ♀	241	215	152	38	47	54	168	30	20
S. Chanda, C.P. (Pitman) ; ad. ♀	245	211	158	36	49	56	160	30	20
Khairpur, Sind (Prater) ; ad. ♀.....	237	210	147	38	47	52	160	30	20
Buj, Cutch (Crump) ; ad. ♀	233	202	149	36	44	51	162	30	19

It is found throughout the plains of northern Hindostan and the open parts and rocky hillsides of the Peninsula, from lower Kashmir, where it is rare, and the Tarai of Nepal and Kumaun, where it is commoner and is not infrequently driven out of the long grass during elephant-beats. Apart from thick forest, which it avoids, it may be met almost anywhere, generally in nullahs, ravines, and the outskirts of forest bordering the plains. By day it lies up in enlarged porcupine-burrows, caves, or in crevices under boulders. Pairs usually go about together, but occasionally a solitary one is seen, and still more rarely a few together, probably a family party. By night they hunt for food, which consists mainly of carrion, and often travel long distances in search of it. They clear up the remains of the "kills" of tigers and panthers, breaking with their powerful jaws and teeth bones that the large Cats reject, and swallowing and digesting big pieces of them. They are, however, by no means restricted to that type of food, but will attack and kill any defenceless animal they can catch and overcome. Although useful scavengers in the neighbourhood of farms and villages, they often inflict considerable damage on the owners of livestock by killing goats, sheep, calves, and small dogs, and there is a recent record of one carrying off a small child.

Hyænas have earned a reputation for cowardice, due partly to the caution they exhibit in refraining from attacking other animals that might hurt them, partly to their fear of man, and to their offering no resistance when pursued and speared on horseback, a method of assault they can have no instinct to deal with. But in their favour it may be pointed out there are records of a single hyæna driving a panther from its "kill." One case was mentioned by Capt. R. C. Bunke (Journ. Bomb. Nat. Hist. Soc. xix, p. 518). In another, observed at Daltonganj by F. Field (Journ. Bomb. Nat. Hist. Soc. xxiv, p. 818, 1916), a hyæna was watched at a kill for half an hour while a panther sat at a distance looking on. Presently the hyæna went off with a large chunk and the panther came forward to resume its interrupted meal, whereupon the hyæna dropped his piece, returned, and drove the panther off again. The courage in these cases is clearly on the side of the hyæna, which would certainly stand a poor chance in a fight against the claws and canine teeth of a panther.

Hyænas have also been condemned as "filthy feeders," second only to vultures in that respect, but, as Dunbar Brander remarks, it is doubtful if they eat carcases in a more advanced state of putrefaction than tigers are known to devour. Moreover, they will not, he says, eat their own kind, although other less maligned carnivores, including tigers, are at times cannibals.

The same observer noticed that when attacked by dogs and held beyond hope of escape a hyæna "shams dead" * and endures without protest the most dreadful worrying, until the dogs desist. This instinct, very rare in mammals, seems to be as highly developed as in the American opossum, since D. Brander was completely deceived on several occasions. He considers them to be highly intelligent animals, with remarkable powers of scent but indifferent sight and hearing. The alleged defectiveness of the last sense is, however, singular, considering the length and width of the ears.

The voice has been described as a chattering laugh or weird kind of howling, very disturbing at night †.

The hyæna is easily tamed, and even when full grown is perfectly docile and trustworthy with its owner. Crump saw one at Chaibasa which lived on terms of complete amity with several small dogs.

From this account it seems that the Hyæna deserves to be held in at least as much respect as is accorded to other Carnivora. It is, nevertheless, usually written about in terms of contempt and dislike; and Col. Stockley's description of it as an unpleasant, slinking, cowardly, usually mangy beast, feeding mainly on carrion and not considered worth a cartridge, probably reflects the opinion of most sportsmen regarding it. It is true that the coat when the moult is completed looks as if it might be mangy, without in reality being so; and Stockley admits that up in the hills the Hyæna often carries a good coat. He records seeing one in the Salt Range trying to kill an oorial ewe and another in the southern Punjab after a chinkara. As evidence of the strength of its jaws he states that they are capable of splintering the thigh-bone of a camel with the greatest ease.

The young, of which the colour and pattern are described above, are born with their eyes and ears closed as in most terrestrial carnivores. The litter, consisting of from two to four, is dropped, usually in the hot weather, in the retreat occupied by the mother. The period of gestation is said by Heinroth to be seven months, the same as in the leopard.

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* A common but unfortunate expression, because it implies on the part of the animal a knowledge of death possessed by no mammal but man.

† In captivity the Striped Hyæna is not nearly so noisy as the Spotted. The latter can be readily induced to utter his infectious laughing howl by the display of a piece of raw meat.

Suborder *ARCTOIDEA*.

The essential characters of this suborder are entered on p. 1, and need not be repeated.

It is a very heterogeneous group, comprising the Wolves, Jackals and Foxes ; the Bears ; the Pandas ; and the Weasels, Badgers and Otters.

Key to the British Indian Families of Arctoidea.

a. Legs long and slender, digitigrade, with the single carpal pad and small first digit of the fore foot raised above the trilobed, typically cordate plantar pad ; the hind foot with only four toes and no trace of metatarsal pads ; the four premolars above and below and the first lower molar with trenchant crowns, associated with two crushing upper molars ; baculum deeply channelled below ..... **Canidæ**, p. 76.

a'. Legs comparatively short and thick, plantigrade or semiplantigrade ; first digit present on both feet close to the second, not raised above the plantar pad ; teeth very variable, but large trenchant carnassials not associated with two upper molars ; baculum not deeply channelled below.

b. Size large, form heavy ; tail short ; feet plantigrade, with the pads of the digits forming a lightly curved line and the plantar pad very wide ; all the back teeth with large, crushing, multicuspid crowns ; three lower molars on each side.

c. Penis, with its baculum, long, the prepuce remote from the scrotum ; no anal glandular area ; no accessory lobe on plantar pad of fore foot covering the tip of a specialized wrist-bone ; skull with long post-dental palate, long auditory tube, and an alisphenoid canal ; the first three upper and lower premolars small, peg-like, spaced, one or more sometimes wanting ; upper carnassial (pm^4) small, tricuspid, in advance of preorbital foramen on cheek ..... **Ursidæ**, p. 163.

c'. Penis and baculum short, prepuce only a little in advance of scrotum ; a large anal glandular area and an accessory lobe on the plantar pad of the fore foot covering the tip of a specialized wrist-bone ; skull without produced postdental palate, with a short auditory tube and no alisphenoid

canal; all the teeth well developed and massive except the first premolar, the rest of the premolars in contact and at least tricupsid; upper carnassial (pm^4) large, with five large cusps and not in advance of the preorbital foramen ..... [p. 233. **[Ailuropodidæ]**,

b'. Size comparatively small, tail of moderate length or long; feet not so plantigrade, the pads of the digits forming a more strongly curved line, the plantar pad not so wide as compared with its length; back teeth variable, but not as under *b*; only two lower molars.

d. Penis, with its baculum, small, the prepuce close to the scrotum; soles of the feet entirely overgrown by hairs, the pads functionless; skull with alisphenoid canal; the last four upper and the last three lower cheek-teeth with broad crushing, strongly cusped crowns; two upper molars on each side; second lower molar nearly as large as the first ..... **Ailuridæ**, p. 250.

d'. Penis, with its baculum, long, the prepuce remote from the scrotum; soles of the feet not entirely covered with hair, at least the pads exposed and functional; skull without alisphenoid canal; teeth crushing and trenchant combined or mainly trenchant; only one upper molar on each side; the second lower molar much smaller than the first ..... **Mustelidæ**, p. 265.

This table, based mainly on the more obvious external characters, is misleading in its suggestion that the Giant Panda (Ailuropodidæ) is more nearly akin to the Bears (Ursidæ) than it is to the true Panda (Ailuridæ), and that the latter has greater affinity with the Weasels, Badgers, Otters, etc. (Mustelidæ) than with the Ailuropodidæ. This family name is bracketed because its typical living genus *Ailuropoda* has not yet proved to be a member of the British Indian fauna. The unquestionable kinship between the two kinds of Panda and the difference between them are discussed in pp. 250–3.

Family CANIDÆ.

Wolves, Jackals, Foxes and Wild Dogs.

A family of terrestrial, cursorial, predatory Carnivora distinguished from the rest of the Arctoid families by a number of well-defined characters. In accordance with the general habits of the species of catching living prey by speed of foot, the limbs are longish, slender, and digitigrade, with the hock (tarsus) and the wrist (carpus) raised from the ground, with the soles of the feet hairy except for the naked digital and plantar pads, which rest on the ground, and, in the fore foot, the single, conical, elevated carpal pad, there being no trace of metatarsal pads on the hind foot; the fore foot has five digits, but the first (pollex) is small, practically functionless, and set high above the rest, which are symmetrically paired, their pads forming a curved line, and are united by webs up to the pads and provided with a thickened, elastic margin holding the digits normally closely in contact; the claws are short or shortish, stout and not retractile; the plantar pad is cushion-like and three-lobed, its pollical element being suppressed; the hind foot is like the front, but has only four toes, the first, or hallux, being absent *. In the head the jaws are long, the rhinarium well developed, with a narrow grooved philtrum dividing the upper lip, the normal complement of shortish facial vibrissæ is retained, and the ears are high, or "pricked," more or less pointed at the tip, and provided with a well-developed bursa. The tail is long or longish and has a scent-gland, typically marked by a black spot, on the upper side of its basal half. A pair of anal glands is present, but there are no circumanal or perineal scent-glands. The penis is long, with the prepuce well in advance of the scrotum, and its baculum, ends in a simple point but is deeply channelled beneath (fig. 14, p. 95). During copulation the sexes "tie." There is no trace at any age of

* In some species found outside the limits of the Indian fauna there are a few variations in the structure of the feet. The African Hunting Dog (*Lycaon*) has only four digits on the front foot, as in Hyænas. In some of the Arctic wolves and foxes the pads are reduced in size and in winter concealed by long hair in adaptation to snow-covered ground. In domestic dogs the first digit of the hind foot may reappear in a degenerate form, and, like the corresponding digit of the fore foot, it is known as the "dew claw."

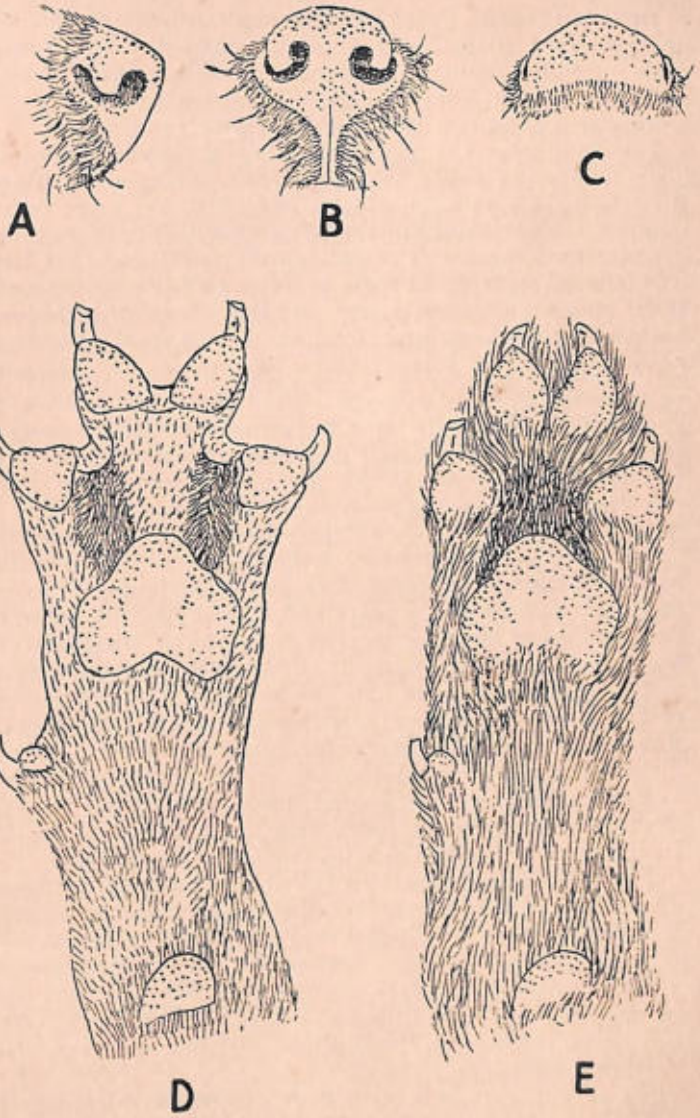


Fig. 9.

A, B and C. Lateral, front and upper views of rhinarium of the smaller Indian Wolf (*Canis lupus pallipes*).

D. Lower view of left fore foot of the same, with the digits spread and the hairs cut short, showing the pads, the narrow webs with elastic rims and other adaptations for swift running on hard ground.

E. The same foot before being clipped and with the digits closed.

a pattern of spots or stripes, the contour-hairs of the coat are long and coarse and typically banded with alternate dark and light annuli, especially on the dorsal surface and tail, but behind and in front of the shoulder there is very commonly a large area of hairs without dark pigment.

The skull has the jaws elongated to accommodate the large number of teeth; the postorbital processes are short; there is an alisphenoid canal; the bullæ are more or less inflated, the paroccipital processes are applied to them behind in their upper part, but project away from them in the lower half, the mesopterygoid fossa is never roofed over by a posterior elongation of the palate, and the postpalatine foramina are situated on the suture. In all the Asiatic species the dental formula is: $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{4}{4}$, $m.\frac{2}{3 \text{ or } 2}$; the upper incisors are pointed and form an evenly curved line; the canines are long and piercing; the first three upper and the four lower premolars have compressed triangular crowns, with a larger median and, except in the first, some subsidiary cusps, but the fourth upper premolar and the first lower molar, the largest of the teeth, are differentiated as "carnassials," the upper carnassial is set far back in the jaw behind the infra-orbital foramen at the point of "greatest maximum efficiency," and has two large main cusps and a small, rooted, anteriorly situated inner lobe (protocone). The lower carnassial also has two large, main cusps, a small inner cusp (metaconid), and a large heel, about half the length of the anterior part of the crown. The first upper molar, also a large tooth, is wider than long, has two outer cusps and a large rounded inner, cuspidate lobe; the second upper molar is very similar but much smaller. The second lower molar is much smaller than the first, about the same area as its "heel"; the third is still smaller, and in the Wild Dog (*Cuon*) is absent *.

From this description it is evident that the teeth are heterodont, being adapted both for cutting, piercing, and crushing. Both in number and form they closely resemble those of primitive carnivores, and, except for the normal presence of the third lower molars, are not very different from those of some of the existing Civets of the Æluroid section. They differ markedly from those of the Hyænas in number, proportions, and shape.

On account of some structural pecularities in which they differ from the typical Arctoidea and resemble the Æluroidea, *e. g.*, in the presence of a cæcum in the alimentary canal,

* This description of the dentition applies in a general way to all the genera of the family, except to the S. African Long-eared Fox (*Otocyon*), in which the teeth are very aberrant both in number and form.

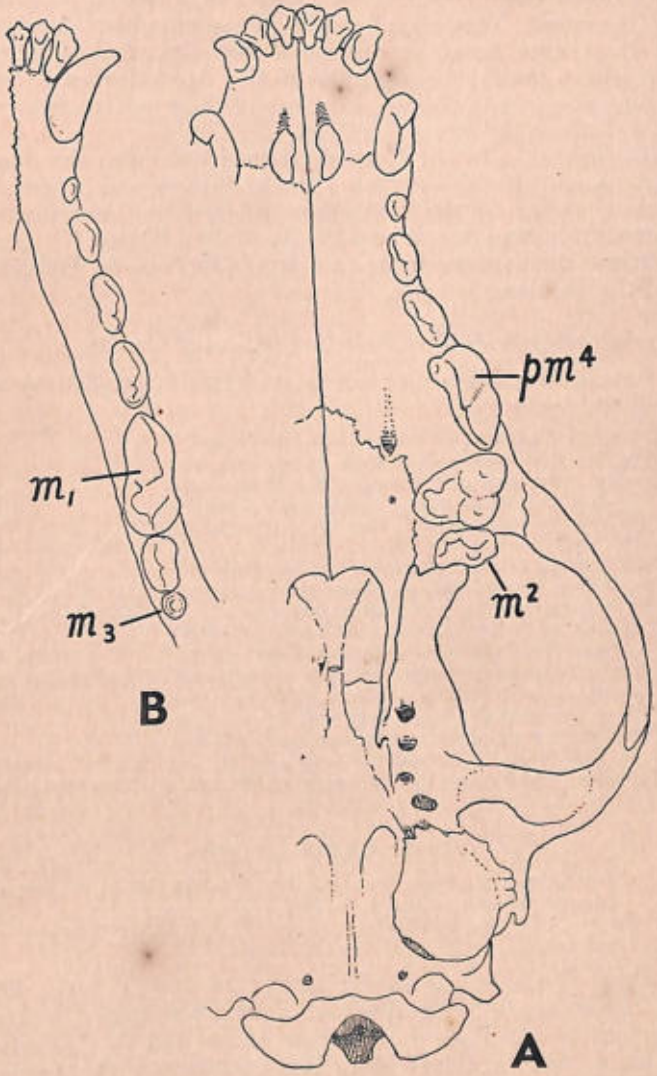


Fig. 10.

A. Lower view of left half of skull of adult ♂ of the smaller Indian Wolf (*Canis lupus pallipes*), from Hazaribagh, showing the upper dentition, palate, bulla and other features characteristic of the Canidæ; pm^4, upper carnassial, m^2, second upper molar.

B. Lower dentition of the left side of the same; m_1, lower carnassial; m_3, third lower molar. (Figures two-thirds nat. size.)

the Canidæ were referred by Flower to a special suborder, the Cynoidea. This classification was adopted by Blanford; but it is now generally admitted that the Canidæ merely represent a well-defined family of the Arctoidea, and there is complete palæontological evidence of their descent from the same stock as the Bears (Ursidæ).

Distribution.—In the Eastern Hemisphere from the Arctic Regions southwards over the whole of Europe and Africa, and in Asia as far to the south-east as Java, but not beyond. Absent from Madagascar and the Australian Region *. In the Western Hemisphere from the Arctic Regions to Patagonia and the Falkland Islands.

Key to the British Indian Genera of Canidæ.

The distinguishing characters are mainly supplied by the skull and teeth.

a. Lower jaw with three molar teeth, the "heel" of the first (carnassial) with more than one cusp; the second lower and the first upper molars well developed; nasals not expanded in their posterior half; ears more pointed at the tip.
  b. Forehead of skull elevated, swollen with air-cells; postorbital processes convex above and depressed; teeth not so trenchant . . . . . CANIS Linn., p. 80.
  b'. Forehead flattened, not swollen with air-cells; postorbital processes slightly hollowed above, with a posterior ridge; teeth more trenchant [p. 109. VULPES Oken,
a'. Lower jaw with only two molars, the heel of the first (carnassial) with only one cusp; the second lower and the first upper molars reduced in size; nasals noticeably expanded in the posterior half; ears more rounded at the tip . . [p. 146. CUON Hodgson,

Genus **CANIS** Linnæus.

Canis, Linnæus, Syst. Nat. ed. 10, i, p. 38, 1758; Miller, Cat. Mamm. Western Europe, p. 304, 1913.
Lupus, Oken, Lehrb. Naturg. iii, pt. 2, p. 1039, 1816 (undefinable genus).

Type of *Canis*, *familiaris* Linn.; of *Lupus*, *lupus* Linn.

Distribution.—In the Eastern Hemisphere from the Arctic Regions to the Cape Province in Africa and to Ceylon and Siam in Asia; in the Western Hemisphere from the Arctic to the northern portions of Central America.

Tail comparatively short, up to about two-thirds the length of the head and body, generally less, less than twice the length of the hind foot, its tip with the hairs seldom reaching much

* It is generally agreed that the dingos, or wild dogs of Australia, were originally domesticated dogs introduced by the aborigines from southern Asia. Similar breeds occur elsewhere in the east.

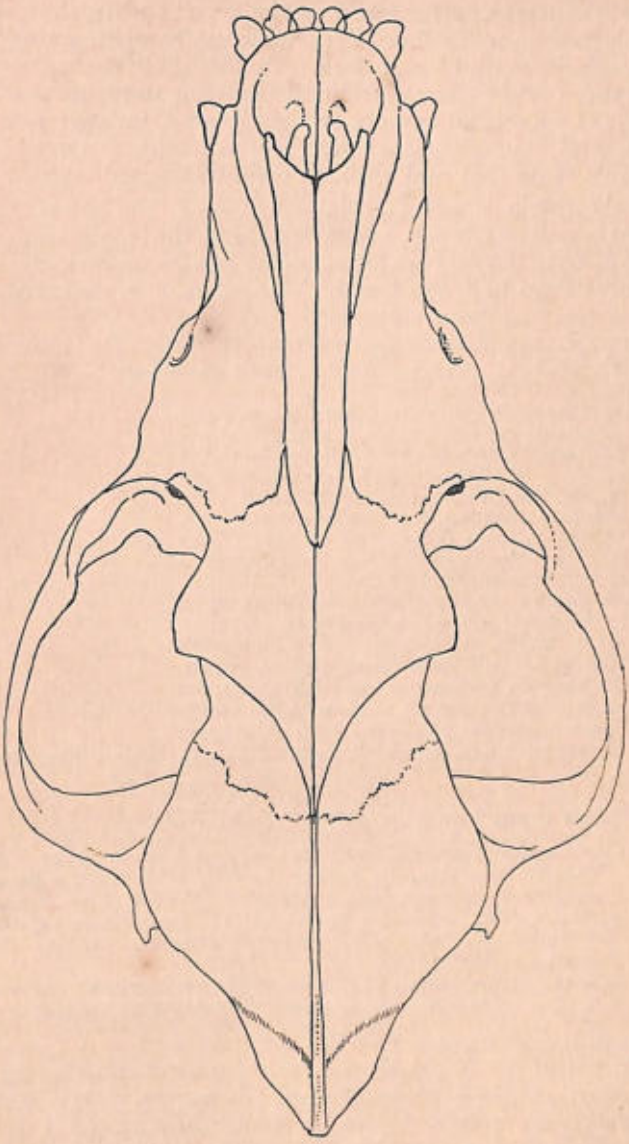


Fig. 11.—Upper view of skull of adult ♂ of smaller Indian Wolf (*Canis lupus pallipes*), from Hazaribagh, showing the shape of the nasals, postorbital processes, etc. characteristic of *Canis*. (Two-thirds nat. size.)

below the hocks, never reaching the ground when the animal stands erect on its four feet. Essentially distinguished by cranial and dental characters. In the skull the nasals are tolerably evenly narrow from the anterior nares to the forehead; the forehead is more or less elevated, inflated with air-cells, and its postorbital processes are convex above, with the tips depressed and with no definitely raised edges. The dental formula is :—*i.* $\frac{3}{3}$, *c.* $\frac{1}{1}$, *pm.* $\frac{4}{4}$, *m.* $\frac{2}{3}$; the second upper molar is well developed, about two-thirds the length and width of the first, the second lower molar is also moderately large but less than half the length of the first or lower carnassial, which has two cusps on its heel.

The two well-defined species found in British India, the Wolf and the Jackal, may be distinguished as follows :—

a. Size large or comparatively large, the smallest ♀♀ not less than 35 in. in the length of the head and body, and the weight not less than 36 lb.; skull and teeth correspondingly larger, the frontal area of the skull more abruptly elevated, forming a concave curvature between it and the summit of the muzzle; the upper molars with hardly a trace of the cingulum *	*lupus* Linn., p. 82.
a'. Size smaller, adult ♂♂ rarely exceeding 30 in. in the length of the head and body, and up to about 25 lb. in weight; skull and teeth smaller; skull with lower frontal region, forming an inclined plane with the upper surface of the muzzle, without a noticeably concave curvature between them; the upper molars with well-defined cingulum	*aureus* Linn., p. 94.

57. **Canis lupus** Linnæus. The typical Wolf.

Canis lupus, Linnæus, Syst. Nat. ed. 10, i, p. 38, 1758; Miller, Cat. Mamm. Western Europe, p. 305, 1913, for the European and most of the Asiatic subspecies; Pocock, Proc. Zool. Soc. 1935, p. 647, *sensu lat.*, to include the North American forms, "Timber Wolves," etc., previously generally cited as distinct species.

(For the synonymy and principal bibliographical references to the British Indian Wolves see under the subspecific headings.)

Locality of the *type*, Sweden.

Distribution.—From the Arctic Regions of the Eastern and Western Hemispheres southwards in Europe to the Mediterranean, now extinct in many countries, *e. g.*, Great Britain and Ireland, and in Asia to south Arabia, south India, formerly, and south China; in North America to the southern states, Florida, Texas, etc., but everywhere being rapidly exterminated in the settled districts.

Size large or moderately large, the head and body in the

* The cingulum is a shelf-like edging on the outer margin of the crown.

smallest specimens about 36 in. long, and the weight in the same not less than about 36 lb. ; tail typically relatively a little longer ; skull also large, the condylobasal length in the smallest ♀ seldom less than 200 mm. ; the forehead convex, elevated,

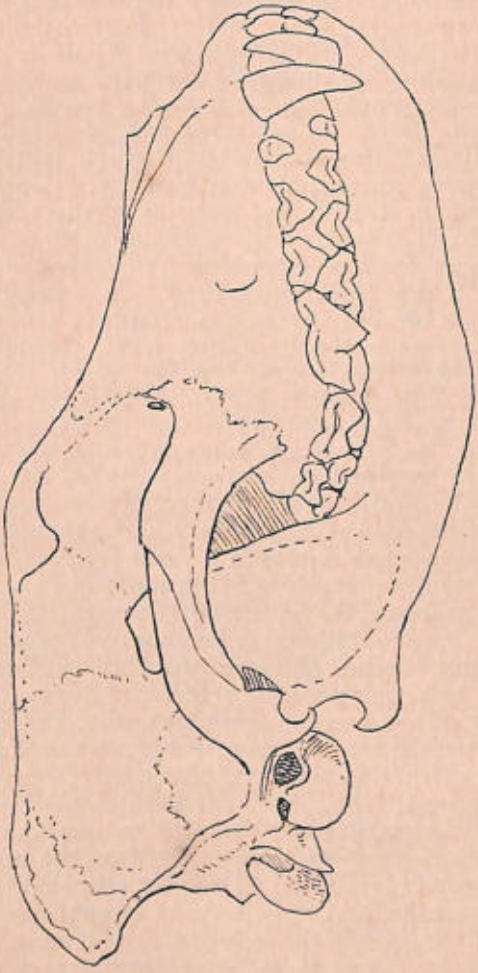


Fig. 12.—Side view of skull of adult ♂ of the smaller Indian Wolf (*Canis lupus pallipes*), from Hazaribagh, showing the dentition, elevated brow, postorbital processes etc. characteristic of *Canis*. (Drawn to smaller scale than figures 10 and 11 of the same skull.)

passing into the upper surface of the muzzle by a concave curvature ; teeth large or moderately so, the upper and lower carnassials (pm^4 and m_1) not less than 22 or 23 mm. respectively, and the upper molars have at most a faintly discernible cingulum.

The number of mammæ is typically five pairs.

Habits.—Apart from a few minor modifications, due to differences of latitude affecting the environment, the habits of wolves appear to be very similar wherever they are found. They frequent open country and forests, if available, and are essentially predatory, attacking and killing any living animal they can overcome, are the source of serious losses to the owners of domesticated sheep, goats, and even of cattle, and when emboldened by hunger will enter houses or villages and carry off children. They hunt singly or in couples or small parties, and sometimes combine in large packs, especially in hard winters in the north, to pull down big game. Being keen of scent, swift of foot, and enduring, they seldom fail to overtake the quarry whose trail they pick up. Carrion is also eaten if fresh food fails, and they have the unintelligible habit, familiar in domestic dogs, of rolling in stinking carcases or other strong smelling substances which they will not eat. Another habit they have transmitted to our dogs is turning round at least once in the process of sitting, preparatory to lying down, supposedly to flatten stiff upstanding grass. They breed only once a year, pairing off for the purpose, usually in the early months; and since the period of gestation is 63 days, the cubs, from about four to eight in number, covered with sleek blackish hair and with eyes and ears closed, are born when the warmer weather is setting in. The female lies up with them either in thick grass or in the shelter of a cave or hole. At two years old they are nearly full-sized, and become mature in the following year.

A point of interest connected with the wolf is the certainty of the species being the principal, if not the sole, ancestor of domestic dogs. There is no unanimity of opinion on the subject, some authors thinking that the jackal probably contributed to the strain, thus accounting for the diminutive size of some of our breeds. That view cannot be summarily dismissed, considering that some of the earliest known dogs possessed by Neolithic man were comparatively small. It is, moreover, generally believed in India that the jackal interbreeds with the pariahs, and that in South America imported dogs sometimes cross with the more remotely related wild dogs of the country. But in view of the remarkable plasticity of the organization of the Canidæ, as attested by the modifications of nearly all the external features in our breeds within historic times, it seems unnecessary to introduce the jackal as a factor in the case. Miller, indeed, excludes that species from the stock because of the presence on the upper molars of the cingulum, which is at all events less well developed in domestic dogs. Although this is a somewhat elusive feature, I am inclined to agree with him that it is needless to look beyond the wolf for the wild prototype.

There is at all events no mistaking the stamp of the wolf on such breeds as the Alsatian and the Eskimo. Practically the only constant difference enabling a wolf's skull to be distinguished from a dog's skull of the same size and shape lies in its heavier dentition. Domestication through long ages has no doubt reduced the size of the teeth in our dogs.

The races of Indian Wolves.

In his volume on the mammals of British India Blanford assigned the wolves to two distinct species—a larger, more northern form which he considered to be identical with the European Wolf (*Canis lupus*), and a smaller, more southern form for which he adopted the name *pallipes* given by Sykes to the wolf he recorded from the Deccan. Blanford's flesh-measurements of the two show scarcely any difference; but he apparently knew only one skull of *pallipes*, a specimen from Sambhar, Rajputana, of which he gave the length as a little under 7 inches; the skull of *lupus* being 8 inches or more in length.

As recorded below (p. 92) this skull from Sambhar is quite abnormally and inexplicably small, and completely misled Blanford regarding the average size of the skull in the southern form.

Blanford, quite correctly, identified the northern form as *lupus*. He had not the material whereby to discover that it is, on the average at least, smaller than the typical European wolf; and he would no doubt have dismissed the difference as unimportant if he had known it.

As a matter of fact the two so-called species of Indian wolves he admitted completely intergrade in size and other characters, and merely represent local races of the widely distributed *Canis lupus*. It is not always possible to say to which of the two a particular specimen should be assigned. This was pointed out by Col. Stockley, who stated that he was unable to identify the wolves with which he was acquainted from the data supplied by Blanford.

The only Indian Wolf I have seen which in size does not fit into the above given diagnosis of *lupus* is an adult ♂ of the smaller race collected at Sambhar, Rajputana, by Adam (p. 92). Its flesh-measurements are unknown, but its skull is about two-thirds of an inch shorter than in the smallest ♀ of the smaller, being nearly intermediate in size between the latter and a large ♂ of *aureus*. Conceivably this unique specimen represents a wild-bred hybrid between the two species; but since the skull has the characteristically raised brow of *lupus* and the larger teeth, with only a weak cingulum on the upper molars, it is probably merely a dwarfed specimen of *pallipes*. As pointed out by De Winton (Proc. Zool. Soc. 1899, p. 537)

the Asiatic wolf (*pallipes*) almost intergrades in size with the Egyptian jackal (*lupaster*), which is commonly known as the "wolf" to English sportsmen in Egypt, but differs by its heavier teeth, the two "bridging any marked difference between wolves and jackals." This observation I confirmed and amplified by a comparison between the skulls of the South Arabian wolf (*C. lupus arabs*) and the large Egyptian jackal, the wolf having on the average a larger, higher skull and larger teeth (Ann. Mag. Nat. Hist. (10) xiv, p. 451, 1934).

57 *a*. **Canis lupus chanco** Gray. The Woolly Wolf. (Pl. II.)

Lupus laniger, Hodgson, Calc. Journ. Nat. Hist. vii, p. 474, 1847.
Canis lupus var. *laniger*, Blyth, Journ. As. Soc. Beng. xvi, pt. 2, p. 1117, 1847.
Canis lupus laniger, G. M. Allen, Amer. Mus. Novit. no. 360, p. 4, 1929; Pocock, Proc. Zool. Soc. 1935, p. 660 (not *Canis laniger*, Ham. Smith, 1840, given to a breed of domestic dogs as pointed out by Allen in 1938).
Canis chanco, Gray, Proc. Zool. Soc. 1863, p. 94.
Canis lupus chanco, G. M. Allen, Mamm. of China and Mongolia, p. 340, 1938.
Canis niger, Sclater, Proc. Zool. Soc. 1874, p. 654 (not of Kerr.).
Canis eckloni, Prjevalsky, 'Third Journey to Tibet,' p. 216, 1883 (*nom. nud.*).
Lupus filchneri, *L. karanorensis*, *L. tschiliensis*, Matschie, in Filchner's Exped. to China, pp. 152–6, 1907.

Vernacular.—*Chanco*, *Chanku*, or *Shanko* (Ladakh and Tibet); *Ratnakin* (Kashmir); *Baghira* in certain districts, according to Col. A. E. Ward.

Localities of the *types*: *chanco*, Chinese Tartary; *laniger*, Tibet; *niger*, near Hanlé in S.E. Kashmir; *filchneri*, Si-nung-fu in Kansu; *karanorensis*, Kara-nor in Gobi; *tschiliensis*, the coast of Chihli.

Distribution.—Central Asia from Chinese Turkestan and the Thian Shan throughout Tibet to Mongolia, North China, Shensi, Szechwan, and apparently Yunnan; the Western Himalayas in Kashmir at least from Chitral to Lahul.

The general colour is very variable both seasonally and otherwise. In full winter coat the dorsal surface and the tail are to a greater or less extent variegated by the black and white or black and buff contour-hairs, which are especially profuse on the back, where they may form a definite black and whitish saddle running from the shoulders to the loins; the wool showing beneath the contour-hairs varies from brightish buff to clear grey; the belly and the outer side of the legs are buff or whitish, and a dark stripe on the fore leg may be strong, faint, or absent; the ears are drabby grey or rich ochreous, the crown and muzzle closely speckled with black, and this speckled tint extends below the eye on to the upper

cheek and ear, isolating a white spot, whence the upper genal tuft of vibrissæ arises ; the chin varies from blackish to nearly white. When the moult is imminent the contour hairs shrivel, become brittle, and break off at the tips, and are then shed, so that the colour of the body is due to the colour of the dead, faded wool which mats in tufts before being shed to expose the new coat beneath. In the winter coat the contour-hairs

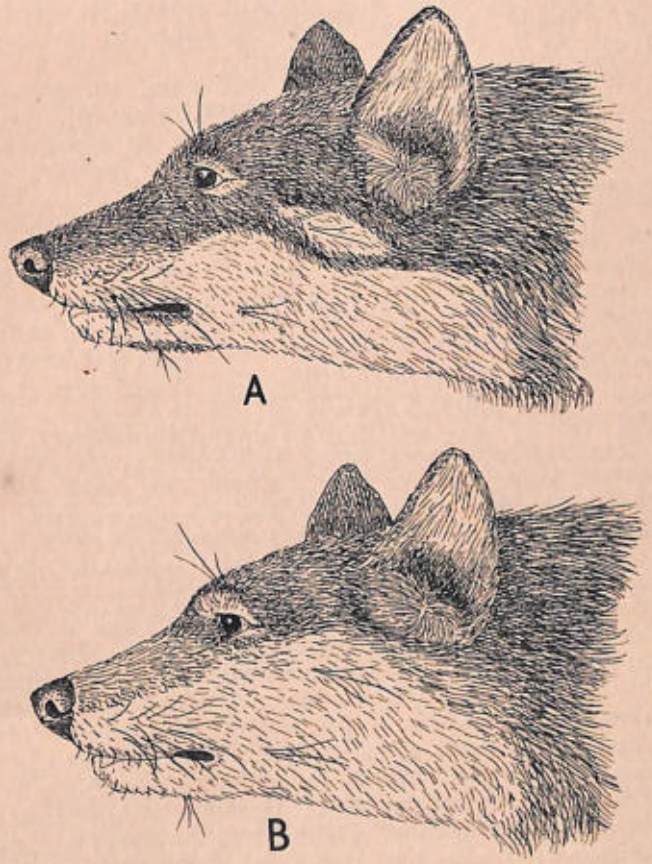


Fig. 13.

A. Side view of head of the Woolly Wolf (*Canis lupus chanco*). (Drawn from a skin collected by Major Waterhouse at Gilgit.)
B. The same, drawn from a skin collected by Capt. Stirling at Chitral.
(These figures show the individual variation in the amount of white on the cheek.)

on the shoulder-mat are from about 100 to 120 mm., on the back from about 70 to 80 mm., and on the flank from about 40 to 60 mm.

From British Indian territory winter and summer skins of the normal type above described have been examined from the following localities :—Chitral (Capt. Stirling), Gilgit, 7,000 ft. (Major W. F. R. Trevelyan and Major A. D. Waterhouse), Ladakh (Lord Aylesford), the Deosai plateau between Gya and Hanlé (Col. C. E. S. Bower), Kyelung in Lahul, 10,500 ft. (A. Whistler), and Rawalpindi in the Upper Punjab.

Other skins exhibit interesting individual variations in colour quite independent of the moult. One from Gilgit (Major Waterhouse) differs profoundly from the others above mentioned from that locality in being boldly marbled with black and buff on the flanks and black and silver on the back, the black being dominant; the ears and crown are rich dark brown, and there is a good deal of black on the hind throat and chest. One from Ladakh (Lord Cunliffe) is still darker, the general colour being chocolate-brown, darker on the back, with the contour hairs white only at the base, and the wool grey on the back, white elsewhere; there is a good deal of white on the chest and belly, some on the toes, and a sprinkling on the upper lip, chin, and lower cheek. Another partial "melano" from between Hanlé and the Tsomoriri Lake (Col. Kinloch) is blacker than the Ladakh specimen, with the wool dark sooty, but the face is a good deal speckled with white, and the sides of the muzzle, the chin, throat, chest, and inside of the fore legs are white, there is some grey on the belly and inside the hind legs, and abundant greyish-white hair on the toes.

A variety of a totally distinct type was received by the Zoological Society from the Maharajah of Nepal. Its general colour above is reddish with scarcely any black pigment in the contour hairs, and the face and underside are white. This specimen, like one of the normal type labelled Nepal (Hodgson), may have come from the northern slopes of the Himalayas, or possibly Tibet, since there are said to be no wolves on the southern slopes of the Himalayas in Nepal.

Out of the large number of skins from the above-mentioned localities, as well as others from Tibet, Thian Shan, and parts of China, only the following were measured in the flesh :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Shensi; ad. ♂	39½	14	9½
"Nepal" (red var.); ad. ♂	37	15	8¼
Chitral; ad. ♀	39	14	8¼
Rawalpindi; ad. ♀	35	14	8

The last three on the list were exhibited in the Zoological Gardens. The ♀ from Chitral was a rather larger wolf than the ♂ of the red variety exported from Nepal and much larger than the ♀ from Rawalpindi, which, except for its thicker winter coat, was indistinguishable from examples of *pallipes*, and probably indicates the area in the Punjab where the two races blend, and, as may be seen from the skull-measurements, ♀ examples of this race completely intergrade with *pallipes* in the size of the skull. So completely indeed do these two races intergrade that it is not always possible definitely to refer some specimens to either.

Col. A. E. Ward recorded the weight of a specimen as 60 lb.

Two of the skulls on the list (p. 93) are unrepresented by skins and are assigned to *laniger* on the evidence of their size. The first is the ♂ from the Salt Range (Oldham), a locality very close to Rawalpindi, but the skull is as large as that of the ♂ from Gilgit. The other is the ♀ from near Quetta, the exact locality being Chotair (H. J. Todd), which is decidedly larger than the ♀ skull from Ladakh (Lord Aylesford).

The longest ♂ skull I have measured is one from Chitral (Capt. Stirling) in the Bombay collection, which has a condylobasal length of 228 mm. The average condylobasal length of five adult ♂ skulls from British India is 222 mm., and of the mandible 176 mm. The same averages of the four adult ♀ skulls entered in the table is 204 and 161 mm., but these averages include the exceptionally small skull of the example from Rawalpindi, which is intermediate in characters between this race and the next.

Habits.—According to Sowerby, quoted by G. M. Allen, this wolf in North Shansi and South Mongolia hunts singly or in pairs, sometimes in threes, but only rarely in larger numbers. It is much feared, Anderson says, by goat- and sheep-herders.

In Kashmir Col. A. E. Ward (Journ. Bomb. Nat. Hist. Soc. xxxii, p. 712, 1928) reports that he very rarely saw wolves unless he was travelling, and owing to their wariness, when seen, found them exceedingly difficult to approach near enough for a shot. This was on the southern slopes of the Karakoram Range, where they probably rarely saw men. They are by no means nocturnal, although usually lying up during the heat of the day; but on one occasion at Ladakh he saw a bitch stand for hours in the scorching sun, keeping a watchful eye on his party in solicitude for her cubs secreted in the hill behind her. He does not think these wolves are carrion-eaters, because, hunting in small packs, they devour all the flesh

of the captured prey, leaving only the bones for the crows and vultures to pick.

According to Col. Stockley ('Stalking in Himalayas and Northern India,' 1936) this wolf feeds very largely on hares throughout the year, on marmots in summer, and slaughters numbers of goa (Tibetan antelope) and sheep (*O. ammon*), when the snow is deep enough to impede their movements, but does not often secure bharal (Blue Sheep) on account of the rougher ground they frequent. A few years before he wrote they had increased to such an extent as to become a plague in Ladakh and Lahoul, even coming down to the villages in winter and killing the children. At Ponga Nagu Springs on a rainy night his ponies were attacked by three wolves, which killed one within a furlong of the camp, mauled four more, and, after stampeding the rest for a dozen miles, came back to eat the dead one, of which they devoured most of the flesh, leaving the stomach. Three of the four mauled ponies were gashed on the right side of the neck and throat. On previous occasions in the Indus Valley and at Rupshu he observed wolves adopt the same method when killing sheep. The wolf stalked and killed one of the flock, pursued the rest, and dashing amongst them seized five in succession, grabbing the sheep in turn by the right side of the neck and jerking its head downwards with a twist, so that, owing to the speed at which it was running, it was stunned by the violence of the impact of its nose on the ground.

57 *b*. **Canis lupus pallipes** Sykes. The small Indian Wolf.

Canis pallipes, Sykes, Proc. Zool. Soc. 1831, p. 101.
Canis lupus, Blyth, Journ. As. Soc. Beng. xiv, p. 345, 1845 (note).
Canis lupus (in part) and *Canis pallipes* (in part), Blanford, Mamm. Brit. Ind. pp. 135, 137, 1888.
Canis lupus pallipes, Pocock, Proc. Zool. Soc. 1935, p. 668.

Vernacular.—*Bagad* (Cutch); *Bagyár* (Sind); *Bheriya*, *Gáng*, *Hondár*, *Nekra*, *Bighána* (Hindi); *Lándgá* (Gond and Dakhani); *Tola* (Kanarese); *Toralú* (Telegu).

Locality of the *type*, "Deccan."

Distribution.—The plains of Northern India from Bengal to Sind and southwards to Dharwar; also Baluchistan, and thence westwards apparently to Mesopotamia.

Distinguished on the average from *C. l. chanco*, with which it intergrades, by its smaller size, as indicated especially by the skull and teeth, and by its shorter, less luxuriant winter coat. There are apparently no records of "black" mutants, which are not uncommon at least in Tibetan and Kashmir examples of *chanco*.

That the seasonal differences in colour and coat are the same as those exhibited by *chanco* is shown by a series of thirteen skins, undated, but in various stages of coat change, which came from Bikanir, and were presented to the British Museum by H.H. the Heir Apparent of Bikanir. The general colour of the dorsal side at its best is sandy fawn, heavily blackened by the black tips of the contour hairs, but the fawn may bleach to grey and the black be reduced in extent and intensity; the fore nape, ears, and occiput are bright or dull ochreous, the crown dark grey, speckled black and white, or much paler grey or buff with no black; the top of the muzzle is tan varying in intensity and extent; the cheek is typically white up to and involving the upper genal tuft; the fore legs may be tan with a faint black streak and buff paws, or buffy with quite white paws; the hind legs whitish, including the paws in front, darker or paler tan from the thighs behind. The contour-hairs on the shoulder-mat vary from 50 to 85 mm., on the back from 35 to 65 mm., and on the flank from 12 to 26 mm.; at their longest they are much shorter than the corresponding hairs in *chanco*. When the coat is long there is a little underwool, but when it is short there may be none.

In addition to this series other skins have been examined from the following localities in British Indian territory:—Hazaribagh (Major O. A. Smith), Siripur Suram in Bihar (M. Mackenzie), Etawah, United Provinces (H. R. Nevill), Sambhar, Rajputana (Adam), "Deccan" (Sykes—type), Sahatwar, ten miles south of Gadag, Dharwar (Q. Jacob), Kathiawar and Cutch (Crump), Sind (Karachi Mus.), and Kajdar, S. Baluchistan (Sir J. E. B. Hotson).

These skins closely resemble those of the Bikanir series. One or two only call for special comment. One from Etawah, January 13, is handsomely coloured, like the best coated Bikanir skins, but has more underwool, thus approaching *chanco*, and the contour-hairs are a few mm. longer; but another from the same locality, September 16, although well coloured, is not nearly so black on the back, with no silvery-white on the shoulder-mat, and the coat is short and thin, without appreciable underwool and the contour-hairs are about one-third shorter. Three skins from Bihar show marked fading in the colour from April 26 to June 6. The single skin from Dharwar, September, matching the best-coloured skins from Bikanir and Etawah, is of interest as being not only the most southern representative of *pallipes* I have seen, but also the most southern representative of *Canis lupus* in the world.

The dimensions in English inches of the only flesh-measured

examples of *pallipes* available, with their weights in lb., are as follows :—

	Head and body.	Tail.	Foot.	Weight.
Hazaribagh ; ad. ♂	39⅜	14½	8⅜	42
Hazaribagh ; ad. ♂	35	13½	8½	45¾
Hazaribagh, ad. ♀	36⅜	13	8+	36
Bajana, Kathiawar ; ad. ♂ ..	36	11⅜	8⅜	42
Charwa, Cutch ; yg. ♂	30	13	7½	—

The ♂ from Dharwar was the heaviest recorded, namely 53 lb.

The skulls call for no special comment. As shown in the table they are smaller sex for sex than those of *chanco* and have slightly smaller teeth. The average condylobasal length of seven adult ♂ skulls is 207½ mm. and of the mandible 166½ mm., the corresponding measurements in three adult ♀ skulls being 196 mm. and 159 mm.

The average of the ♂ skulls does not, however, include the dimensions of the adult ♂ from Sambhar, Rajputana, which gave Blanford his erroneous conception of the size of *pallipes*. This skull is fully developed, but its condylobasal and mandibular lengths are only 182 and 145 mm. respectively, much shorter, that is to say, than in the smallest recorded ♀ of *pallipes*, and the skin is unquestionably that of a ♂. This interesting wolf, which in its diminutive size resembles the S. Arabian wolf *C. l. arabs*, may be set aside as a "dwarf" of *pallipes*. It is improbable that any further information will be forthcoming about it, because I learn from Mr. S. H. Prater, who kindly made special inquiries for me, that wolves have been exterminated in the neighbourhood of Sambhar.

Habits.—Crump has the following notes on this wolf from the parts of India where he encountered it or received information about it. In Kathiawar it was said to be common in the remoter open parts of the state, and was reported by shepherds to be very bold, having little fear of man and doing much damage to flocks by day and night, even breaking through thick thorn hedges to seize goats and sheep. One that he shot yelped exactly like a hurt dog. It got away with both its fore legs broken, and was seen to lie down in the short grass ; but although the spot was marked and the moon nearly full Crump could not make him out until within ten yards of him. The interest of this observation lies in the evidence it supplies of the obliterative coloration of the animal, which must be of service to it when hunting prey by moonlight.

In the eastern parts of Cutch the wolf is unknown, in the southern parts it is rare, but it is common along the north

Skull-measurements (in mm.) of *Canis lupus chanco* and *C. lupus pallipes*.

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. l. chanco.									
Scardo, Kashmir; ad. ♂	239	225	133	42	44	44	178	25	28
Chitral; ad. ♂	233	221	116	—	—	42	174	25	28
Gilgit; ad. ♂	235	218	123	40	46	43	173	23	25½
Salt Range; ad. ♂	235	218	130	40	47	44	173	24	26
Chitral; ad. ♀	239	220	127	40	46	48	171	23	27
Ladakh; ad. ♀	220	197	124	36	40	41	156	21	25½
Rawalpindi; ad. ♀	205	192	115	39	42	37	151	22	25
Near Quetta; ad. ♀	223	208	—	45	47	43	165	24	25
C. l. pallipes.									
Bikanir; ad. ♂	—	212	131	40	40	41	175	22½	25
Bikanir; old ♂	229	209	126	37	41	41	166	23	25
Bajana, Kathiawar; ad. ♂	225	205	119	37	37½	39	164	23	26
Hazaribagh; ad. ♂	220	207	122	38	41	42	162	21	25
Hazaribagh; ad. ♂	215	204	112	36	35	41	162	23	25
Hazaribagh; ad. ♂	211	201	117	37	39	41	163	23	25
Bikanir; ad. ♀	212	202	118	—	—	38	160	22	23
Bikanir; ad. ♀	215	198	117	35	38	39½	158	23	22

coast, especially in the Bunnee, small packs of seven, probably a family party, being seen at Motha and Charwa. Here, as in Kathiawar they kill large numbers of sheep turned out to graze, and occasionally attack the shepherds, who, however, have little difficulty in driving them off with sticks.

At Hazaribagh, as reported by Major O. A. Smith, the wolves were notorious for their man-killing propensities. Several packs terrorised the neighbourhood, and became such a curse that the Indian Government offered rewards for their slaughter. They hunted by day in pairs or small packs, displaying deadly cunning and resource, and pulling down women and children and sometimes men. The members of a pack wandered over a wide area, assembling at fairly regular intervals at particular spots.

According to Dunbar Brander this wolf was fairly common in the Central Province in the middle of the last century, but was exceedingly rare in 1907, and was very infrequently seen even in localities where it might be expected to occur. Although he observed it in the open scrub and plains at Berar, Seoni, and Hoshangabad, it seems evident from his account that its numbers are steadily diminishing in the settled parts of India.

58. **Canis aureus** Linnæus*. The Asiatic Jackal.

Canis aureus, Linn., Syst. Nat. ed. 10, i, p. 40, 1758; Miller, Cat. Mamm. Western Europe, p. 315, 1912; Pocock, Proc. Zool. Soc. 1938, p. 37.

Locality of the *type*, Laristan in Persia.

Distribution.—From South-eastern Europe and South-western Asia, throughout British India and Ceylon to Siam.

Essentially resembling *Canis lupus* in the colour, texture, and seasonal changes of the coat, but distinguished by its smaller size, the head and body being about 30 in. long and the weight in a large ♂ up to about 25 lb.; tail relatively shorter. Skull also smaller, the condylobasal length rarely reaching 160 mm. in the largest ♂ skulls; the forehead is

* *Canis aureus* is the type of the following nominal genera :—

Thos, Oken, Lehrb. Naturg. pt. 3, vol. ii, p. 1037, 1816.

Vulpicanis, Blainville, Ann. Sci. Nat. Paris, 2nd ser., Zool. viii, p. 279, 1837.

Sacalius, Ham. Smith, Jardine's Nat. Libr. Mamm. ix, p. 213, 1839.

Oxygous, Hodgson, Calc. Journ. Nat. Hist. ii, p. 213, 1841.

During recent years there has been a trend towards the adoption of *Thos* or *Thous*, the latter given by Ham. Smith to the North African jackal *anthus*, either as a valid genus or as a subgenus of *Canis* to include the Jackals and even the Prairie Wolves of North America; but, very suggestively, there is often no attempt to define it. In my opinion *Thos* is indefensible even in a subgeneric sense, and, following Miller (1913), I regard it as a generic synonym of *Canis*.

flatter, forming an inclined, sometimes sinuous, plane with the upper side of the muzzle ; teeth smaller, the upper and lower carnassials being at most 17 and 20 mm. respectively, and the upper molars have the cingulum well defined.

With its extensive range this Jackal is represented by several local races, four of which occur in British Indian territory, including the typical Persian race which passes through

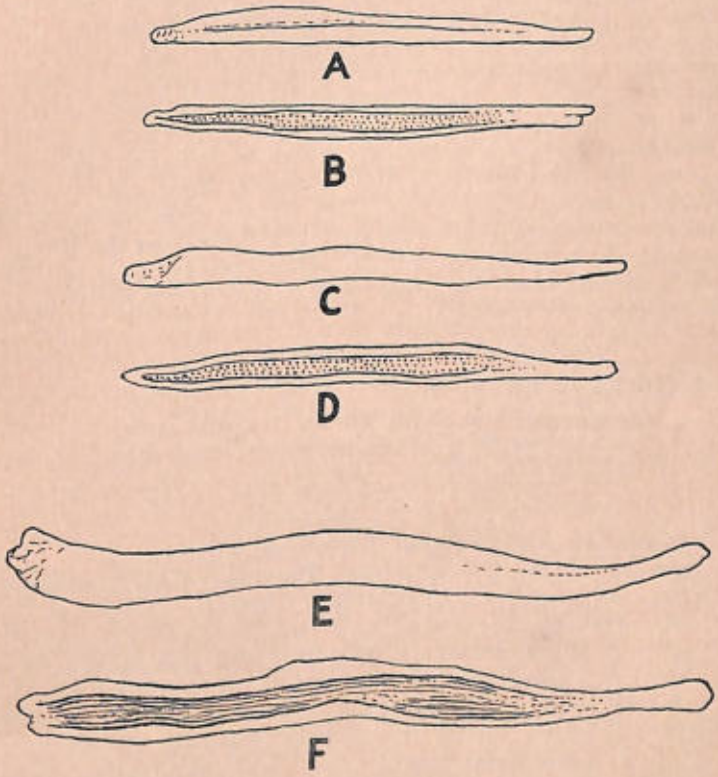


Fig. 14.

A. Side view of baculum of Indian Hill Fox (*Vulpes vulpes montana*) from the Himalayas (Zoological Society).
B. The same from below.
C and D. Side and lower views of baculum of the Asiatic Jackal (*Canis aureus aureus*) from Persia (Woosnam).
E and F. Side and lower views of baculum of old specimen of the Woolly Wolf (*Canis lupus chanco*) exported from Nepal (Zoological Society).

Baluchistan into western India. Westwards it spreads into Mesopotamia, where it intergrades with the Syrian race *syriacus* Hempr. & Ehrb. (Symb. Phys. 1828), which

on the somewhat scanty evidence appears to be distinguishable by its average darker colour. In the western and northern districts of Asia Minor, in the Caucasus, on the shores of the Caspian Sea, and in S.E. Europe there is a race *moreoticus* Geoffroy (Expéd. Sci. Morée, p. 15, pl. 1, 1853) *, which is larger and darker than *aureus* and seems to differ from the typical Himalayan race *indicus* merely by its rather larger size.

By Blanford and others the British Indian Jackals were cited as *Canis aureus*. That is their correct specific title. But when Wroughton revised these jackals in 1924 he not only discarded *aureus* but divided them into three distinct species—one, for which he took Hodgson's name *indicus*, occurring in northern India, where it is represented by two subspecies, *indicus* and *kola* ; a second, for which he proposed the name *naria*, inhabiting southern India ; and a third, named *lanka*, which is restricted to Ceylon. But his race *kola*, found in the deserts of western India, is indistinguishable from the Persian jackal, which is typical *aureus*. His *Canis naria* is nothing but a subspecies of the latter, and it is doubtful if the name *lanka* should be retained.

58 *a*. **Canis aureus aureus** Linn. The Persian Jackal.

Canis aureus, Linn., Syst. Nat. ed. 10, i, p. 40, 1758.
Canis indicus kola, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 651, 1916.
Canis aureus aureus, Pocock, Proc. Zool. Soc. 1938, p. 37 (footnote).

Vernacular.—*Neru-Koela* (Khandesh).

Locality of the *type* of *aureus*, Province of Lar (Laristan), Persia ; of *kola*, Deesa in Palanpur, Gujarat.

Distribution.—Mesopotamia, Persia, BALUCHISTAN and the deserts of WESTERN INDIA, blending with *indicus* and *naria* to the north and south respectively.

General colour of the upper side in good coat typically black and white, due to the extensive black tip and the more extensive white band beneath it of the contour-hairs, varied frequently by the exposure of the summit of the wool, which varies individually through all shades from pale brown to pale slate-grey. Not infrequently there is a buff wash on the pale band, especially over the nape and shoulders, and this

* This name will probably, I think, have to be replaced by *campestris*, given by Dwibugski (Prodr. Faun. Ross. i, Mamm. p. 10, 1804) to a supposed race of *Canis lupus* from the Kirghiz, Bokhara Steppes, between the Black and Caspian seas. It was said to be very like the common wolf, but only half the size, and " *griseus* " in colour. But a few lines lower the colour was stated, apparently on hearsay evidence, to be " *sordide flavo-rubens.*" I am indebted to Mr. Chaworth Musters for drawing my attention to this very rare volume.

sometimes affects all the contours of the dorsal surface. Ears and legs typically buffy, sometimes tan, the paws paler, but the hind leg above the hock deeper in tint. Underside variable, chin and fore throat typically whitish, the area behind the fore legs white or buffy in the middle line.

This description is taken from twelve Persian skins, six from the neighbourhood of Shiraz, 3,200 to 5,200 ft. (Sir J. E. B. Hotson), January, February, and July, the rest from Dizful, 500 ft. (Woosnam), Fao (Cumming), Bunder Abbas (Dr. Rae), Persian Gulf (Col. Evans), and Seistan (Col. Kennion). In these the colour, as described above, varies individually in the same locality. The palest skin is a ♀ from Bunder Abbas, February 2, which has the contours thinning and the wool pale ashy-grey at the summit, the richest one from the Persian Gulf, which has a buff wash on the back, deeper on the shoulders and nape, and the summit of the wool drabby brown. A second from Bunder Abbas is intermediate between these two.

From these Persian skins I am unable to distinguish skins from Panjgur, Mastung, 5,500 ft., and Khozdar, 4,100 ft., in Baluchistan (Sir J. E. B. Hotson), from Jacobabad, Larkana, Khairpur, and other places in Sind (S. H. Prater), from Cutch and from Gujarat (Crump), Palanpur in N. Gujerat being the type-locality of *kola*.

Flesh-measurements (in English inches) of some specimens of *Canis aureus aureus*.

Locality and sex.	Head and body.	Tail.	Hind foot.
Larkana, Sind ; ad. ♂	32	8¼	5⅜
Palanpur, Gujarat ; ad. ♂	30⅜	7⅜	6¼
Palanpur, Gujarat ; ad. ♂	26½	7⅛	5⅛
Panjgur, Baluchistan ; ad. ♂	29½	9¼	6⅜
Panjgur, Baluchistan ; ad. ♂	27½	9½	6⅜
Jacobabad, Sind ; ad. ♀	29	7½	5⅛
Palanpur, Gujarat (type) ; ad. ♀	28½	9⅜	5⅛
Khairpur, Sind ; ad. ♀	25⅜	8	5⅜
Panjgur, Baluchistan ; ad. ♀	28	9	6
Khozdar, Baluchistan ; ad. ♀	27½	11⅜	6½

In two adult ♂♂ from Persia the head and body are respectively 31½ and 26⅜, and in two adult ♀♀ 29½ and 23⅜ mm.

Average of head and body in 12 ad. ♂♂ from Palanpur and Sind = 28⅛
" " " 2 ad. ♂♂ " Baluchistan = 28½
" " " 5 ad. ♂♂ " Shiraz, Persia = 29⅜
" " " 10 ad. ♀♀ " Palanpur and Sind = 27⅜
" " " 2 ad. ♀♀ " Baluchistan = 27⅜
" " " 4 ad. ♀♀ " Shiraz, Persia = 26½

The weights of the two ♂ specimens from Palanpur in the table were 23 and 15 lb. respectively. The ♀ from Jacobabad

was 22 lb., the type from Palanpur was 18 lb., and another from the same locality, with the head and body 27½ in., was 14 lb.

The average condylobasal length of 10 adult ♂ skulls from districts near the typical locality of *kola* is 145½ mm., and of 10 adult ♀ skulls 139 mm. The largest ♂ skull from Shiraz has a condylobasal length of 154 mm., and the smallest 145 mm.; whereas in two ♀ skulls from Bandar Abbas the length is 143 and 126 mm. respectively.

This race has an extensive range to the east and north of Sind, Gujarat, and Cutch. It occurs in Rajputana and Gwalior, and in Khandesh unmistakeably blends with the South Indian race *naria*. It is traceable to western Bengal, but at Daltonganj, Hazaribagh, and Gaya it is represented by specimens which on the average are slightly darker than those from Gujarat in colour and have slightly larger skulls. The largest and smallest adult ♂♂ have a condylobasal length of 153 and 141 mm. respectively, the average of nine being 149 mm.; and the condylobasal of the largest and smallest ♀ is 148 and 135 mm. respectively, the average of five being 143½ mm. They thus come nearer the northern race *indicus*, to which they were assigned by Wroughton.

Northwards from Sind up the Indus and its tributaries it extends to the Upper Punjab. Skins from Dhalwad and Chakri, 900 ft., in the Salt Range (Wells), collected in March, and two in full moult from Rawalpindi, 1,100 ft., and 1,500 ft. (Stockley), July, are inseparable from Gujarat skins. There are also single skins from Pathakot, Kangra, 1,590 ft., and Chamba, but those from the first two localities, collected in February and March, are darker and more richly coloured than typical *aureus*, and suggest *indicus*. But the skulls of these Upper Punjab specimens are on the average smaller than those of typical *indicus*.

In a series of seven adult examples from Pilibhit, Rohilkand, March 1 to 8, one only is fairly richly coloured like *indicus*, the rest being pale like *aureus*. The average length of the head and body in 4 ♂♂ is 28⅝ in. and of 3 ♀♀ 28½, the weights of the ♂ being from 15 to 18 lb. and of the ♀ from 18 to 21 lb. The average condylobasal length of the skulls of the two sexes are respectively 142 mm. and 140½ mm. A series of four adult ♂ skulls, without skins, from Dehra Dun, Garhwal (submontane) and Bijnor (B. B. Osmaston) also has an average condylobasal length of 142 mm. Although a little shorter in the skull than typical *aureus*, these specimens from the upper waters of the Ganges and its tributaries are assignable to *aureus*. The skull is much too small for *indicus*.

In Kumaun, due north of Rohilkund, the jackals are intermediate between *aureus* and *indicus*. A series from Ramnagar,

Cranial and dental measurements of *Canis aureus aureus*,

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Panjgur, Baluchistan ; ad. ♂	164	152	86	27½	26	27	118	17—	19—
Vankaneer, Kathiawar ; ad. ♂	164	(153±)	90	30	28	29	120	17	20½
Larkana, Sind ; ad. ♂	162	153	84	30	27	27	118	16	17
Kashmor, Sind ; ad. ♂	148	142	80½	27	24	25	108	16	—
Panjgur, Baluchistan ; ad. ♀	155	148	85	30	23½	25	116	16	17
Palanpur, Gujarat (type *kola*) ; ad. ♀.	154	146	83	28	25	27	114	16	18
Bhuj, Cutch ; old ♀	156	147	83	—	—	27	113	16	19
Charwa, Cutch ; ad. ♀	144	137	78	31	25	26	105	15	17

1,500 ft., Takula, 5,350 ft., and Almora, 5,850 ft., December, with an average length of the head and body in six ♂♂ 27⅘ in., and of two ♀♀ 26½, resembles *indicus* in its rich dark tints; but the skulls are smaller, the average condylobasal length of the six ♂♂ being 147½ mm. and of the ♀ 139 mm. Thus the skulls are practically as in *aureus* but the colour as in *indicus*.

58 *b*. **Canis aureus indicus** Hodgs. The Himalayan Jackal.

Canis aureus indicus, Hodgson, Asiat. Res. lviii, p. 237, 1833.
Canis indicus indicus, Wroughton, Journ. Bomb. Nat. Hist Soc. xxiv, p. 650, 1916.
Canis aureus indicus, Pocock, Proc. Zool. Soc. 1938, p. 37 (footnote).

Vernacular.—Gidah, Shial, Shal (Kashmir); *Syal* (Lepcha and Pahari); *Nao-han* (Bhotia in Sikkim); *Toung-Khwe* or *Rhwea* (Burmese at Mt. Popa); *Quay-at* (Chin Hills); *Mania* (Shan States).

Locality of the *type*, Nepal.

Distribution.—NEPAL, up to 12,000 ft. at Gorkha; SIKKIM up to 7,000 ft. at Darjeeling; BHUTAN, 600 ft.; DARBHANGA, 150 ft.; ASSAM, up to 1,300 ft. in the Naga Hills; BURMA and S.W. Siam.

Distinguished on the average from typical *aureus* by the darker and richer colour of the unfaded coat, the pale areas of the dorsal contour-hairs having typically a pale buff rather than a whitish or silvery tint, the wool darker, the ears and the legs deep rich tan, and the chest and fore belly more prevalently buff. Also the body-measurements and the skull are a trifle larger on the average.

The variation in colour with the change of coat is very marked. Before the moult sets in the buffish hue of the dorsal contour-hairs fades to whitish, the tan of the ears and legs to palish buff, and the underside becomes more uniformly whitish. This style of coloration is exhibited by Hodgson's type and by a skin from Bankulwa Morang in Nepal, dated March 13. These skins are indistinguishable in colour from those of typical *aureus*, and, as in that race, when the contour-hairs are dead and broken or shed the dorsal surface loses its speckled aspect and becomes tolerably uniformly yellowish-brown owing to the exposure of its underhair. Skins showing various stages in the moult of the contour-hairs and the exposure of the wool were collected in Darbhanga, 150 ft., at the end of July and the beginning of August, at Pedong, Darjeeling, 4,700 ft., on September 7 and 9, and at Rongli, Sikkim, 2,700 ft., as late in the season as November 24. On the other hand, a large ♀ from Darjeeling, 7,000 ft., February 22, with the head and body 31⅘ in., has the full coat and rich

colouring of the best Nepalese skins. Of special interest are two skins from Rongli, Sikkim, November 26, one from Hasimara, Bhutan Duars, November 22, and one from Margherita, in the Naga Hills, October 27, which in their shortish, early winter coat, with narrow bands on the contours, resemble in colour well-coloured skins of the S. Indian race *naria*.

The following are the flesh-measurements of the largest and smallest adult ♂ and ♀ examples from Nepal :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Bankulwa Morang ; ad. ♂	31⅜	10⅜	6½
Hathiban ; ad. ♂	29½	10⅜	6¼
Bankulwa Morang ; ad. ♀	31½	10	5⅝
Gorkha ; ad. ♀	28⅜	8⅝	5⅝

Average of head and body of 6 ad. ♂ from Nepal = 30⅜
,, ,, ,, 3 ad. ♂ ,, Sikkim & Sivok, Bengal = 30
,, ,, ,, 3 ad. ♀ ,, Nepal = 30
,, ,, ,, 7 ad. ♀ ,, Sikkim & Darbhanga = 29½

These dimensions slightly exceed those of typical *aureus*.

There is clearly very little difference between the sexes. Actually the largest ♂ of this race, with a head- and body-measurement of 32 in., came from Margherita in the Naga Hills. Of skins from Burma the only one measured in the flesh is an adult ♀ from Mt. Popa (Shortridge), with the head and body 28⅜, tail 10⅜, hind foot 5⅝.

The weights are variable. The ♂ from Hathiban entered above was 23 lb. Another, slightly larger, from the same locality, with a head- and body-measurement of 30⅜ in., was 20 lb. A ♀ from Darjeeling with the head and body 30½ in. was 24 lb., one from N. Kamrup with head and body 30⅜ was 19 lb., and the one from Mt. Popa was 13½ lb. These weights agree with Ward's statement that in Kashmir the weight, presumably of a ♂, is up to 25 lb., and of a good ♀ 19 lb.

The average condylobasal length of six adult ♂♂ from Nepal is 155 mm. and of three adult ♀♀ 145 mm. The same average of eleven adult ♂♂ from Nepal, Bhutan, Sivok, S. of Darjeeling, and Assam is also 155 mm., and of ten adult ♀♀ from Nepal, Sikkim, Darbhanga, and Assam is 147 mm. These averages are approximately 10 mm. longer, sex for sex, than those of typical *aureus*. The skull from Katmandu (Oldfield) is the largest Nepalese ♂, but one from Margherita in the Naga Hills and one from Angarakata, N. Kamrup, with a condylobasal length of 161 and 160 mm. respectively, are a little larger. Others, however, from Assam are smaller, the average of four adult ♂♂ from that district being 156 mm. Of two adult ♂♂ skulls from Burma, one from Toungoo is 156 mm., the other from Chindwin 146 mm. ; and three adult ♀ skulls from Mt. Popa,

Skull-measurements (in mm.) of the largest and smallest ♂ and ♀ specimens of *C. a. indicus* from Nepal.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Katmandu ; ad. ♂	168	159	91	27	28	31	123	17	20
Hathiban ; ad. ♂	159	148	92	30	28	29	115	16½	18½
Gorkha ; ad. ♀	157	148	82	27	24	26	113	16	17½
Gorkha ; ad. ♀	147	141	80	27	22	26	108	16	18

the Shan States, and "Burma" are 152, 148, and 140 mm. respectively, the skull from Mt. Popa equalling the largest ♀ skulls of *indicus* from west of the Brahmaputra, and the average of the three ♀ Burmese being almost exactly the same as that of the ten ♀♀ ranging from Nepal to Assam.

58 *c*. **Canis aureus naria** Wrought. The Southern Indian Jackal.

Canis naria, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 651, 1916.
Canis aureus naria, Pocock, Proc. Zool. Soc. 1938, p. 37 (footnote).

Vernacular.—*Kola* (Marathi and Dekhanese); *Koila* (Ratnagiri); *Nari* (Kanarese); *Nakka* and *Tada Nakka* (Waddari).

Locality of the *type*, Virajpet, S. Coorg.

Distribution.—The whole of the southern part of PENINSULAR INDIA from THANA near BOMBAY in the north-west southwards through the WESTERN GHATS, MYSORE, the EASTERN GHATS, and MADURA.

Distinguished on the average from the northern race by its shorter winter coat, which, being smoother and less shaggy, appears darker on the back, the black tips of the contour-hairs concealing to a greater extent the pale penultimate band, the general effect, as described by Wroughton, being black speckled with white. The underside is also, as a rule, more pigmented on the chin, the hind throat, the chest, and fore belly *. The limbs are rusty ochreous or rich tan.

The general colour is sometimes subject to the same extreme seasonal contrast exhibited by the northern race, but the contour-hairs are sometimes moulted without manifest bleaching and the moult occurs earlier in the season. In the type, dated January 13, the shedding of the dorsal contour-hairs was apparently just beginning, judging from the comparatively small exposure of the ochreous-brown wool, but in three skins from the same locality in S. Coorg, dated January 13, 23, and 29, most of the contour-hairs are gone, the back being covered mainly with soft woolly hair, varying from reddish-brown to dull yellowish in colour. Two skins are remarkably pale. One from Jellapur, N. Kanara, October 24, is very grey, the contour-hairs being white with black tips. The other from the Thana District, February, is similar to it. The difference in the dates of these two bleached skins suggests that there may be two moults. A skin from Payangadi, N. Malabar, September, is dark, blackish brown with white speckling above, and deeply and extensively reddish below.

* Wroughton's description of this jackal suggests that its coloration is of a different style from that of the northern Indian jackals. It is fundamentally the same, the difference depending on the shorter coat and consequently narrower bands on the contour-hairs.

Flesh-measurements (in English inches) of the largest and smallest ♂ and ♀ specimens, and of the type in the British Museum :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Virajpet, S. Coorg ; ad. ♂	30½	9½	5⅜
Cumbum, Madura ; ad. ♂	27½	8½	6½
Cauvery Falls, Mysore ; ad. ♀	28⅜	8½	5⅜
Virajpet, S. Coorg (type) ; ad. ♀	26½	8⅜	5⅜
Ratnagiri ; ad. ♀	24½	9	6⅜

Average length of head and body in ten adult ♂♂ 29½, in ten adult ♀♀ 26½.

The weights are variable. That of the ♂ from Virajpet was 17 lb. Two ♂ specimens from Salem with the head and body 29½ and 28½ weighed respectively 17½ and 17 lb. The ♀ (type) from Virajpet was 19 lb., one with exactly the same length of head and body from Cumbum was 18 lb., the ♀ from Ratnagiri was 15 lb., whereas the largest ♀ from the Cauvery Falls was entered as only 13 lb., and a ♀ from Salem with the head and body 26 in. was 12 lb.

58 *d*. **Canis aureus lanka** Wrought. The Ceylon Jackal.

Canis lanka, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxiv, p. 651, 1916 ; Phillips, Man. Mamm. Ceylon, p. 194, 1935.
Canis aureus lanka, Pocock, Proc. Zool. Soc. 1938, p. 37 (footnote).

Vernacular.—Nariva, rarely *Hiwala* (Sinhalese) ; *Narie* (Tamil) ; *Kulla Narie* (Jaffna Tamil).

Locality of the *type*, Mankeni, E.P.

Distribution.—" Practically the entire Island " of CEYLON (Phillips).

Distinguished from *naria* by the apparently constant presence on the inner side of the third upper premolar of a rooted lobe, which is only occasionally present in *naria*.

Wroughton described the Ceylon Jackal as a species distinct from the southern Indian form, *naria*, mainly on the evidence of the dental peculiarity above described, without being aware at the time of its occasional occurrence in *naria*, as well as in some domestic dogs. It is present in two skulls of *naria* in the British Museum, one shot by Major Rodon at Dharwar, the other collected by Baptista in the Chettiri Range, Salem. Its apparently invariable presence without survival value in Ceylonese skulls, as attested by those in the British Museum and in all, as he tells me, seen by Phillips, is too interesting to be lost sight of, and the racial name *lanka* may be retained to commemorate it *.

* Since this diagnosis was written Phillips has sent me an unusually small ad. ♂ skull from Gammaduwa with the lobe absent.

Wroughton also stated that *lanka* is larger than *naria*. This is not borne out by flesh-measurements; but the skull he selected as the type of *lanka* from Mankeni, E.P., is longer than the skull of any of the Indian races I have measured. The upper part is not available for examination to ascertain the condylobasal length, but the mandible, an equally good criterion, is 129 mm. In another ♂ skull from the same locality, however, the mandible is 122 mm., the same length as in a ♂ skull of *naria* from Cumbum in Madura. The number of skulls of *lanka* in the British Museum is comparatively small, but the average length of the mandible in five adult ♂♂, including the type, is 120 mm., whereas in six adult ♂♂ of *naria* it is 116½ mm. In the available ♀ skulls of the two races the length of the mandible is about the same. The evidence to hand merely suggests the possibility of *lanka* being a trifle larger than *naria*.

Flesh-measurements (in English inches) of the largest and smallest ♂ specimens in the British Museum, and of Phillips's largest ♀ and of the smallest ♀ in the British Museum :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Mankeni (type); ad. ♂	30⅜	7	6⅜
Mankeni; ad. ♂	26½	9⅜	6½
Phillips's largest; ad. ♀	29	9½	5½+
Anasigalla; ad. ♀	27	8¼	5½

Average length of head and body in 5 adult ♂♂ 29⅜, in 4 adult ♀♀ (Phillips) 27.

The weights are variable. A ♂, according to Phillips, with the head and body 30½ in. was 20 lb., but a ♂ from Mousakanda (Brit. Mus.) with the head and body 30 in. was only 16 lb., whereas Philips's largest ♀ was 18 lb.

Habits.—The Indian Jackal has great powers of adaptation to varied surroundings. With a few unimportant differences, due to local environment, the habits of all the races seem to be similar. It is found in nearly all districts in British India, and some accounts of its occurrence noted by the collectors for the Mammal Survey may be put on record. Many were collected by Hotson in Baluchistan, and by Prater in Sind. According to Crump it is exceedingly common all over Cutch, in Kathiawar, especially about cultivation, and although abundant round Palanpur in Gujarat, it is not found so high up as Uria, and is rare in the hot weather at Danta, but after the rains its howling was heard there. In western Bengal it was plentiful all over the cultivated areas near Daltonganj and Hazaribagh, but was not seen in the Singbhum forest. In Kumaun it does not appear to penetrate far into the higher ranges, but is found in the Sargu Valley, also in Almora

Cranial and dental measurements (in mm.) of *Canis a. naria* and *Canis a. lanka*.

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.
Canis a. naria.									
Coimbatore (Morris); oldish ♂	165	155	90	33	31	30	121	18	19
Cumbum, Madura (Prater); ad. ♂	166	154	90	32	32	31	122	18	20
Satara (Prater); ad. ♂	158	150	86	26	26	30	116	17	19
Kurnool (Baptista); ad. ♂	159	149	85	30	27	28	115	18	19
Chettiri Range (Baptista); ad. ♂	155	146	84	32	26	27	113	17	19
Virajpet, S. Coorg (Shortridge); ad. ♂	152	145	83	31	27	27	110	16+	18
Cannanore, N. Malabar (Dallas); ad. ♀	153	141	84	30	25	28	—	17	—
S. Mysore; ad. ♀	—	139	81	32	26	26	108	16	18
Virajpet, S. Coorg (type); ad. ♀	147	138	81	30	24	25	109	16—	17
Nilgiri Hills (Davison); ad. ♀	146	137	86	28	25	28	—	15	—
Madura (McCann); ad. ♀	143	136	80	30	27	26	104	16	17
Canis a. lanka.									
Mankent (Mayor) (type); ad. ♂	—	—	—	—	—	—	129	—	19
Mankeni (Mayor); ad. ♂	—	—	—	—	—	—	122	—	19
Hambantota (Phillips); ad. ♂	161	152	87	33	31	31	117	18	19
Gammaduwa (Phillips); ad. ♂	159	150	85	32	28	—	117	18	19
Gammaduwa (Phillips); ad. ♂	145	137	80	25	23	26	105	15	17
Anasigalla (Phillips); yg. ad. ♀	150	141	77	29	23	25	108	16	18
Kalutara (Baptista); ad. ♀	149	139	76	27	22	24	108	16	17

and at Lohaghat and Champawat in the Bhaba, but usually becomes scarce above the foothills. In Sikkim it is not common above 3,000 ft., but in the Darjeeling district occurs up to 7,000 ft. Col. Ward has heard it up to 7,500 ft. in Kashmir. According to Dunbar Brander it is found both in the forests and open country of most parts of Central India, but is rare in Berar, where the black soil is not suitable for the burrows in which it rears its young. Shortridge also found it very plentiful in forests and open country in Dharwar, and also in S. Coorg, especially near villages. In Ceylon Mayor came across it everywhere, but more commonly in the Eastern Province. Phillips also states that it is found over practically the whole of the island, but more frequently in the plains than in the hills. He adds, however, that it is a wanderer in most parts, especially in the hills. It may be abundant in a particular district in one year but entirely absent in the following year or even for several years thereafter. In Burma it is not so plentiful as in India and Ceylon, and seems to be a comparatively recent immigrant into the country, but is steadily spreading its range. According to Mackenzie it is said to be an occasional visitor at Tamin in the Chin Hills, probably coming over from Manipur; but Shortridge recorded it as well known round Mount Popa, Mandalay, Mingun, and other parts of the Dry Zone, and as occasionally ascending the Shan plateau at Maymyo, whence it extends, though not in large numbers, as far east as the Salween. Peacock also stated that jackals are fairly common in the Dry Zone but very rare in most other parts of Burma. Writing in 1917 Allen declared that whereas twenty-nine years previously there were no jackals in the Henzada District in Lower Burma, he found them to be plentiful in that year. They reached the district, he thought, either by coming across the Arakan Yomas or from Thayetmyo.

The diet of Jackals is very varied. They are notoriously useful scavengers, prowling around villages at night to pick up any edible offal they can find, eating any dead animals they come across in the jungle, and finishing off the remains of the "kills" of tigers and leopards. But they also kill for themselves any mammals, birds, or reptiles they are capable of overcoming up to the size of small deer and antelope, and it is very destructive to sheep in Kashmir according to Ward. They usually hunt either singly or in pairs, but occasionally in packs like wild dogs. They have been seen to course hares and black buck in the open, and Dunbar Brander records watching a pack of ten or a dozen "in full cry" after a four-horned antelope, which he did not doubt they would catch, having good scenting powers. They also eat kids and lambs when they can get them, and are often a great pest

to poultry keepers. Near the coast in Ceylon, Phillips tells us, they may be frequently seen trotting up and down between tide-marks close to the water's edge to feed on shell-fish or anything edible stranded on the sand. Insects also form part of their diet, as well as fruits of various kinds, especially the small plums of the ber (*Zizyphus*), and in certain districts maize, sugar-cane, and, like the palm-civet, coffee berries, which, when collected from their droppings, are said to make the best coffee, probably because, as Sterndale asserts, the jackals choose the finest quality of berries to eat.

Being swift of foot jackals give a good run when hunted with hounds; but in Ceylon, according to Phillips, the dogs will not always follow the trail, and sometimes refuse to kill the jackal when overtaken, no doubt, it may be supposed, because they recognize him as one of their own kind *. The jackal, however, is not sufficiently swift to make good sport when coursed, being easily caught by greyhounds.

The jackal's howl, which has been often discussed, has been described as a wail three or four times repeated in ascending scale, followed by three quick yelps, also repeated two or three times. By Anglo-Indians it has been likened to the cry of "Dead Hindoo; where, where, where." It is usually uttered shortly after dark and just before dawn; and Dunbar Brander graphically wrote that in the still hours of the morning the sound may be heard approaching from a distance, to be caught up by jackals round the camp and passed on to others until it fades away in the distance, as if transmitted all across India from Bombay to Calcutta. A different cry, which has been onomatopœically transferred to the animal itself, has been described as "*Pheal, Phion*, or *Phnew*." This is admittedly uttered when the jackal is aware of a tiger or leopard near by, and it was formerly believed to be restricted to such occasions †; but Dunbar Brander states that he has heard it when there were no tigers within miles of the spot. He thinks it is a cry of alarm or suspicion, whatever the cause may be; and Col. Ward states that it is emitted when pigs, wild dogs, or bears are on the move.

The legend which has elsewhere earned for the jackal the title of "Lion-provider" is prevalent in India in connection with the tiger. It is likely enough that jackals follow tigers for the chance of finishing the "kill" when the tiger is gorged. Dunbar Brander describes them as the only animal which has any friendly relations with the tiger, and reports seeing one

* Phillips also states that the labourers' dogs "only bark and rarely molest" a jackal that makes a raid on the fowls of their owners.

† Blyth, it may be noted, heard a pariah dog make this howl on scenting some tigers in a cage.

running fearlessly in and out between three tigers emerging nearly abreast from the jungle during a beat. He thinks the jackal is beneath the tiger's notice; and, judging from his account of hearing a jackal utter the "pheal" cry upon detecting his presence, of which the tiger was unaware, it is possible that the jackal may be of use to the tiger.

The period of gestation is from 60 to 63 days, as in the wolf and domestic dogs. With the latter jackals in captivity have been crossed, and it is commonly believed in India that they sometimes interbreed with pariahs. The cubs, usually three or four in number, are born either in an enlarged chamber at the bottom of a burrow dug by the bitch, in a drain, or in some natural shelter like an overhanging rock or hollow tree-trunk.*

Genus **VULPES** Oken †.

Foxes.

Vulpes, Oken, Lehrb. Naturg. iii, pt. 2, pp. 1033–4, 1816; and of all recent authors, including Miller, Cat. Mamm. Centr. Europe, p. 325, 1912.

Type of the genus, *Canis vulpes* Linn.

Distribution.—The greater part of the Old World, except Madagascar, S.E. Asia, and Australasia; America as far south as Mexico.

Distinguished from *Canis* and *Cuon*, the other genera of Canidæ inhabiting British India, by having the forehead of the skull between the postorbital processes flat, not inflated by air-cells, the processes themselves slightly concave, with raised anterior edge, instead of convexly rounded, and the canine teeth typically longer, the upper with their points reaching as low as the inferior margin of the mandible, and the points of the lower reaching well above the line of insertion of the upper incisors (text-fig. 21, B, C, p. 143). The feet are relatively longer, less compact, and the plantar pad is invaded by hairs behind and more crescentic, less cordate in shape, and on the lower side of the digits in front of the plantar pad there is a deep glandular pit, which leaves the scent followed by hounds. This is furnished with two elongated, scantily-hairy areas separated in the middle line by a band of close-set hairs (text-fig. 17, p. 130).

* Owing to its prevalence in certain parts of India and Ceylon, the belief that a jackal sometimes grows a horn on its forehead should perhaps be recorded, although it is apparently unsubstantiated and its foundation unknown.

† The Common British Indian Foxes have been dealt with at some length in this volume owing to their extreme individual variation.

Key to the Species based on External Characters.

a. Tail and ear long, tail over half the length of the head and body, ear much more than half the length of the hind foot.
  b. Tip of the tail white; upper half of back of ear black and strongly contrasted with tint of head and nape (four pairs of mammæ) ..... [p. 110. *vulpes* Linn.,
  b'. Tip of the tail black; backs of the ears generally nearly the same tint as the head and nape, never jet-black and strongly contrasted.
    c. Larger; coat never very long and full; colour brownish or ochreous on the back, the contour-hairs always with pale band giving a speckled look to the pelage (three pairs of mammæ) ..... [p. 129. *bengalensis* Shaw,
    c'. Smaller; coat very long, full and loose; the contour-hairs extensively white and black, so that the pelage is never closely speckled (mammæ ?) ..... [p. 139. *cana* Blanford,
a'. Tail and ear short, tail less than half the length of the head and body; ear less than half the length of the hind foot ..... [p. 140. *ferrilata* Hodgson,

Key to the Species based on the Skull and Teeth.

a. Muzzle comparatively short and broad, its width above pm^2 about one-third the length of the palate; canines moderately long, height of upper from base to point less than length of upper carnassial (pm^4) and first molar (m^1) as set in jaw.
  b. Nasals on the average narrower posteriorly; the upper carnassial relatively larger as compared with the first molar.
    c. Skull in smallest ♀ over 100 mm. in condylo-basal length ..... [p. 110. *vulpes* Linn.,
    c'. Skull in adult ♂ up to about 90 mm. ..... *cana* Blanford.
  b'. Nasals on the average broader posteriorly and upper carnassial smaller as compared with first upper molar ..... [p. 139. *bengalensis* Shaw.
a'. Muzzle long, with concave lateral margins, its width above pm^2 about one-quarter the length of the palate; canines very long, height of upper exceeding combined length of pm^4 and m^1 ..... [p. 129. [p. 140. *ferrilata* Hodgson,

59. **Vulpes vulpes** Linn.

Canis vulpes, Linn., Syst. Nat. ed. 10, i, p. 40, 1758.
(For descriptions and full synonymy of typical *Vulpes vulpes* from Sweden and of related European forms see Miller, Cat. Mamm. Western Europe, pp. 330–40, 1912.)

Locality of the *type*, Sweden.

Distribution.—Europe from the Arctic coast to the Mediterranean, and Africa north of the Sahara; Asia from the far north to S. Arabia, N.W. India, the Himalayas, S. China,

and Tong-king; the greater part of N. America from the Arctic coast southwards to California. Absent from the greater part of PENINSULAR INDIA, CEYLON, BURMA, Malaya, Siam, Sumatra, Java, and Borneo.

The range agrees on the whole very closely with that of the Wolf (*Canis lupus*) and of the Bear (*Ursus arctos*).

Distinguished by the combination of black backs to the upper half of the ears and a white tip to the tail. Although commonly called the "red fox," on account of the dominance of that tint, the colour is very variable both individually and locally, the contour-hairs of the back being sometimes flavescent, "silvery," or black to a varying extent. The size is also variable. Although typically considerably exceeding on the average that of other species, some of the subspecies are comparatively small. Usually at all events there are four pairs of mammæ.

59 *a*. **Vulpes vulpes montana** Pearson. The Hill Fox.

"The Hill Fox," Royle, Journ. As. Soc. Beng. i, p. 99, 1832.
Canis vulpes montana, Pearson, Journ. As. Soc. Beng. v, p. 313, 1836 (Jan.).
Canis himalaicus, Ogilby, Proc. Zool. Soc. 1836, p. 103 (Oct.); and in Royle's 'Botany of the Himalayas,' Mamm. p. lxvi, 1839.
Vulpes nepalensis, Gray, Charlesw. Mag. Nat. Hist. i, p. 573, 1837.
Vulpes alopex, Blanford, Mamm. Brit. India, p. 153, 1881.
Vulpes waddelli, Bonhote, Proc. Zool. Soc. 1906, p. 303.
Vulpes ladacensis, Matschie, Filchner's Exped. Chin. p. 167, 1907.
Vulpes vulpes montana, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 38, 1936.

Vernacular.—Lomri (Hindi); *Rubah* (Pers.); *Luh* ♂, *Laash* ♀ (Kashmiri); *Wamu* (Nepal).

Locality of the *type* of *montana* *, "Himalayas"; of *himalaicus*, Mussooree; of *nepalensis*, Nepal; of *waddelli*, Kambajong, Tibet; of *ladacensis*, Ladakh.

Distinguished from the typical Scandinavian race and the other races of continental Europe admitted by Miller by its smaller size on the average, especially indicated by the skull and teeth (see p. 118).

In this Fox, in winter at least, the long coarser hairs on the sole of the foot are copiously mixed with softer woolly hairs.

Notes on the synonymy.—The type of *montana*, of which the exact locality is unknown, was described as having a dark rufous cross on the back set off by light fawn on the neck and behind the shoulders; the sides of the body and the

* Wrongly stated by Mivart (Mon. Canidæ, p. 96, 1890) to be in the British Museum.

shoulders being grizzled and the underside dark. Blyth, who had Pearson's type and stated that the fox occurs at Simla and Mussooree, described it as much less rufous than the European fox and paler and more hoary (Journ. As. Soc. Beng. xxiii, p. 730, 1854). He also astutely suggested that it might prove to be the same as the large fox of Afghanistan described by Griffith. From the description it appears that this fox comes into the intermediate category, since its description agrees tolerably closely with skins from Kangra, Chamba, and Simla referred to below.

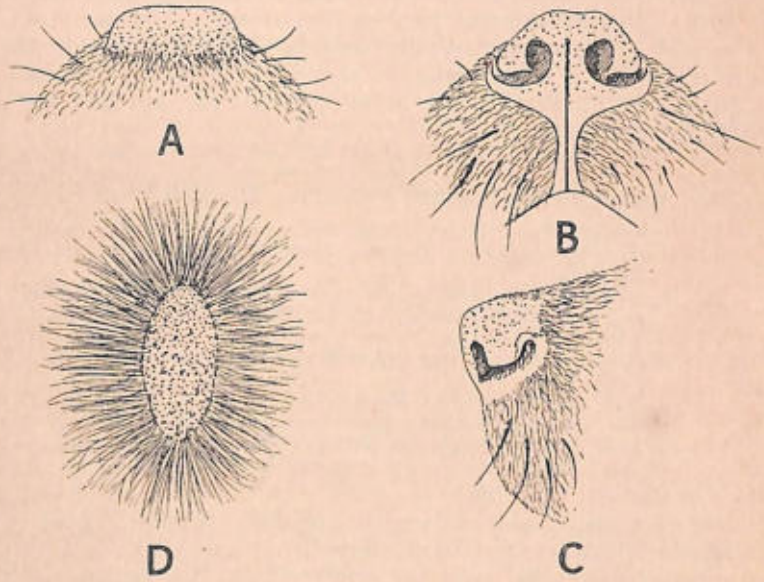


Fig. 15.

A, B and C. Rhinarium of the Hill Fox (*Vulpes vulpes montana*) from above, from the front and from the side.
D. Gland on the upper surface of the tail of the same, with the hairs pulled aside to show the naked area. (This gland, present in other Canidæ, is particularly well developed in Foxes.)

The type of *himalaica*, from Mussooree, was described as bright bay on the back, yellowish on the sides of the body, white on the side of the neck, hoary grey on the hips, and smoky brown below. Ogilby's type, which is in the British Museum, is now tawny-red above, with hardly a trace of black, but with some buffy-white on the loins, isabelline on the flanks, silvered and hoary on the thighs, sooty below, set off by bright buff on the chest. Although both Ogilby and Blyth

considered *himalaica* to be a synonym of *montana* the two types do not agree in coloration, *himalaica* belonging to the first category mentioned below.

The type of *nepalensis*, one of Hardwicke's Nepalese specimens of which the whereabouts is unknown, was described as bright fulvous-yellow above, like the English fox, but with the fur brighter and much softer. According to Blyth (Journ. As. Soc. Beng. xxiii, p. 730, 1854) this is a large fox with very fine, long, dense fur, bright light yellowish-fulvous in colour, and with a huge brush. According to him it occurs in Tibet, rarely south of the snows. Possibly Hardwicke's specimen was a traded skin; but the description agrees very closely not only with some Tibetan skins in the British Museum, but with one from Sikkim and some from Kumaun as stated below.

The type of *waddelli*, from Kambajong, Tibet, 16,400 ft., was regarded by Bonhote as distinct from *montana* because it represented a redder type than any of the Himalayan skins in the British Museum at that time. It is not redder, however, than skins from Sikkim, Kumaun, and elsewhere subsequently received.

The name *ladacensis* was given by Matschie to a skin from Ladakh which he thought was specifically identical with the paler of the two foxes collected by Stolicka in Turkestan, and illustrated by Blanford (fig. 1, pl. 2) in the report on the Second Yarkand Mission, 1891. Matschie was apparently quite unaware of the individual variation in the colour of foxes. There is no doubt that the two foxes depicted on the plate by Blanford merely represent colour-phases of one and the same subspecies, comparable with the "red" and "flavescent" phases of *montana* from Kumaun, Sikkim, and Tibet, although Matschie regarded them as specifically distinct. I have seen no foxes from Ladakh, but one from Gilgit, in the same river valley, is inseparable from *montana*.

The British Museum has the following Himalayan skins * :—

Sikkim, Kapup, 13,000 ft. Adult ♂ (Crump), November 24, in fresh winter coat is bright reddish-bay from nape to loins, with scarcely any black or buff or grey areas in the contour-hairs, but the forehead and cheeks have a good deal of whitish; the thighs are hoary grey; the under side white; the top of the tail red, and the fore legs darkish tawny, with a grizzled black streak to wrist; hind legs paler.

Sikkim, Thanga, in the Upper Chambi Valley, 11,000 ft. Adult ♀ (Crump), January 4, in mid-winter coat, is much paler and yellower, the contour-hairs bleached to buff on the

* The individual skins have been dealt with at some length on account of their great variability in colour both when in good coat and during the moult.

back, the bright tint being restricted to the back, with the flanks greyish; the fore legs also are much paler, but the under side is white.

Tibet, Kambajong, 16,400 ft. Adult, October 8 (type of *waddelli*, Col. Bailey coll.), is very like the Kapup skin, but has the contour-hairs on the flanks paler. A second skin named *waddelli* by Bonhote, from Pharijong, January 11, is like the Upper Chambi skin but rather brighter. Two undated skins labelled Tibet (Hodgson) are also a little brighter and more golden than the Chambi skin, the three being intermediate between the two skins assigned to *waddelli*. An adult ♂ from Dachin, Tibet, 14,700 ft. (Col. Bailey), June 22, is in full moult, all the contour-hairs of the back being shed, leaving a thick coating of tufted, dark chocolate wool. Another adult ♂ from Gyantse, 13,000 ft. (Col. Bailey), undated, is in much the same condition, but a few contour-hairs, with the tips bleached white, dead and shrivelled, remain. All these skins are white-bellied. The redder of them belong to the phase represented by the type of *himalaica*, and the paler agree precisely with Gray's description of *nepalensis*.

No fox of this type has been recorded from Bhutan, Assam, or Upper Burma; but it occurs in Yunnan, whence the Museum has two skins, both from Tengyueh, an adult ♀, 9,000 ft. (Howell), February 11, which is an almost exact match of the skin from Kapup in Sikkim, and an adult ♂, 6,000 to 7,000 ft. (Forrest), dated December 24, but almost certainly wrongly, because the whole of the back behind the shoulders is covered with brown wool with a few white-bleached contours, as in Col. Bailey's Tibetan skins, but the nape and shoulders still retain the long buffy contours, resembling in colour the paler skins of the *nepalensis*-type from Tibet and Sikkim.

Kumaun.—A series of six skins (Crump) closely resembles those described above. The extremes in colour are an adult ♂ from Lohaghat in Almora, 5,600 ft., February 6, which is dark reddish-bay above from the head to the tail-root, as is the skin from Kapup, Sikkim, but there are some black-tipped hairs on the nape and shoulders and the belly is mostly blackish; and an adult ♀ from Champawat in Almora, 5,850 ft., February 21, which is much paler, with the general colour above buffy-yellow, the fur of the back grey-brown instead of sooty, and the throat and chin and greater part of the belly white, with some dark grey on the chest. A second from Lohaghat closely matches the Champawat ♀.

Two adult ♂ skins from Takula, 5,350 ft., October 12 and 15, are like the first described ♂ from Lohaghat, whereas a ♀ from the Takula, October 12, is paler, intermediate between the ♂ Takula skins and the pale ♀ from Champawat.

These skins also exhibit the colour-phases represented by the types of *himalaica* and *nepalensis* respectively.

Mussooree.—In addition to the type of *himalaica* above described the Museum has another skin, 5,500 ft. (Hutton), which is very like it, but has more white banding in the contour-hairs of the hind quarters, and is white below in the middle line instead of slate-grey.

Simla.—A series of four skins (Hume) shows great individual variation. Two, ♂♀, closely resemble the Mussooree skins, another ♀, September 28, is much darker, all the hairs of the dorsal surface being black-tipped and buff below the tip,

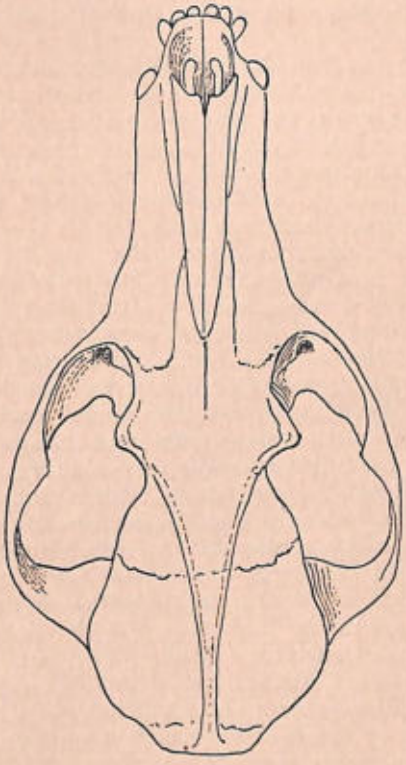


Fig. 16.—Upper view of skull of adult ♂ of the Hill Fox (*Vulpes vulpes montana*) from Takula, Kumaun. (Two-thirds nat. size.)

the general effect being grizzled brown from the crown backwards. Another ♀, September 26, is much darker than the last, the pale areas of the contour hairs being much less evident, especially on the nape and shoulders, which are heavily blackened ; the under side is sooty, and the legs are very dark. The general effect is a blackish fox, speckled with buff or grey, with a brighter buffy cross-mark down the spine and across.

the shoulders. Another ♀ skin (Blanford), October, is short-coated and marked above with a dark rusty-red cross showing no buff or black speckling; the thighs and fore legs are blackish, speckled with white. This skin of Blanford's agrees very closely with the type of *montana* as described by Pearson, but neither appears to be in complete coat, judging from the distinctness of the "dark rufous" cross mark on the back; and it is evident from Blyth's description of the foxes from Simla and Mussooree, that the skins he had, said to be much less rufous, paler and more hoary than European foxes, belonged to the type prevalent at Kangra and Chamba.

Kangra Valley.—Four skins (Wells), those in good coat of the "crossed or decussate," hoary type, with the bright colouring reduced on the back and the contour-hairs with a broad whitish band and a black tip, the black often dominant. Adult ♂ from Gopalpur, 6,000 ft., February 29, is dark reddish-tan down the back, with abundance of black but not much of the pale tint, the flanks are grey, the thighs and shoulders hoary, the under side smoke-grey, the fore legs dark hoary, with dark tan paws, and the hind legs dark tan with a dark hoary patch. A second adult ♂ from the same locality, 5,600 ft., February 18, is a good deal paler above but has more black on the limbs. Adult ♀ from Sanyala, 4,500 ft., May 8, is still paler, yellowish down the back, with the dark hair-tips scarcely evident, but the thighs and sides of the shoulders are hoary, the throat sooty, and the abdomen covered with short red hairs in preparation for suckling. An undated skin from Baijnath is very dark, with a dull ochreous tint in the dorsal contour-hairs and the fur nearly black.

Chamba.—A series of nine skins collected by Wells in December and January between 4,000 and 5,000 ft. Two only, one from Pukri 4,000 ft., and another from Bara Tissa, 7,500 ft., are of the reddish type like the richer skins from Kumaun. The others from Pukri, Bara Tissa, Chalan Tissa, 6,700 feet, Chatri, 5,000 ft., and Siluni, 5,000 ft., are darker, with the bright colour on the back not so red, but varying from ochreous to reddish-brown and more restricted, forming a broad band or cross, more or less obscured by the black tips of the hairs; the thighs, flanks, and sides of the shoulders are hoary. These are like the dark Kangra skins.

Gilgit.—Two skins of the red and paler phases, like those of Tibet, Sikkim, and Kumaun. One, 5,000 ft. (Biddulph), October 7, in fresh winter coat has the contour-hairs of the back tolerably uniformly red, without appreciable pale areas or black tips; the under side has the throat ashy, the abdomen ashy, overcast with white, and the inguinal region white; the legs have some black and white hairs on their front surfaces. The second, 6,000 ft. (Col. W. F. R. Trevelyan), is in full moult,

most of the contour-hairs being shed, leaving the woolly coat exposed. The coloured area of the back is reduced in extent and not so red as in Biddulph's skin, the general tint being faded to bright ochreous, with the head still paler; the rest of the upper side is covered with thick tufted wool, white on the sides of the neck and flanks, pale sooty on the hind back; the under side is ashy; the legs are more heavily pigmented in front than in Biddulph's skin and the tail is mostly covered with white wool.

Summary.—From the evidence of the skins above described, which were mainly collected by the Mammal Survey, it seems that the Hill Fox undergoes noticeable change in colour when traced westwards through the Himalayas from Sikkim. The eastern form varies from bright reddish-bay to bright yellowish-fulvous, with scarcely a trace of black and very little silvery-white in the pelage. The reddish phase was named *himalaica* and the fulvous or flavescent phase *nepalensis*. These are the only phases known in Sikkim and Kumaun; but the red phase also occurs in Mussooree, Chamba, and Kangra. In these districts, however, the "hoary" phase, described as *montana*, and distinguished by the reduction of the bright hue of the back and by the generally black and white coloration of the contour-hairs of the flanks and elsewhere, is prevalent. These may prove to represent distinct races, *himalaica* and *montana*; but for the present I prefer to regard them as one, since in N. America the "red," the "hoary," and the "black" or silver-tip phases occur in the same locality. But I have given racial status to a still more hoary form found to the west of Chamba and Kangra, and typified by a fox originally recorded from Kandahar (p. 121).

The following are the flesh-measurements converted from millims. into English inches, and some weights (in lb.) of the largest and smallest males and females from each district :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Sikkim, Kapup; ad. ♂	27½	17⅝	6⅞	—
Sikkim, Thanga; ad. ♀	24⅜	15⅜	6	8¾
Kumaun, Almora; ad. ♂	25	16⅛	6	10¼
Kumaun, Takula; ad. ♂.....	22⅛	17½	(4—)	10½
Kumaun, Takula; ad. ♀	23½	15⅛	5⅜	8½
Kumaun, Almora; ad. ♀	22⅜	14	5⅜	8
Kangra, Gopalpur; ad. ♂ ...	28	18	6	—
Kangra, Gopalpur; ad. ♂ ...	26⅛	17⅛	5⅛	11¼
Kangra, Samyala; ad. ♀	24⅛	13⅜	5⅜	8
Chamba, Pukri; ad. ♂	29⅜	18	6	—
Chamba, Bara Tissa; ad. ♂ .	26	14⅛	5⅜	—
Chamba, Chalan Tissa; ad. ♀.	26	13⅜	5	—
Chamba, Chalan Tissa; ad. ♀.	25⅛	16⅛	5⅛	8

The ear is usually about 3½ inches long, measured from the notch, but may be 4 inches (100 mm.).

The table suggests that the foxes from Kangra and Chamba are bigger, sex for sex, than those from Kumaun, but since this is not borne out by the skulls the apparent difference is probably due to the "personal equation" of the collectors, Wells and Crump respectively.

Of the measured Tibetan skins, Col. Bailey's adult ♂ from Dochin, and the type of *waddelli* from Kambajong have a head- and body-measurement of 26¾ inches and 25 inches respectively; and the ♂ and ♀ skins from the Tengyueh Valley in Yunnan are exactly the same in head and body as the ♂ and ♀ from Sikkim. The tails and hind feet of these Tibetan and Yunnan skins similarly agree very closely with those of the Sikkim and Kumaun skins.

From the available data it does not appear that the flesh-measurements of this fox are appreciably less than those of the Continental European foxes, although the skulls as recorded below are decidedly smaller.

Skulls of *montana*, sex for sex, are smaller on the average than those of the three British and Continental European races of *V. vulpes*, admitted by Miller, namely *V. v. vulpes* from Scandinavia, *V. v. crucigera* from Central Europe and Italy, and *V. v. silacea* from Spain, which are closely related. In ♂ skulls of *montana* the condylobasal length varies from 128 to 141 mm., with an average of about 136 mm., the same measurement for ♀ skulls being from 123 to 132 mm., and the average about 130 mm. In the European races ♂ skulls range from 136 to 155 mm., with an average of about 145 mm., and ♀ skulls from 126 to 141 mm., with an average of about 134 mm. The teeth also of *montana* appear to be similarly a little smaller, especially the upper carnassial (pm^4).

In the table of skull-measurements of this race (p. 119) the zygomatic width and the postorbital or "waist" widths are entered because it is customary to record them. They are, however, of very little use, because they vary with age after the skull has attained its full length, the zygomata becoming wider and the postorbital area narrower from muscular moulding as the skull gets older.

In two skulls, ♂ ♀, from Simla (B. B. Osmaston), which have no skins, the condylobasal length is respectively 135 and 132 mm. It may be added that the two unsexed skulls of Bailey's Tibetan specimens, above referred to, have a condylobasal length of 134 and 139 mm. respectively, that the adult ♂ skull of the type of *waddelli* is 136 mm., and the adult ♂ and ♀ skulls from the Tengyueh Valley in western Yunnan are respectively 139 and 130, with a mandibular length of 110 and 104 mm. All these skulls fit in with the Himalayan series of *montana*. Finally, the skull belonging to the skin collected by Biddulph at Gilgit, although immature and defective,

Measurements (in mm.) of largest and smallest ♂ and ♀ skulls of *Vulpes vulpes montana* and *Vulpes v. griffithii* from various localities.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
V. v. montana.								
Takula, Kumaun ; ad. ♂	141	76	21	27	22½	108	13	15
Takula, Kumaun ; ad. ♂	129	74	21	27	22	100	12	13½
Kangra ; old ♂	140	78	20	27	24	110	13	14
Kangra ; ad. ♂	134	75	23	28½	24	103	12	13
Pukri, Chamba ; ad. ♂	137	77	20	29	24	108	13—	15
Bara Tissa, Chamba ; ad. ♂	128	71	23	26	20	96	12	14
Takula, Kumaun ; ad. ♀	132	72	21	25	20	103	12	14
Almora, Kumaun ; ad. ♀	129	69	20	25	21	100	12	14
Kangra ; oldish ♀	127	71	19	24	20	98	12	14
Chalan Tissa, Chamba ; ad. ♀	130	74	20	27	22	101	12	14½
Charan Tissa, Chamba ; ad. ♀	123	69	24	23	19	93	12	14
V. v. griffithii.								
Kandahar ; ad. ? ♂	132	69	22	23	21½	100	14	16
Kandahar ; ad. ? ♂	127	65	17	23	19	94	12	14
Wano, Waziristan ; yg. ad. ♂	127	67	23	24	21	96	12	14
Kotli, Murree Hills ; ad. ♂	127	72	22	26	21	99	12	14
Murree Hills ; ad. ♂	125	72	22	25	21	90	12	14
Murree Hills ; ad. ♀	125	72	20½	20	21	9	11	13
Kandahar ; ad. ? ♀	124	65	18	22	19—	94	12+	14

has the upper carnassial (pm^4) and the upper molar (m^1) the same size as in *montana*.

Habits.—In the Himalayas the Hill Fox occurs at altitudes varying according to the records from 4,000 ft. in Chamba to 13,000 ft. in Sikkim, but seem to be most plentiful between 5,000 and 6,000 ft. In Tibet, however, it ascends as high as 16,400 ft. As already stated, it is very closely related to the Common European Fox, and leaves the same scent on the ground from the skin-glands between the plantar and digital pads of its feet. It is seldom found, however, in districts where hunting on horseback with hounds is feasible, although, according to Jerdon, the 7th Hussars kept a pack in Kashmir in 1865 and enjoyed good sport.

In general habits it also resembles our fox. It is not gregarious, and is never known to hunt in packs, and, being diurnal as well as nocturnal, may be seen singly or in pairs. It frequents forests and also more open broken country, and lies up in burrows, beneath rocks or in crevices between them, or in thick bush. Although eating fruits and berries of various kinds, some insects, and robbing wild bees of their honey, it is mainly predatory, preying upon any small mammals it can catch, such as rats, squirrels, marmots, picas, and hares, and any birds, like francolins (partridges) and pheasants, it can pounce on. Not infrequently it raids the pens of domesticated poultry, and in the winter, when the ground is covered with snow and wild game scarce, it may, as recorded by Hutton at Simla, assemble in some numbers near human dwellings to pick up any discarded scraps of food it comes across.

Like wolves and jackals these foxes breed but once a year, pairing off towards the end of winter, so that the cubs are born in the spring. Blanford repeated the common belief that the period of gestation is nine weeks, *i. e.*, 63 days; but Mr. J. M. D. Mackenzie, who owns a fox "farm" composed of examples of the Canadian race (*V. v. fulva*), tells me that the time is from 51 to 53 days, *i. e.*, seven and a half weeks: and there is no reason to doubt that it is the same in the closely related Indian Hill Fox. The cubs, usually three to six or seven to the litter, are born blind and deaf, and are covered with short sleek blackish hair, as in Wolves and Jackals. According to Col. A. E. Ward they may be seen in summer in Kashmir playing about on swards of green turf, while the vixen lies near at hand concealed in some bushes, but on the watch and ready to give a shrill bark, repeated at intervals, at the slightest sign of danger. If the cubs are heedless of the warning, she rushes out and leads them to some sheltered spot, but never, in his experience, straight back to the burrow. Their growth is rapid, and they are nearly full-sized in the following winter, and are capable of breeding when about one year old.

59 *b*. **Vulpes vulpes griffithii** Blyth.

Vulpes flavescens, Hutton, Journ. As. Soc. Beng. xiv, p. 344, 1845 (with descriptive note by Blyth); Blyth, Journ. As. Soc. Beng. xxii, p. 581, 1853 (not *flavescens*, Gray).
Vulpes griffithii, Blyth, Journ. As. Soc. Beng. xxiii, p. 730, 1854; Scully, Ann. Mag. Nat. Hist. (5) viii, p. 226, 1881.
Vulpes vulpes griffithii, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 43, 1936.

Locality of the *type*, Kandahar in Afghanistan.

Distribution.—Southern Afghanistan, WAZIRISTAN and Murree in the UPPER PUNJAB.

A trifle smaller on the average, judging from the few available skins, than *montana*, and, although exhibiting the red phase, typically extensively hoary and silvered, with the brighter tint reduced to a wash of pale ochreous, forming a narrow band down the back, considerably paler and less extensive than in the Chamba skins of *montana*, but intergrading with the latter and also with the next race, *pusilla*, both in the Punjab and Baluchistan.

Hutton, who was the first to give an account of this fox, said :—"The fox of Afghanistan, or at least of the southern and western parts, is apparently the same as our Himalayan species, though somewhat less in size . . . It is common in the valleys round Candahar, hiding in burrows and holes in rocks." He gives, however, measurements of two ♀ specimens which show equality in size to ♀ *montana*. In a note to Hutton's account Blyth, to whom Hutton sent the type, quoted Griffith's statement that "a large and small species of fox appear to exist in Afghanistan. The former perhaps is the same as the large Himalayan fox found at Quetta and Olipore. The small seems to resemble the fox of the plains of India." Blyth, quite wrongly I think, identified Hutton's specimen, for which he adopted the name *flavescens*, as the small Afghan fox described by Griffith * ; but he described it as having "the longer hairs black-tipped, yellowish-white along the back, white on the sides, the face fulvous with a blackish patch on the muzzle, the fore leg blackish in front, the hind paw with a blackish spot above and the underside dusky." In the following year he named this fox *griffithii*. Later Scully repeated the information supplied by Hutton † and Blyth about the fox, and gave some measurements of a skull from Kandahar which he referred to *montana*. Blanford, misled by Blyth's identification of Hutton's small Kandahar fox as *griffithii*, wrongly identified the latter as *leucopus* (=*pusilla*).

* This was no doubt the species subsequently named *Vulpes cana* by Blanford.

† The length of the tail given by Hutton as 17 inches was misquoted, or misprinted, by Scully as 27 inches.

The British Museum has the following skins :—Wano in Waziristan, near the Afghan–Baluchi border. A young adult ♂ (W. B. Cotton), December 19, has a faint ochreous wash from the nape forming a narrow band down the back, but scarcely traceable on the loins ; the head and face are tan, with a conspicuous black patch on the muzzle ; the fore legs are tan with some grey down the front and a pale grey patch on the paws ; the hind legs cream-buff with no black, and the whole of the under side is sooty. This specimen agrees very closely with Blyth's description of the type of *griffithii*.

Gharial in the Upper Punjab, near Murree, 7,000 ft. An adult ♀ (Major H. N. Dunn), July 27, differs from the last in having a lighter muzzle patch, the hairs of the crown more bleached and worn, and the ochreous wash only traceable behind the shoulders but stronger on the loins than in the Waziristan skin ; the black is more dominant on the nape and shoulders, which are blacker than the hoary flanks ; the fore legs are deep tan with a conspicuous blackish-grey streak down the front ; the hind legs are whitish below the hocks in front, with some infuscation, and the abdomen, covered with short new hair, is white, the skin also is white, but some old hair adhering to the throat and chest is smoky grey.

Kotli in the Murree Hills, 5,800 feet (Wells). An adult ♂, June 19, is changing coat, with some long contour-hairs, retained on the back, dark tipped, with a white, or on the back a buffy subterminal band ; but wherever the new coat is exposed above, *i. e.*, on the head, thighs, back, etc., it is ochreous, whereas on the chest and belly it is white ; the legs are as in the Gharial skin, but there is practically no bright colour on the tail above except at the base. The appearance of this skin suggests that, with the moult completed, it would be indistinguishable from the skins in summer coat of the two examples of the next race, *pusilla*, collected at Ava in the Salt Range by Col. Stockley.

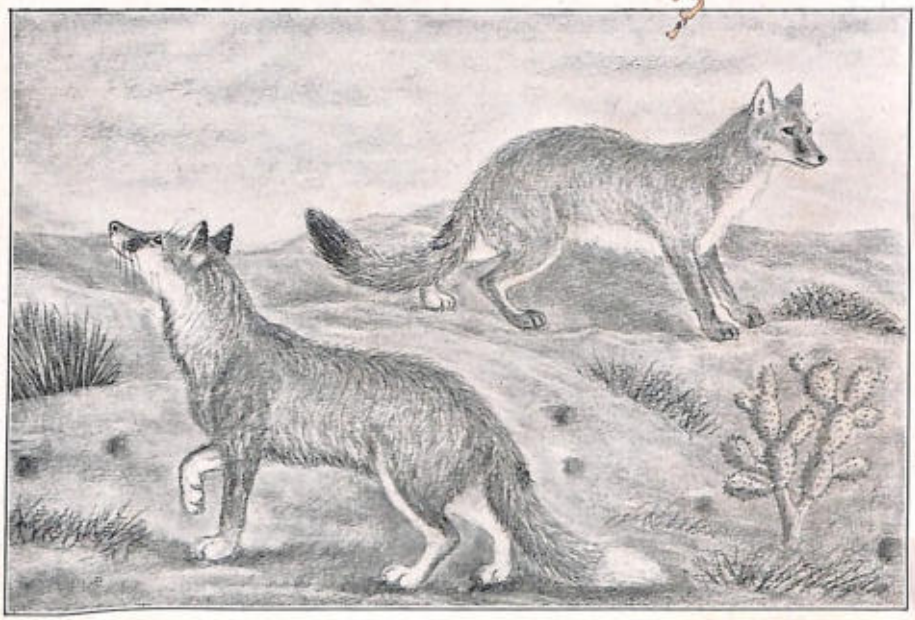
Murree, 7,000 ft. (Dr. J. E. T. Aitchison). An adult ♂ resembles the Sikkim and Kumaun and a few of the Chamba skins in exhibiting the red phase of coloration.

The only available flesh measurements (in English inches) are the following :—

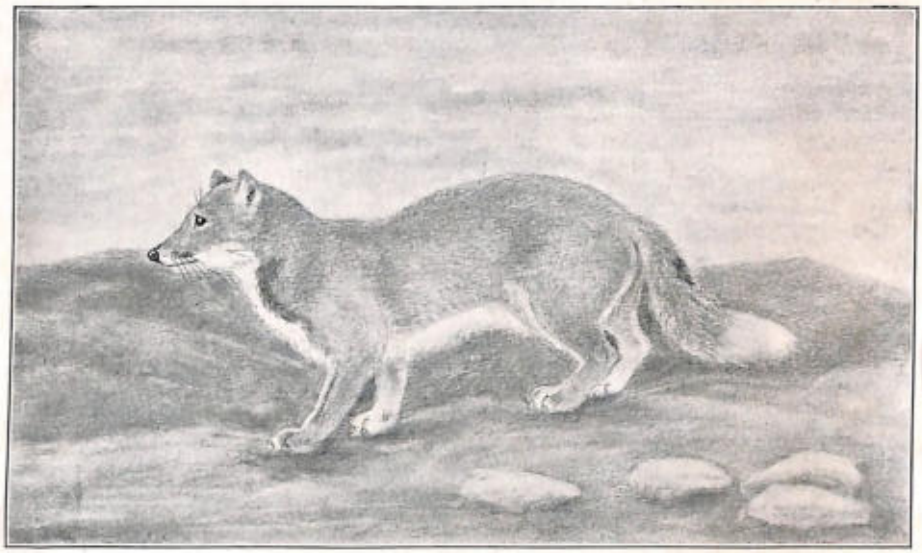
Locality and sex.	Head and body.	Tail.	Hind foot.
Murree Hills, Kotli ; ad. ♂	23½	17⅞	5⅜
Gharial, near Murree ; ad. ♀.....	23	15	5⅛
Kandahar (Hutton) ; ad. ♀	24	17	—

These data are too scanty to establish definite conclusions. They merely suggest that *griffithii* is on the average smaller than *montana*, sex for sex.

ZOOLOGICAL GARDEN
CALCUTTA



Bengal Fox (*Vulpes bengalensis*), above.
White-footed Fox (*Vulpes vulpes pusilla*), below.



Tibetan Sand Fox (*Vulpes ferrilata*).

The first skull of *griffithii* in the table was collected by Swinhoe, and is marked "Scully," indicating that it is the one above referred to of which Scully published some measurements, namely the condylobasal length, the zygomatic width, the length of the mandible, and the three teeth. My measurements agree very closely with his except in the condylobasal length, which he entered as 139 mm. This was no doubt a misprint. At all events, a skull of that length would have had a mandible exceeding 100 mm. The second Kandahar skull was presented by Blanford. The third was another of Swinhoe's. Their dimensions are inserted to show their general agreement with the skulls from the Murree Hills and Waziristan. The second adult ♂ skull from the Murree Hills belongs to the skin in the red phase collected by Aitchison. It is smaller than the smallest of the ♂ skulls of *montana*. The average condylobasal length of the five known and supposed ♂ skulls in the table is just over 127 mm., slightly smaller, that is to say, than the average of the ♀ skulls of *montana*.

An interesting point is the exceptional size of the teeth in the first Kandahar skull. They are equal to the teeth of a considerably larger race of fox found in western Turkestan, the Altai, and near Lake Baikal, and are larger than in *montana*, although the teeth of the remaining six skulls of *griffithii* are on the average smaller than in *montana*.

Habits.—Nothing special has been recorded about the habits of this fox. No doubt they are the same as in the typical Hill Fox.

59 *c*. **Vulpes vulpes pusilla** Blyth. The White-footed Fox. (Pl. III.)

Vulpes flavescens, Blyth, Journ. As. Soc. Beng. xxii, p. 581, 1853; Gray, Proc. Zool. Soc. 1868, p. 517 (not *flavescens* Gray, 1843) *.

Vulpes pusilla, Blyth, Journ. As. Soc. Beng. xxiii, p. 729, 1854.

Vulpes leucopus, Blyth, Journ. As. Soc. Beng. xxiii, p. 729, 1854, and xxv, p. 443, 1856; Blanford, Mamm. Brit. Ind. p. 151, 1888; and of subsequent authors.

Vulpes persica, Blanford, Ann. Mag. Nat. Hist. (4) xvi, p. 310, 1875; Zool. of Eastern Persia, p. 39, pl. 2, 1876.

Vulpes vulpes pusilla, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 45, 1936.

Vernacular.—*Lúmri* and *Lokri* (Hindi & Sindhi), *Lombar* (Baluchi); *Rubah* (Persian).

* *Vulpes vulpes flavescens*, a name which figures in the bibliography of Indian foxes, is a fox from N. Persia as large as *montana* and related to it. It occurs in two colour-phases, the typical "flavescent" and the "red." The latter was named *splendens* by Thomas—that at least is my interpretation of *splendens*.

Locality of the *type* of *pusilla*, the Salt Range ; of *leucopus*, Multan ; of *persica*, Shiraz.

Distribution.—Throughout the more or less desert districts of N.W. India from Rawalpindi to Rajputana, Sind, Cutch, E. Khandesh ; and through Southern Baluchistan to Southern Persia and Mesopotamia.

Size very variable, but considerably smaller, sex for sex, than *montana* and a little smaller than *griffithii* ; general coloration very uniform, apart from seasonal changes, throughout the vast range of the race, never exhibiting the "red" phase in the winter coat, not very different from some skins of the "flavescent" type of *montana*, but much less black than the dark Kangra and Chamba skins of that race, never so silvered and hoary as in typical *griffithii*, and with the ochreous or buffy hue of the dorsal side much more extensive. The seasonal changes in colour are very marked as described below in the case of the Salt Range skins ; but, in addition, when the coloured contour-hairs are first shed the tint of the back may be dark greyish-brown.

In his first reference to this fox as *flavescens* from the Salt Range Blyth described it as "much brighter than Afghan skins, tints purer, more contrasted, legs paler, redder, less black than *montana*." A year later, when he named it *pusilla*, he said that it nearly resembles *montana* but is smaller. The name *pusilla* has line priority over *leucopus*, and, according to the rules of nomenclature, should be preferred.

In his description of *leucopus* Blyth quoted Elphinstone's observation that the fox of the western Hariana desert is smaller than our fox (*montana*), and in one part of the desert has the legs and belly black, in another white. Blyth based his species *leucopus* on a specimen from Multan which he described as smaller than *pusilla*, light fulvous on the head and back, variegated with black and white, the cheeks, sides of the neck, flanks, and the inside and mostly the front of the limbs being white. Two years later he referred to the same species specimens from Hansi and Hissar, from a spot between Ludhiana and Ferozepore, and from Cutch. The specimen from Hansi had the belly black and the legs dark, showing Blyth the inappropriateness of the name *leucopus*.

The opinion expressed by Adams (Proc. Zool. Soc. 1858, p. 516) that *leucopus* would turn out to be the same as *pusilla* was adopted by Blanford, who unfortunately chose the inadmissible name *leucopus*, giving it full specific rank. Mivart (Mon. Canidæ, p. 123, 1890) followed Blanford in this respect ; but he was the first to detect that Blanford's *persica* is a synonym of *leucopus*, although he quite failed to perceive the close kinship between *leucopus* and typical *Vulpes vulpes*, and wrongly affiliated it with *V. corsac* of Central Asia, which

is related to *V. bengalensis*. With far more material than other authors were able to examine I have been unable to distinguish *leucopus* from *pusilla*. I have not, however, seen topotypes of *leucopus* from Multan; but specimens from Hissar, which Blyth referred to *leucopus*, are inseparable from specimens from the Salt Range, the type-locality of *pusilla*. Nevertheless, as the table of measurements shows, the skulls of Sind specimens appear smaller on the average than those from the Upper Punjab. I believe the differences to be merely individual. At all events, the evidence that these small specimens represent *leucopus* is inconclusive, and the intergradation is complete.

It is needless to attempt to describe in detail the very large number of skins in the British Museum which I assign to this race. A few will serve to illustrate the individual and seasonal differences.

Bhattu in Hissar, 6,000 feet (Col. Stockley), November 12. Two adult ♂♂ and one adult ♀ in new winter coat are tolerably uniformly rich ochreous, spangled with whitish above; flanks whitish; thighs externally and lower shoulders hoary, the contour-hairs showing a white band with a black tip; tail ochreous above with black-tipped hairs; fore leg dark, brownish to nearly black, with the toes paler; hind leg below hock white in front, with a dark spot on the paw; underside ashy-grey, with the chin white.

Ava in the Salt Range, 2,300 ft. Two late winter ♀ skins (Wells), March 26, resemble the skins from Hissar, but a ♂, March 23, is much less well coloured above, the tint being apparently faded with the close of the winter. Two adults, ♂♀, 3,800 feet (Stockley), July 27, in summer coat, are very different. In the ♀ the moult is not quite complete, the ochreous-brown tint of the new hair of the back being partially obscured by old deep brown long hair, the new coat of the under side is white, but some old dusky hair is retained on the throat; the fore legs are tan, grizzled down the front; the hind legs are paler. In the ♂ the moult is completed, the colour above being ochreous-brown, the flanks grey, the under side white as in the new coat of the ♀, but the feet are much darker.

Chakdulla, Campbellpore, 2,000 feet, in the Attock district of the Upper Punjab (Stockley). A young adult ♀, November 17, closely resembles the Hissar series, but is not so hoary on the shoulders and thighs, and has the fore legs pale yellowish-brown, the hind legs nearly the same and not strongly contrasted with the fore legs as in the Hissar skins. This skin and a ♀, rather duller in hue, from Potwar, W. of Rawalpindi (Bingham), February, both from the extreme northern part of the range of *pusilla* in the Punjab, differ strikingly in colour

from the skins identified as *griffithii* from higher altitudes in the Murree Hills a few miles to the east and north-east.

Numerous skins from the following, amongst other localities, differ to a certain extent individually in the coloration of the upper and undersides and of the limbs, and often considerably in accordance with the moult, but are indistinguishable as a whole from those above described from farther north :—

Kashmor, Mirpur, Khairpur in Upper Sind, on the right and left banks of the Indus (Prater) ; Thar and Parkar, Lower Sind ; Bhuj and Nokania in Cutch (Crump) ; Jodhpur and Sambhar in Rajputana (Adams and Hume). Also a large number of skins collected by Sir J. E. B. Hotson at or near Khozdar and Turbat and Panjgur in southern Baluchistan are indistinguishable from Indian skins ; and the same is true of S. Persian skins, the type and topotypes of *persica* from Shiraz, one from Chahanbar on the Persian Gulf (Hotson), one from the Karun River identified by Thomas as *flavescens* (see above, p. 123), three from Baghdad (Cox and Cheesman), and one from a locality on the Tigris (Christy).

The following are the flesh-measurements (in English inches) of the largest and smallest ♂ and ♀ examples from the principal districts arranged roughly geographically from north to south and westward :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Salt Range, Ava ; ad. ♂	22⅜	15⅜	5
Salt Range, Ava ; ad. ♂	21½	14½	5⅛
Salt Range, Ava ; ad. ♀	21½	13⅜	5—
Salt Range, Ava ; ad. ♀	20⅝	14⅛	5⅜
Hissar, Bhattu ; ad. ♂	21⅜	14	5⅜
Hissar, Bhattu ; ad. ♀	21⅛	14⅛	5⅜
Hissar, Bhattu ; ad. ♀	19½	13½	4⅞
Upper Sind, Kashmor ; ad. ♂	21⅜	14⅜	5⅛
Upper Sind, Mirpur ; ad. ♀	20	12½	4⅜
Sind, Tar, Parkar ; ad. ♀	19	12⅜	—
Cutch, Bhuj ; ad. ♂	20⅜	13⅛	5½
Cutch, Nokania ; ad. ♀	19—	12⅜	4⅜
Baluchistan, Wadh ; ad. ♂	22⅛	17⅜	5⅛
Baluchistan, Nand ; ad. ♂	22	16⅜	5⅜
Baluchistan, Khozdar ; ad. ♀	22	16⅜	5⅜
Baluchistan, Panjgur ; ad. ♀	20	15⅛	5⅛

The ear is only slightly smaller than in *montana*, a trifle under 3½ in. on the average.

Two flesh-measured adult ♂ skins from S. Persia, one from Chahanbar (Hotson), the other from the Karun River, both localities being on the Persian Gulf, have the head and body 23½ and 22⅛ in. respectively ; and three adult ♂ skins from Baghdad (Cox and Cheesman) are 21⅛ in.

The only recorded weights in English lb. are as follows :—Kashmor, Upper Sind, adult ♂, 8 ; Bhuj, Cutch, adult ♂ 6¾ ; Ava, Salt Range, 2 ♀♀, 5¼ and 4½.

The flesh-dimensions show that this race is a little smaller on the average than *griffithii*, and considerably smaller, sex for sex, than *montana*. The weights are also much less than in *montana*.

In the following table of cranial and dental measurements the largest and smallest ♂ and ♀ skulls from various localities have been selected. They are arranged, under their respective sexes, in accordance with their size, irrespective of localities. Great individual variation in size in the same district is illustrated by two ♂ skulls from Upper Sind, in which the condylobasal length is 122 and 108 mm. respectively, and by two from the Mekran district of Baluchistan, where the same dimensions are 125 and 115 mm. respectively. Similar variation is shown by two ♀ skulls from the Salt Range which are 117 and 108 mm., and two from the Mekran which are 123 and 113 mm. There is a complete overlap in size between ♂ and ♀ skulls; but the average condylobasal length in the ♂ skulls is as nearly as may be 119 mm. and of the ♀ skulls 112 mm. These are decidedly less than the corresponding averages in *griffithii*, although some individual skulls of *pusilla* are as large as in *griffithii*.

A point to note is the comparatively small size of the foxes over a considerable area of Upper Sind. Those from Rajputana are also rather small, intermediate in size between those from the Salt Range and the smallest from Upper Sind. The physical conditions may be less favourable to growth, varying annually, where these small specimens occur than elsewhere, and possibly they represent a distinct race, for which it may be thought the name *leucopus* is available. But Blyth's localities for *leucopus* were Ferozepore, Ludhiana, Hansi in Hissar, Multan, and Cutch, and the foxes in the Museum collection from Hissar, from Kashmor in Upper Sind, the nearest locality to Multan, and from Cutch closely resemble in size specimens from the Salt Range, whence the type of *pusilla* came. Provisionally, at all events, all these foxes may be assigned to the same race.

Habits.—In all essentials the habits of this fox, so far as they are known, are the same as those of the Hill Fox, apart from such adaptations as are imposed by its more barren, typically desert or semi-desert environment. On this account its prey is more restricted in variety, and it is said to feed mainly on gerbils, a species of sand-rat. Prater found it and its congener, the Bengal Fox, about equally common in Sind; but Jerdon states that in that country it occurs on different kind of ground from that occupied by the other species. Blanford, however, who quotes the observation, declares that both are "common on the waste land with scattered bushes that covers so large a portion of the province," but

Cranial and dental measurements of *Vulpes vulpes pusilla*.

Locality and sex.	Cond.-basal length.	Zygo-matic width.	Post-orbital width.	Inter-orbital width.	Maxil-lary width.	Mandi-bular length.	pm^4.	m_1.
Salt Range ; ad. ♂	127	69	17+	24+	21	96	12	13
Mand, Baluchistan ; ad. ♂	125	—	—	25	20½	96	11	13
Bhattu, Hissar ; ad. ♂	124	65	18	23	19	96	11	13
Ava, Salt Range ; ad. ♂	122	67	23	22	19	94	11	13
Kashmor, Upper Sind ; ad. ♂	122	69	20	21	20	94	12½	14
Bhuj, Cutch ; ad. ♂	120	65	19	22	18	90	10	11
Umarkot, Lower Sind ; ad. ♂	119	63	19	21+	18	93½	11½	13
Sambhar, Rajputana ; ad. ♂	117	68	21	24	18½	90	10½	12
Wadh, Baluchistan ; ad. ♂	115	65	20	22	17½	—	11+	—
Jodhpur, Rajputana ; ad. ♂	112	59	23	20	18	86	9½	12
Wahi Pandi, Upper Sind ; ad. ♂	110	63	21	23	18	—	11	—
Khairpur, Upper Sind ; ad. ♂	108	60	19	21	18—	82	10	13
Khozdar, Baluchistan ; ad. ♀	123	65	19	21	18½	—	11	—
Ava, Salt Range ; ad. ♀	117	65	21	24	20	90	11½	13+
Bhattu, Hissar ; ad. ♀	114	61	19	19	18	87	11	12½
Panjgur, Baluchistan ; ad. ♀	113	—	23	20	18—	86	12	13
Sambhar, Rajputana ; ad. ♀	111	61	23	20	18	85	11—	12
Mand, Baluchistan ; ad. ♀	110	60	18½	21	17	83	11	12+
Salt Range ; old ♀	108	65	20	21	17½	84	10	12½
Rohri, Upper Sind ; ad. ♀ ?	105	61	22	20	17½	80	11	12½
Rohri, Upper Sind ; ad. ♀ ?	102	59	19	20	17	71	10	12

adds that *pusilla* appears to be the only fox actually found amongst the sand-hills of the desert. It is, according to Jerdon, fleeter of foot than the Bengal fox, and gives a good run when coursed with greyhounds; but it seems hardly likely that it excels the other species at adeptness in doubling, as recorded by Dunbar Brander (p. 138).

60. **Vulpes bengalensis** Shaw. The Bengal Fox. (Pl. III.)

Canis bengalensis, Shaw, Gen. Zool. i, p. 330, 1800.
Canis kokree, Sykes, Proc. Zool. Soc. 1831, p. 101.
Canis (Vulpes) indicus, Hodgson, As. Res. xviii. pt. 2, p. 237, 1833 (*nom. preocc.*).
Canis (Vulpes) rufescens, Gray, in Hardwicke's Illustr. Ind. Zool. pt. 2, pl. 3, 1833–4.
Canis chrysurus, Gray, Charlesw. Mag. Nat. Hist. i, p. 577, 1837.
Vulpes hodgsonii, Gray, Charlesw. Mag. Nat. Hist. i, p. 578, 1837.
Vulpes xanthura, Gray, Proc. Zool. Soc. 1837, p. 68 (published Jan. 22, 1838; see Proc. Zool. Soc. 1893, p. 437).
Vulpes bengalensis of all recent authors; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 49, 1936.

Vernacular.—*Lúmri*, *Löm*, *Lokri* (Hindi); *Lukhariya* (Bundelkund); *Khekar*, *Khikir* (Behar); *Khek-siyal* (Bengali); *Kokri* (Mahr.); *Khekri* (Gond); *Konka-nakka*, *Gunta nakka*, *Poti Nara* (Telegu); *Konk*, *Kemp-nari*, *Chandak-nari* (Kanarese).

Locality of the *types*: *bengalensis* (from Pennant), Bengal; *kokree*, Deccan; *indicus*, India; *rufescens*, India; *chrysurus*, *hodgsonii*, and *xanthura*, Nepal.

Distribution.—The whole of INDIA from the foothills of the HIMALAYAS, up to 4,500 feet at Kangra, to Cape Comorin and from SIND to EASTERN BENGAL (BIHAR and ORISSA), and even to ASSAM according to Blanford.

Distinguished from *Vulpes vulpes* by the black tip of the tail, by the ears being the same tint as the nape or, when darker, never exhibiting the blackness characteristic of that species, by the presence of only two pairs of mammæ instead of three, by the shorter, less luxuriant winter coat, the finer, closer pale speckling of the dorsal pelage, and by the much shorter hairs on the soles of the feet in winter even in the Himalayas. The size on the average is nearly the same as in *V. v. pusilla*, but the tail and hind foot are a trifle shorter. It is doubtful if there is any constant difference between the skulls of *V. bengalensis* and *V. v. pusilla*. They are frequently very difficult to distinguish; but the teeth of *bengalensis* are on the average smaller, the difference being more apparent to the eye than when expressed in mm., and the nasals are usually broader in their posterior part.

Notes on the Synonymy.—The fox described by Pennant as the "Bengal Fox," which Shaw named *bengalensis*, was probably exported from Calcutta. Its locality may be fixed as the

adjoining area of Bengal, south of the Ganges. There was no precise locality for the type of *kokree*, and no character to distinguish it from *bengalensis* was given. The type, ticketed

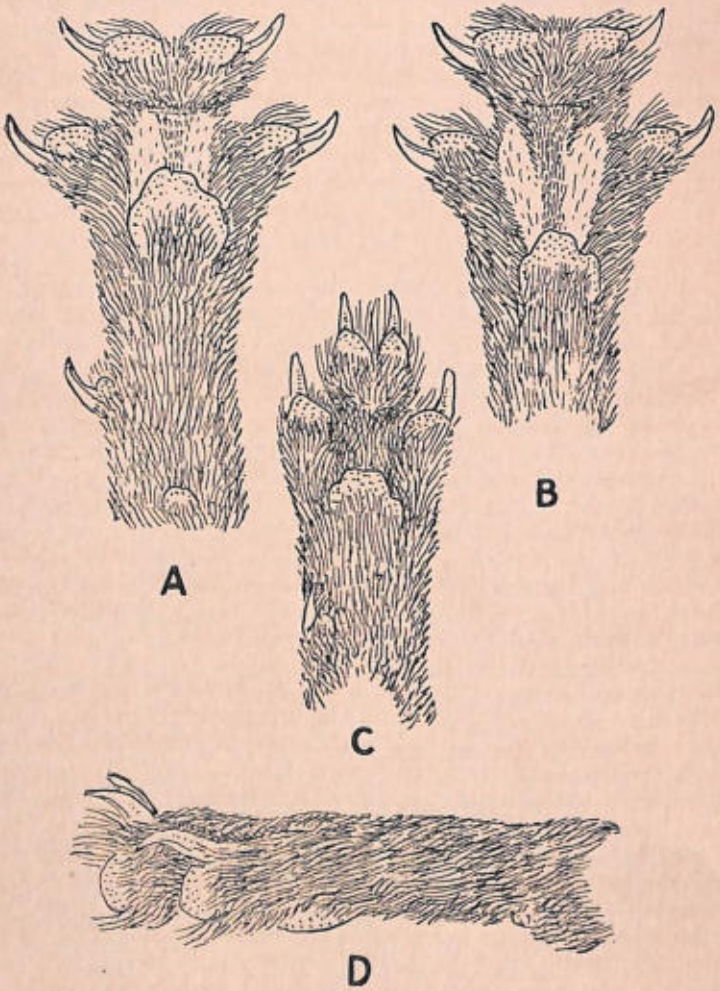


Fig. 17.

A. Lower view of left fore foot of *Vulpes bengalensis* from Bankulwa Morang, Nepal, with the digits spread, displaying the glandular areasi n front of the plantar pad.
B. The same of the left hind foot.
C. The same as A, with the digits in natural position.
D. Outer side of left hind foot of the same.

(All figures nat. size.)

the Deccan, is in the British Museum. Hodgson recorded *indicus* as occurring over the greater part of India. The type in the British Museum has no locality, but since the name was preoccupied for the Indian Jackal the locality is of no moment. The next name, *rufescens*, similarly cannot be assigned to the fox of any definite locality. Hardwicke's illustration, which is the type, indicates a specimen which had moulted the black and white contour-hairs and was tolerably uniformly fulvous. The names *chrysurus* and *xanthura* were given by Gray to the same specimen, a fox collected by Cobbe in Nepal. The type is in the British Museum, the skin labelled *chrysurus*, the skull *xanthura*. The type of *hodgsonii* also came from Nepal.

Colour of the dorsal surface very variable according to the condition of the pelage. When the coat is fresh and unfaded the dorsal surface and flanks are everywhere speckled with the whitish bands in the contour-hairs, but the crown and the back behind the shoulders are brownish, ochreous, or buff, owing to the summit of the wool and a small area between the black tip and the white band of the contour-hairs being one of those tints; but these tints are absent on the flanks, which are greyish and speckled, and mostly on the nape, which is thus typically contrasted with the back and crown; the muzzle is darkish, but there is usually a greyish-black smudge in front of the eye; the throat is white, the chin sometimes fuscous, and there is often a fuscous collar on the hind throat and a good deal of buff on the fore breast and axillæ; the belly is white, but the base of the tail below, the anal and genital areas, and the backs of the thighs to the hocks are ochreous or rufous; the hind leg in front below the hock is whitish or some pale shade, and the fore leg is rufous from the elbow externally, but greyish with a varying amount of black down the front usually to the wrist; the tail is mostly darkish grey, owing to the black and white contour-hairs, which form a good brush, the black being dominant at the end to form the black tip. When the pelage is in moult or approaching it, and the hairs are dead or dying, the characteristic colouring described above fades away.

Although the large number of specimens collected by the Mammal Survey suggests that this species may be represented by a few local races, as might be expected from its wide distribution and varied environment, the insufficiency of series of skins collected at the same time of the year in different localities, and the considerable individual variation in skins and skulls from the same locality, make the definition of local races impossible for the present. If further material shows they can be established, *kokree* will come in for the southern Deccan form, *chrysurus* for the northern Nepalese form, and *bengalensis*

itself for the form from the central plains of India south of the Ganges.

Some individual and seasonal variations in the species may be shown by an enumeration of a few of the skins collected for the Survey in the principal districts.

Bahgownie in Darbhanga, 150 ft. Ten skins (Baptista) between July 29 and October 21. No two are quite alike in every respect, the extremes being collected on consecutive days, July 29 and 30. One, July 30, is a dark fox with the brown of the crown and back conspicuously speckled with black and buff, the flanks grey, speckled with black and white; the chin and throat white, a blackish collar on the hind throat, breast buffy, and abdomen whitish; inguinal region and back of thighs deep brown, hind leg below hock in front whitish, with the paw dusky; fore leg deep brown above externally, speckled black and grey down front. The other, July 29, is in poorer coat and much paler, with the contour hairs more scanty, so that the black and white speckling is much less in evidence; below, the hind throat has hardly a trace of the collar, the breast is much paler buff; the inguinal area and the legs are rusty ochreous rather than brown and there is less pigmentation down the front of the fore leg. The remaining specimens are in varying degrees intermediate between these two.

Haldibari, just S. of Sikkim (Crump). An adult ♀, April 13, is moulting, the coat being thin on the body and tail and bleached, so that the colour is a little paler than the palest skin from Darbangha; the belly is nearly naked, in preparation for suckling.

Kangra. An adult ♀, Hamirpur, 2,000 ft. (H. Whistler), is undated, but evidently in winter coat, which is full and soft and 37 mm. long; the general colour is very much as in the darkest of the skins from Darbhanga. Another ♀ from the Kangra Valley (Wells), 2,000 ft., March 28, has the same coat but is rather paler than Whistler's skin, with the black hair still less abundant, the collar smaller, the breast less richly buff, the inguinal region and back of the thighs paler ochreous, and the fore leg with much less black down the front. A third ♀ from Gopalpur, 4,500 ft. (Wells), March 13, is like the last in colour below and on the legs, but the coat is not so full as in either of the others despite the greater altitude, and the colour of the back is yellower and less speckled with black and white.

Gwalior. A series from Binganj (Ryley O'Brien) consists of mostly darkish rich-coloured skins tolerably closely resembling the darkest skins from Kangra and Darbhanga, but with the coat, owing to the season, fuller and longer than in the latter.

Sind (S. H. Prater). An adult ♂ from Gangra Mithi Tal, Thar Parkar, October 4, agrees in coloration with the average of the series from Darbhanga. An adult ♂ and ♀ from Mirpur in Sukkur, March 26 and 27, are in moult and faded, showing only a pale buffy wash on the fore quarters and a more ochreous tint on the rump; the flanks are pale grey or dirty white, and there is little speckling on the fore legs. The ♀, which was suckling, has the abdomen covered with short red hair. A ♀ from Khot Diji in Khairpur, April 10, although in better coat, is a close match of the two Sukkur skins. Another ♀ from Gambat, Khairpur, April 15, has hardly a trace of buff or ochreous above, merely a faint wash on the hind back, but the dorsal surface and flanks are darker than in the other March and April Sind skins, owing to there being more black in the contour-hairs.

Deccan. Dharwar, 2,500 ft. (Shortridge). An adult ♀, January 8, in good coat, about 30 mm. long, has an ochreous wash down the back, spangled with white, but with no black tips to the contour-hairs, so that the dorsal coloration is paler than usual; the ears, however, are exceptionally dark and more strongly contrasted with the head and nape than is normally the case; there is a small darkish collar on the hind throat and some ochreous on the breast. This specimen has the belly moulted for suckling, a condition which in more northern specimens occurs later at the end of March or beginning of April. An adult ♂ from the same locality, 1900 ft., December 21st, is very like the ♀, but has some black speckling in the coat.

Kurnool (Baptista). An adult ♂ from Diguvametta, April 25, has a thin short faded coat of dead hair, with no wool and a pale grey sepia wash, speckled with buff, on the back. An adult ♀ from Malakondapenta, May 19, also has a thin short coat with no wool, but a brownish wash on the back and the shoulders, and nape speckled black and white.

High Wavy Mountain on the borders of Madura and Travancore (S. H. Prater). A pair, June 8, are in faded thin summer coat, showing no distinctive characters. They are worth recording as the most southern examples of the species procured by the Survey.

Flesh-measurements (in English inches) of the largest and smallest ♂ and ♀ specimens, where available, from the principal districts, are as follows :—

Locality and sex.	Head and body.	Tail.	Hind. foot.
Darbhanga; ad. ♂	21¼	11⅜	5
Darbhanga; ad. ♂	20⅜	10⅝	—
Darbhanga; ad. ♀	20	10⅜	4⅛
Kumaun; ad. ♂	20⅜	11¼	4⅜
Kumaun; ad. ♂	19⅜	11⅛	4⅜

Locality and sex.	Head and body.	Tail.	Hind foot.
Kangra ; ad. ♀	23⅜	11⅜	4⅛
Gwalior ; ad. ♂	24½	12⅘	4⅜
Gwalior ; ad. ♂	21⅜	11⅛	4⅜
Gwalior ; ad. ♀	22⅜	13	4⅜
Sind, Thar Parkar ; ad. ♂	19⅜	12⅘	—
Sind, Mirpur, Sukkur ; ad. ♂	17¾	9¾	4
Sind, Mirpur, Sukkur ; ad. ♀	18⅜	11⅛	4⅜
Sind, Gambal, Khairpur ; ad. ♀	19⅜	11⅜	4⅜
Deccan, Kurnool ; ad. ♂	19⅜	12	4⅛
Deccan, Kurnool ; ad. ♀	20⅜	12	4⅛
Deccan, Dharwar ; ad. ♂	20⅛	12	4⅜
Deccan, Dharwar ; ad. ♀	20	14	4⅛

The average length of the ear is 3 in.

The weight is from about 6 to 8 lb. in adult males.

The measurements are, on the whole, tolerably uniform throughout the range of the species, although the single measured

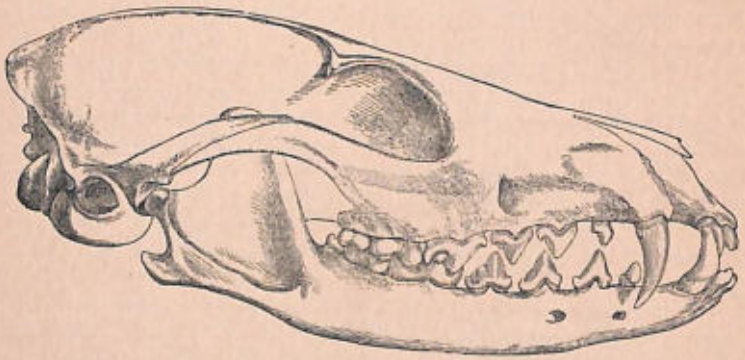


Fig. 18.—Side view of skull of *Vulpes bengalensis*. (From Blanford.)

specimen from Kangra and the specimens from Gwalior, of which only the largest and smallest males are entered, appear to be larger than those from other districts. But since this is not borne out by any superiority in the size of the skull, I suspect it is due to the "personal equation" of the collectors. The exceptionally small adult ♂ from Mirpur, in Sind, is referred to below under the skulls.

A surprising fact revealed by the following table is the diminutive size of the skull of the ♂ from Mirpur, Sukkur, Sind. Possibly this skull and the ♀ from the same locality have had their labels exchanged, but even so the smaller is exceptionally small and may be regarded as a dwarfed specimen. In its condylobasal length it hardly exceeds

Cranial and dental measurements (in mm.) of *Vulpes bengalensis*.

Locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
Nepal (*chrysurus* type); ad. ♂	(117±)	68	18	22	20	90	10	11½
Darbhanga; ad. ♂	117	68	22	21	21	—	9	—
Dharwar; ad. ♂	(117±)	62	19	18	16½	86	9	11
Binganj, Gwalior; ad. ♂	115	65	22	23	19	87	9	10½
Kumaun; ad. ♂	114	66	19	23	18½	90	10	12—
Thar Parkar, Sind; ad. ♂	(111±)	64	21	22	18	84	9	11
Kurnool; ad. ♂	110	61	20	20	17	85	10	10½
Binganj, Gwalior; ad. ♂	108	62	20	20	17	82	9	11—
Kumaun; ad. ♂	106	60	20	20	18	80½	9	11
Mirpur, Sukkur, Sind; ad. ♂	92	59	20	19	16	70	8	10
Kurnool; ad. ♀	115	61½	19	20	17	89	10—	11—
Gopalpur, Kangra; ad. ♀	111	64	20	21	17	87	9	10
Darbhanga; ad. ♀	110	65	20	21	17½	84	9	11
Binganj, Gwalior; ad. ♀	110	58	18	18	16	83	10	11
Hamirpur, Kangra; ad. ♀	108	62	20	19	19	82	10—	12
Palkonda Hills; ad. ♀	108	57½	19	19	17	84	9½	10
Dharwar; ad. ♀	107	61	19	19	16½	—	9	—
Mirpur, Sukkur, Sind; ad. ♀	105	60	19	20	18	80	9	10
Darbhanga; ad. ♀	104	59	20	20	18	80	9	11
Kangra Valley; ad. ♀	103	57	21	19	17	76	9½	11—
Deccan (*kokree* type); ad. ♀	103	53	20	19	16	79	9	10
Gambat, Sind; ad. ♀	102	57	18	18	15½	76	9	10
Kot Diji, Sind; ad. ♀	100	56	19	18	15	76	9—	10½

Blanford's Fox (*V. cana*), although much more robust. As in *V. v. pusilla*, Sind specimens seem to be a trifle smaller on the average than those found elsewhere; but there is very little

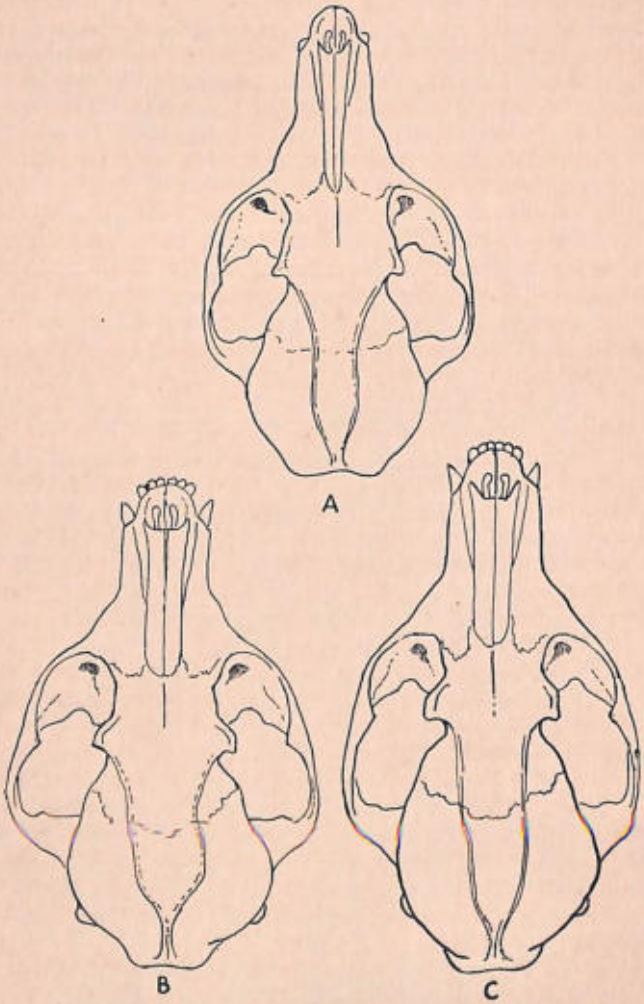


Fig. 19.

A. Skull of the type of Blanford's Fox (*Vulpes cana*) from Gwadar.
B. Adult skull of dwarf ♂ of *Vulpes bengalensis* from Sukkur, Sind.
C. Skull of normal ♀ of *Vulpes bengalensis* from Sukkur, Sind.
(All figures two-thirds nat. size.)

to choose between the 2 ♀♀ from the Kangra Valley and Gambat, Sind. A good deal of individual variation in ♂ skulls from the same district is shown by those from Binganj, Gwalior, and Kumaun. There is also a noticeable difference in the size of the teeth (more manifest to the eye than when expressed in mm.) in the two ♀ skulls from Gopalpur and Hamirpur in Kangra, both being old with the teeth about equally worn. The difference is still greater in the case of the first upper molar (m^1), not shown in the table. This tooth in the skull from Hamirpur (Whistler) is 8½ by 12 mm. in length and width, wider than in all the other skulls examined, in which it ranges from 9 to 11 mm., whereas in the skull from Gopalpur (Wells) its same dimensions are 7×9, exactly the same as in the type of *kokree* from the Deccan, the length of 7 mm. being less than the average of all the skulls. In the skull indicated as ♂ from Mirpur, Sukkur, Sind, this tooth is the smallest of all, 6×8½ mm., smaller indeed than in both the skulls of *V. cana* entered in the table (p. 144), which are respectively 7½×10 and 6½×9.

Habits.—No important additions to our knowledge of the habits of this Fox seem to have been made since Blanford summarized the observations of Jerdon, McMaster, Elliot, and Sterndale. A few notes, however, regarding its occurrence in various localities made by collectors for the Mammal Survey may be recorded. According to Prater it is quite as common as *leucopus* (= *V. v. pusilla*) in the semi-desert districts of Sind. In Dharwar Shortridge found it fairly plentiful, chiefly among rocky hills and broken country, where it might often be seen by day. In Daltonganj and southern Hazaribagh it was very common, according to Crump, but he failed to find it at Singbhum. The same observer stated that it does not ascend the hills in Kumaun, but was plentiful in the Bhaba, where, as a rule, it avoids heavy forest. Also it does not occur in the hills of Sikkim, but was common at Jalpaiguri and Haldibari, although not seen in the Terai. Wells, on the contrary, collected it as high as 4,500 ft. in Kangra. It is common in most parts of the Central Province according to Dunbar Brander, but is rare on the plains of Berar, where the black soil is not suitable for burrows.

Like other foxes this species lies up in burrows, which it digs for itself, usually in open country or thorny scrub, choosing an elevated site in districts where lower lying ground is liable to be flooded during the rains. The burrow or "earth" usually has several entrances and passages leading to a central chamber. Two that Crump excavated in E. Khandesh contained respectively two and six outlets

and runs, all but one in the latter case converging to the chamber, the runs being from four to six feet long.

The diet of this fox is extremely varied, consisting mainly of small ground birds, like quails, of eggs, lizards, land-crabs, and insects of many kinds, especially white ants or termites, grasshoppers, beetles, and even moths, which it has been seen to capture on the wing at dusk. According to D. Brander it captures birds by pouncing upon them like a cat; but it has been stated to be less of a bird-eater than most foxes, and is seldom a pest to poultry-keepers. It also eats fruits such as melons and the plums of the ber (*Zizyphus*) and pods and shoots of gram (*Cicer*).

Since it refrains from making itself a nuisance to human beings it is generally unmolested and is comparatively fearless of man, often entering gardens or wandering about the precincts of bungalows or other dwellings. Blanford records seeing it on the Maidán in Calcutta, and almost every night during the cold weather hearing its bark, which consists of a sharp yelp quickly repeated three or four times; but according to D. Brander their "chattering" bark could be heard on most evenings, a remark which suggests that it is not merely a sexual call.

Although it is exceedingly swift-footed and active in every way, D. Brander thinks its speed has been acquired as a means of escape from enemies, since he has never seen it chasing a hare. It affords good sport when coursed with dogs. Greyhounds can readily overtake it, but the extreme suddenness with which it can double often gives it a fresh start of several yards, and D. Brander has seen the dogs run to a standstill. When doubling it swings its tail sideways, like a rudder, he says. Jerdon, on the contrary, states that it raises its tail in the air. Foxhounds are seldom used for hunting it, partly because of the impossibility of blocking its numerous "earths," and partly because of the difficulty of following its scent owing to its foot-glands being less odorous than in the common English fox. It appears to be as cunning as the latter at evading capture, judging from McMaster's record of a specimen baffling his dogs by running into a herd of sheep and cattle.

Pairing time is in the winter, between November and January, varying locally according to the season, and the litter, consisting generally of four cubs, is born between February and April. While suckling her young the female is seldom seen abroad after sunrise; and the young, as a rule, do not leave the burrow until nearly full grown.

61. **Vulpes cana** Blanf. Blanford's Fox.

" The small Afghan fox of Griffith," quoted but wrongly identified by Blyth, Journ. As. Soc. Beng. xiv, p. 344 (footnote), 1845.
Vulpes canus, Blanford, Journ. As. Soc. Beng. xlvi, pt. 2, p. 321, 1877; Sclater and Alston, Proc. Zool. Soc. 1878, p. 392.
Vulpes cana, Blanford, Mamm. Brit. Ind. p. 150, 1888; Ognev, Ann. Mus. Nat. Hung. xxiii, p. 238, 1926.
Vulpes cana var. *nigricans*, Shitkow, Zool. Anz. xxxii, p. 448, 1907.
Vulpes cana, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 53, 1936.

Vernacular.—Poh (Baluchi); *Kúrba-shákál* (Persian of Kandahar).

Locality of the *type* of *cana*, Gwadar, Baluchistan; of *nigricans*, Bokhara in Turkestan.

Distribution.—Baluchistan, Afghanistan, N.E. Persia (Khorassan), and Turkestan.

Distinguished from *V. bengalensis* by its smaller size, much fuller, softer, and more luxuriant winter coat, and by its very different coloration, the coat when fresh exhibiting on the back none of the black and ochreous or buff or white close speckling characteristic of *bengalensis*. The contour hairs of the back, which vary from 45 to 65 mm. in length, have an extensive black tip and an extensive silvery subapical band; the thick wool, varying from 35 to 45 mm. in length, may be grey or lighter or darker ochreous at its summit; the muzzle is darkish, with a conspicuous black smudge in front of the eyes; the crown and cheeks are to a varying extent silvery; the ears are blackish-grey; the flanks and underside are mostly white, but the chin may be blackish, and there may be some infuscation on the hind throat and some buff on the breast; the tail is mostly grey, overcast with the extensive blackness of the tips of the contour hairs ranging from 65 to 90 mm. long and forming a voluminous, black-tipped brush; the legs are mostly darkish grey, with some black, the ends of the digits are whitish, but sometimes the legs have no black and are mostly ochreous and cream. In Hotson's specimen from Baluchistan, mentioned below, the sole of the foot in winter (December) has the pads exposed to about the same extent as in the winter skin of *bengalensis*.

There are four skins of this species in the British Museum. An adult ♂, collected by Sir J. E. B. Hotson at Turbat, Kech, Baluchistan, on December 13, has the summit of the wool of the back grey, with an ochreous wash in it on the nape; the legs are blackish-grey; the forehead and cheeks silvery. Blanford's type, taken fifteen miles from Gwadar, near Kelat, Baluchistan, differs in having a faint ochreous wash down the back, which is more silvery, less overcast with black; the legs paler grey, and the forehead and cheeks less silvered. A skin from Kandahar, Afghanistan, has a richer ochreous

wash down the back than the type. A skin bought in Peshawar, and said to have come from Bezaur, North-West Frontier Province, is still more richly ochreous on the back than the Kandahar skin, and the legs are very pale, the fore leg being creamy-grey down the front, ochreous behind, and the hind leg ochreous above the hock instead of grey, and the front below the hock cream (the paws are missing).

The specimen collected at Turbat is the only one of the series measured in the flesh :—Head and body 16 in. ; tail ? * ; hind foot 4 in. ; ear 3½ in. It may be noted that the ear is almost as long as the hind foot and is actually as long as in *bengalensis*, and therefore relatively considerably longer.

The skull has the general shape of that of *bengalensis*, but is smaller and, judging from the two examined, is muscularly less well developed, the temporal ridges forming a wide lyriform area. The carnassial teeth also are relatively larger. As the measurements show these teeth (pm^4 and m_1)are as large as in the biggest skulls of *bengalensis* and actually larger than in the smallest dwarfed ♂ skull of this species from Mirpur in Sind. The first upper molar (m^1) is also a trifle larger than in that skull, and very nearly if not quite the average size of other skulls. But a comparison between the general dimensions of the dwarf ♂ skull of *bengalensis* from Mirpur and the two of *cana* shows that although the condylobasal length is approximately the same in the three, the skull of *bengalensis* is more strongly developed, being broader across the zygomata and across the muzzle at the canines. A noticeable individual difference between the two skulls of *cana* is seen in the nasals, which in the skull from Turbat are exceedingly narrow behind, whereas in the type they are broader, although not so broad as in the average of *bengalensis* (text-fig. A, p. 136).

The skull-measurements of *cana* are entered in the table on p. 144.

61 *a*. **Vulpes ferrilata** Hodgson. The Tibetan Sand Fox. (Pl. III.)

Vulpes ferrilatus †, Hodgson, Journ. As. Soc. Beng. xi, p. 278, pl., 1842 ; Blanford, Mamm. Brit. Ind. p. 155, 1888 ; Bonhote, Proc. Zool. Soc. 1905, p. 303, fig. (skull) ; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxix, p. 55, fig. 3, A, B, 1936.

Vernacular.—Dē-dzĕ (Tibet, F. M. Bailey).

Locality of the *type*, near Lhasa, Tibet.

* Hotson gave the tail as 135 mm. (=5⅜ in.), but half of it is missing. In other made-up skins the tail is at least two-thirds the length of the head and body.

† This name presumably refers to the " wide " pale rusty hue of the back and not to the " side " of the body, which is hoary. This conception justifies its emendation to *ferrilata*.

Distribution.—Tibet, the plateau at about 15,000 to 16,000 ft., Nepal, and the Upper Sutlej Valley *.

Distinguished from the previously described species by its relatively much smaller ears, its shorter tail, its very thick but comparatively short and rather wavy winter coat, and by several striking differences in the skull and teeth.

Coat consisting of an intimate mixture of the contour-hairs, which have a pallid subapical band, and of the wool, the two being approximately equal in length and varying in length from about 25 to 40 mm., no doubt in accordance with the season ; but interspersed in this coat, sometimes very sparsely, sometimes tolerably abundantly, are numbers of longer, fine black hairs up to 50 mm. or more in length. The general colour of the upper side from the head to the root of the tail is ochreous from the tint of the tips of the contour-hairs and the summit of the wool, speckled by the pallid areas of the contour-hairs but hardly appreciably darkened by the long erect black hairs ; the head is often greyer, not so bright as the body, and there is no trace of a fuscous patch on the muzzle in front of the eye ; there is a clear buff patch behind the ear on each side, the backs of the ears are sometimes a little darker than the nape, but never sharply contrasted ; the sides of the neck, the flanks and thighs are hoary, the tail is dark grey, mixed black and white hairs, sometimes with a buffy tinge above, and the tip is extensively white ; the hind leg is ochreous above the hock and below it behind, white in front below the hock ; the fore leg from the elbow is ochreous or palish buff, with white paws and sometimes a fuscous patch on the wrist ; the upper lip, the chin and the rest of the underside are white, the white of the hind throat being set off on each side by a fuscous patch.

This description is taken from six skins in good coat, a recently received mounted specimen from Tibet (R. Ward) ; two lectotypes from Lhasa (Hodgson), one from eastern central Tibet (Thorold), and two labelled Nepal (Hodgson). Two younger skins from Nepal (Hodgson) are paler, either greyer or more buffy, less ochreous than the adults ; but a skin

* Specimens in Hodgson's collection labelled Nepal and a living example from that country exhibited in the Zoological Gardens may have been brought to Nepal from Tibet ; and Stoliczka's record of the species from the Upper Sutlej (Journ. As. Soc. Beng. xxxvii, pt. 2, p. 5) may be due to the erroneous identification of a specimen of the Common Hill Fox, *V. v. montana*, although some typical Tibetan species were associated with it. An alleged race of this fox was recorded as *V. ferrilatus eckloni* by Ognev from Mongolia. The name *eckloni* was given by Przjevalski to the steppe fox said by him to be found in Mongolia, Kansu, Tsaidan and Kokonor, and to be especially plentiful at Kokonor. I believe this fox to be at most a local race of *Vulpes corsac*, an entirely distinct species from *V. ferrilata*. For further references to *eckloni* see my paper of 1936, above quoted.

from the Karo La Pass, 16,600 ft. (Waddell), is differently coloured owing to being in full moult. Most of the contour-hairs of the back are shed, those that remain having dead shrivelled tips, and the wool, which is close and matted, is about 25 mm. long; the general colour is browner, not so ochreous as in well coated skins and is decidedly more blackened

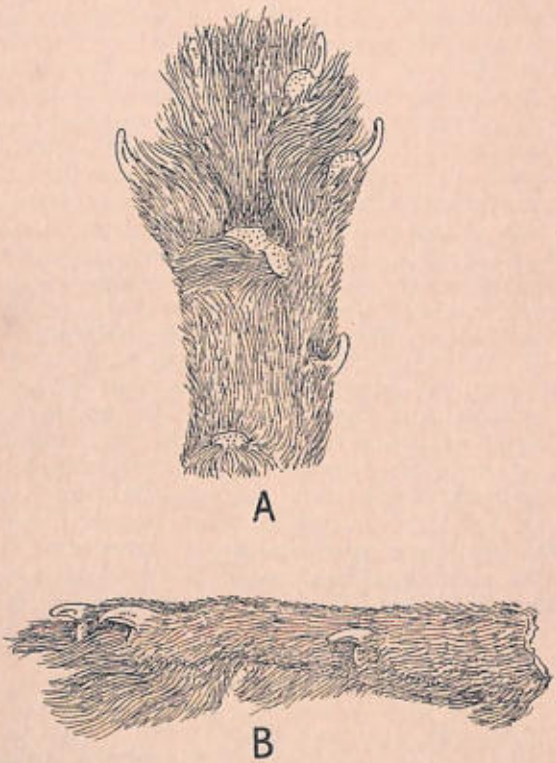


Fig. 20.

A. Lower side of right fore foot of *Vulpes ferrilata* in winter coat, with the hairs partly pulled aside to show the pads.
B. The same foot from the inner side. (Two-thirds nat. size.)

by the long, black hairs; the tail has no contour-hairs and is covered with soiled felted wool.

None of these skins has date or flesh-measurements; but the following are the dimensions (in English inches) of the mounted specimen:—Head and body $26\frac{1}{2}$; tail $11\frac{1}{4}$; hind foot 5; ear $2\frac{1}{8}$.

These measurements, coupled with the size of the skull,

with which he was unacquainted, disprove Blanford's statement that *V. ferrilata* is considerably less in size than *V. vulpes montana*; but they show that the tail without the hair is less than half the length of the head and body, instead of over,

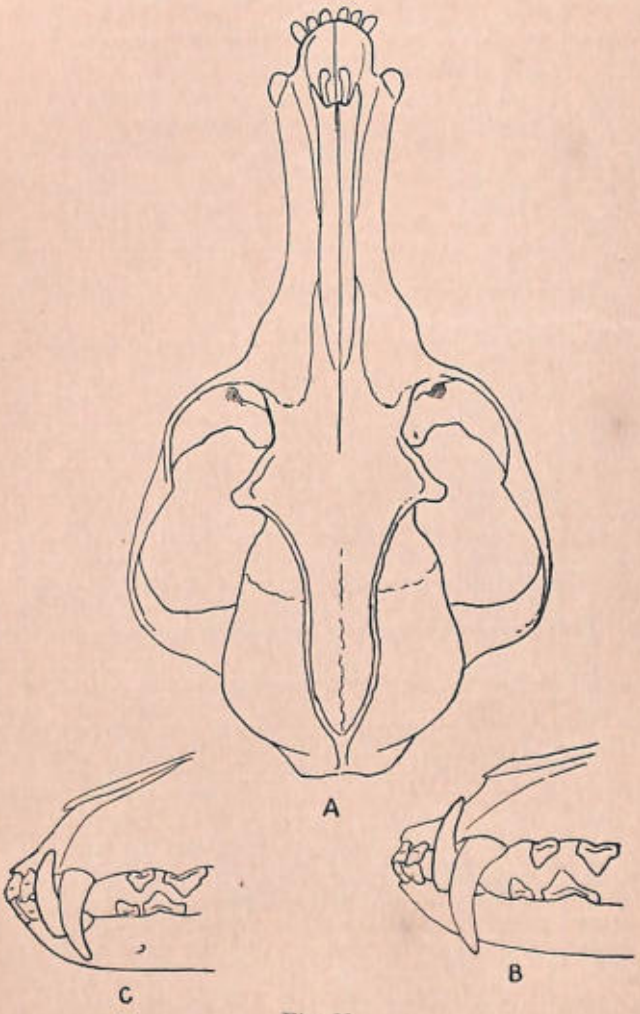


Fig. 21.

A. Upper view of skull of adult ♂ of *Vulpes ferrilata* from the Karo La Pass, Tibet.
B. Anterior end of jaws of ♂ of the same species from Gyantse, Tibet.
C. The same of *Vulpes vulpes montana* from Takula, Kumaun, showing the shorter canine teeth.

(All figures two-thirds nat. size.)

Cranial and dental measurements of skulls of *Vulpes cana* and *Vulpes ferrilata*.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Upper cheek-teeth.	Mandibular length.	pm^4.	m^1.	m_1.
Vulpes cana.										
Turbat, Baluchistan ; ad. ♂	91	50	19½	18	13	43½	69	10	7½	11
Gwadar, Baluchistan ; ad. o	89	50½	18	19	13	41½	67	9½	6½	11
Vulpes ferrilata.										
" Nepal " ; ad. ♂	152	86	24½	27	25	75	124	13	8½	16–
Karo La Pass, Tibet ; ad. ♂	145	83	26	24—	23	75	118	13	8½	15
Tibet ; ad. o	145	82	24—	24	25	70	116	13½	7½	15
East Central Tibet ; yg. ad. o	144	(72±)	22½	21	22	71	115	13	8	14½

and that the ear is 1 inch or more shorter. These differences also distinguish *V. ferrilata* from *V. bengalensis* and *V. cana*.

The remarkable skull of this fox, which in its development is an extreme exaggeration of the skull of *V. vulpes*, was first described by Bonhote, who pointed out many of its peculiarites. It is longer in its condylobasal length and in the length of the mandible and upper cheek-teeth than any skull of *V. vulpes montana* I have seen; but the difference is due to the exceptional length of the jaws, the cranial portion, although it has rather wider zyogmata, being actually shorter on the average. The jaws, however, are not only longer but narrower, being actually narrower by about 3 mm. above the second premolar than in a large skull of *montana*, but they expand above the canines, where the width is about the same as in that fox. The forehead is concave from side to side owing to the uplift of the postorbital processes. There are also differences in the teeth, the most noticeable being the extreme length of the canines, the upper * when fully erupted and unworn being 5 mm. longer down its anterior edge than in *montana*; the lower canine is similarly higher, and the upper premolars (pm^1 to pm^3) and the lower premolars (pm_1 to pm_4) are longer from back to front; but whereas the upper carnassial (pm^4) and the lower (m_1) are subequal to those of *montana*, the first upper molar (m^1) of *ferrilata* is smaller. The result of those differences is that in *ferrilata* the height of the upper canine exceeds the combined lengths of the upper carnassial and first molar, as set in the jaw, and that the third upper premolar is longer than the first upper molar. In *montana*, on the contrary, the canine is much less than the other two teeth and the third upper premolar is shorter than the first upper molar.

Of the skulls of *ferrilata* the one labelled Nepal was presented by the Maharajah to the Zoological Society. Those from Karo La Pass, Tibet, and E. Central Tibet were collected and presented to the British Museum by Col. Waddell, Col. F. M. Bailey, and Mr. W. Thorold respectively.

Habits.—No doubt the habits of this fox are similar to those of other species, although nothing hitherto seems to have been recorded about it. I am, however, indebted to Col. F. M. Bailey for the following interesting information. *V. ferrilata* "lives on the higher plateaux of Tibet above tree-level. The Common Red Fox, on the other hand, is found at Gyantse among the thorny bushes and willow-jungles that fringe the

* Bonhote recorded the upper canine of the skull from Karo La Pass as 29 mm. and that of his type of *waddelli* (=*montana*) as 20 mm. The latter figure is correct, the former is a misprint for 25.

river's edge; but I never saw *ferrilata* on the Gyantse plain. On one occasion on the high plateau country of western Tibet north of Nepal near Tadum I came upon two of these foxes hunting mouse-hares (*Ochotona*). They were so intent on their business that I was able to shoot both with a rifle. This was on November 11, 1904, at an altitude of 15,000 ft. Its Tibetan name is Dē-Dzē."

Genus **CUON** Hodgs.

Cuon, Hodgson, Ann. Mag. Nat. Hist. i, p. 152, 1838; Pocock, Proc. Zool. Soc. 1936, p. 33 (emended to *Cyon* by Blanford, who was followed for a time by many authors).
Chryseus, Ham. Smith, Jardine's Nat. Libr., Mamm. ix, p. 167, 1839 (in part).
Anurocyon, Heude, Mém. Hist. Nat. Chin. ii, p. 102, 1888.

Type of *Cuon*, *primævus*; of *Chryseus* *, *dukhunensis*; of *Anurocyon* †, *clamitans*.

Distribution.—Central and eastern Asia from the Altai Mountains and Manchuria southward to Cape Comorin and Java. Not found in Ceylon.

Resembling *Canis* in general external features, except that the ears are more rounded at the tip and there are typically six or seven pairs of mammæ ‡, but differing in the following well-marked cranial and dental characters:—The third lower molar (m_3) is absent; the second molars above and below (m^2 and m_2) are reduced in size; the first lower molar, the carnassial (m_1), has only a single cusp, instead of two, on its heel; the nasal bones are expanded in their posterior half; the anterior palatine foramina are longer and the muzzle is relatively broader in the premolar region (see Forsyth Major, Proc. Zool. Soc. 1890, p. 1833).

Although the Indian Wild Dog is quite unlike the African Hunting Dog (*Lycaon*) in several external characters, the two have been affiliated owing to certain resemblances in the skull and the presence of a single cusp on the heel of the lower carnassial. It has also been suggested that *Cuon* is akin to the S. American Bush Dog (*Speothos*), but in my opinion without much reason.

The British Indian Wild Dogs were referred by Blanford to two distinct species, the Indian *Cyon dukhunensis*, with

* A composite genus including the known forms now restricted to *Cuon* as well as many different breeds of feral dogs, including the Australian Dingo, for example, all referable to *Canis*.

† Based upon a skin of *Cuon* from S. China which happened to have lost its tail.

‡ The number of mammæ varies. I have seen a skin with six on one side, seven on the other, and a Burmese skin with eight pairs.

which he united the Himalayan form named *primævus* by Hodgson, and *Cyon rutilans*, which he said ranged from Tenasserim through the Malay Peninsula to Sumatra and Java. A third species he admitted under the name *alpinus* was a Wild Dog from the Altai which has exceptionally large teeth. But Mivart, in his revision of the genus (Mon. Canidæ, 1890), came to the conclusion that all the different kinds of southern Wild Dogs from India to Java are merely "varieties" of one species, for which he adopted the oldest

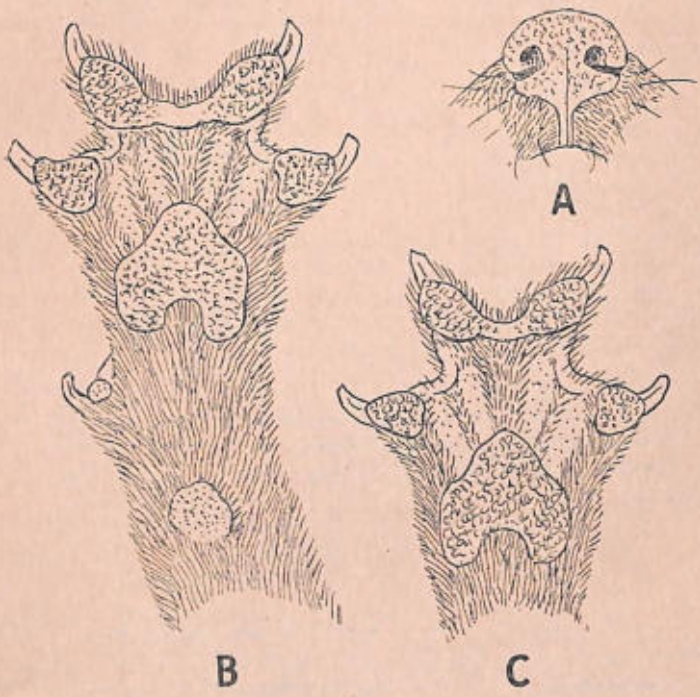


Fig. 22.

A. Front view of rhinarium of Wild Dog (*Cuon alpinus*).
B. Lower side of left fore foot of the same with the hairs cut short and the digits spread.
C. Lower side of left hind foot of the same.

name known to him, *javanicus*. The examination of far more material than was available to either of these authors convinces me not only that Mivart's view about the southern forms was correct, but that the northern forms, ranging from the Altai to Manchuria, also belong to the same species, *alpinus*,

and are subspecies of it. There appear to be five distinguishable races in British India, two of them occurring in Burma, but the name *rutilans* is not available for either of these.

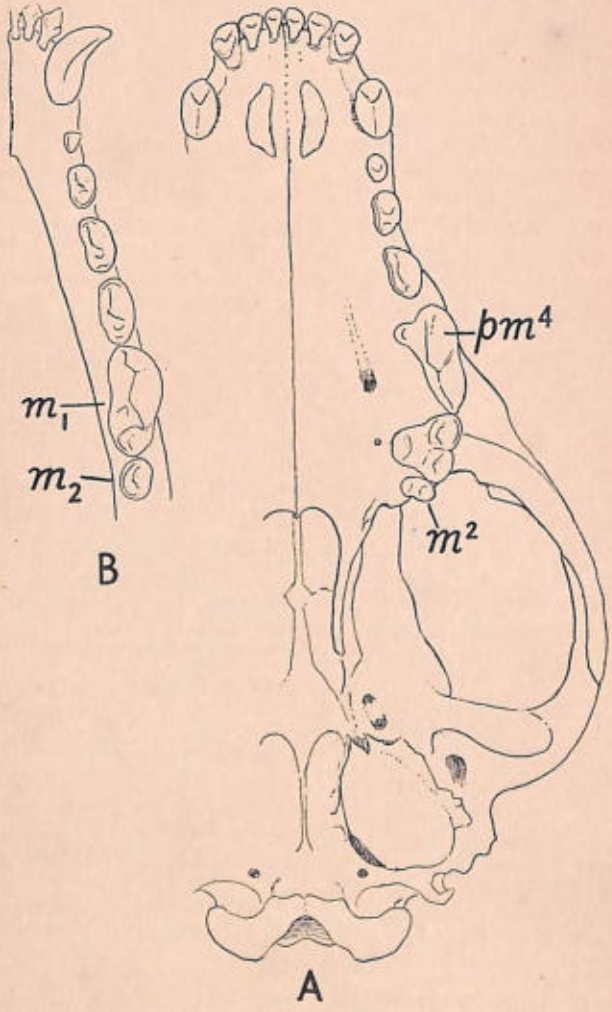


Fig. 23.

A. Lower view of left half of skull of ♂ Wild Dog (*Cuon alpinus dukhunensis*) from Bori, Hoshangabad.

B. Teeth of lower jaw of right side of the same. (Both figures two-thirds nat. size.)

pm^4 and m_1, upper and lower carnassials, the latter with a single tubercle on the heel; m^2 and m_2, second upper and lower molars, the third lower molar being absent. (For comparison with dentition of the Wolf, fig. 10, p. 79.)

62. **Cuon alpinus** Pallas. The Wild Dog.

Canis alpinus, Pallas, Zoogr. Ross. Asiatica, i, p. 34, 1811 *.

Locality of the *type*, Udskoi Ostrog, Amurland (selected by Pocock in 1936).

Since there is only one species of *Cuon* its characters and distribution are the same as for the genus. Although the head and body are about as long as in the Indian Wolf the Wild Dog is lower on the legs and has a relatively longer tail, which in its winter fullness and the nearer approach of its tip to the ground is more like a fox's brush. These features, coupled with its typically reddish or bright tawny hue, give it, when living, a very different appearance from that of the Wolf or Jackal. Although Blanford's statement that the Wild Dog differs from the Wolf and Jackal by having "long hair between the foot-pads" was copied as recently as 1933, there is no truth in it. The skull and teeth are smaller than in the Wolf; but a marked feature of the skull, apart from those mentioned, is the inflation, sometimes very pronounced, of the frontal region where it passes into the muzzle with air-cells, so that the profile at this point is more or less convex instead of concave. This character is more in evidence in the southern than northern races, but is individually very variable, even in the former.

62 *a*. **Cuon alpinus dukhunensis** Sykes.

Canis dukhunensis, Sykes, Proc. Zool. Soc. 1831, p. 100.
Cuon or *Cyon dukhunensis* of Blanford and other writers on the Indian fauna (in part).
Cuon javanicus dukhunensis, Pocock, Proc. Zool. Soc. 1936, p. 42.

Vernacular.—*Son-Kutta*, *Rám-Kutta*, *Jangli* or *Ban-Kutta*, *Ban-Kuka* (Hindi); *Kolsun*, *Kolasna*, *Kolasra*, *Kolsa* (Mahr.); *Eram-naiko* (Gond.), *Tani* (Ho Kol); *Vatai-Karau* (Tam.); *Reza-Kútá*, *Adari Kútá* (Tel.); *Kennai*, *Chennai* (Coorg); *Shin-nai* (Mal.); *Rám-hun* (Kashmir); *Siddaki* (Ladak); *Bhaosa*, *Bhánsa*, *Bhuánsú* (in Himalayas from Simla to Nepal); *Hazí*, *Phará* (Tibetan); *Paoho* (Bhot); *Sa-tum* (Lepcha). These vernaculars, copied mainly from Blanford, embrace the three races occurring in India from the Himalayas southwards.

Locality of the *type*, the Deccan.

Distribution.—Peninsular India, at all events south of the Ganges in the more or less forested districts, up to at least 7,000 or 8,000 ft., but not in the western deserts.

* The date of this volume was formerly cited as 1831. Hence in my monograph of the genus, published in 1936, in which only one species was admitted, the name *javanicus*, Desm., 1820, was taken as its pecific title.

General colour above reddish, but less intense and with a tawnier or yellower tinge than in the Nepalese and Burmese races, the back generally darkened to a varying extent by

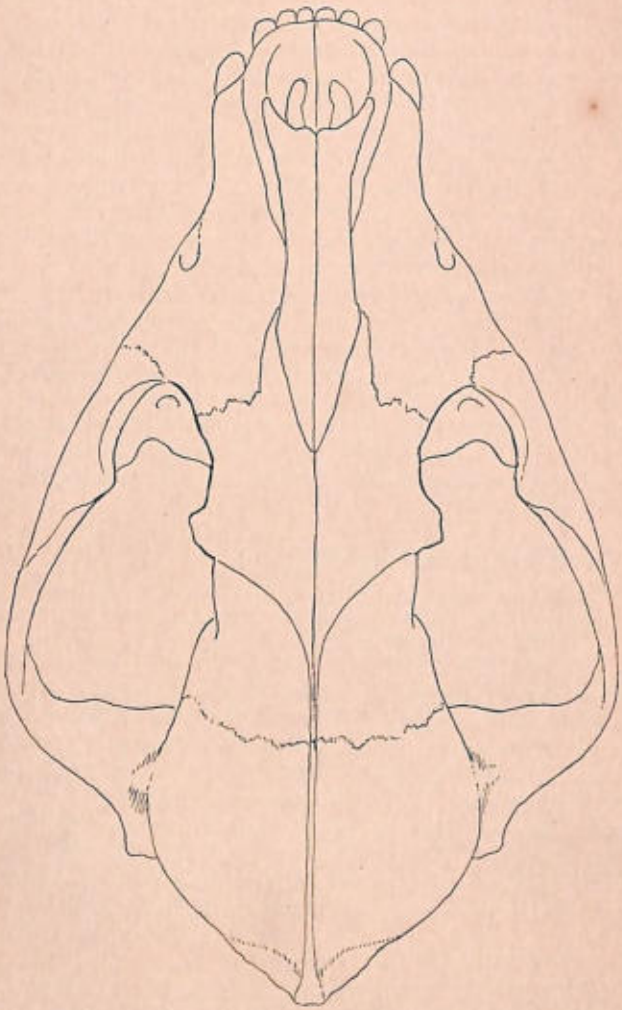


Fig. 24.—Upper view of skull of ♂ Wild Dog (*Cuon alpinus dukhunensis*) from Bori, Hoshangabad. (Two-thirds nat. size.) (For comparison with skull of the Wolf, fig. 11, p. 81.)

blackening of the tips of the hairs, but sometimes uniformly reddish; hair inside the ears whitish or buff; the muzzle typically blackish and with black facial vibrissæ; the outer

side of the legs sometimes uniformly reddish like the back, but often with buff or white on the paws; the under side of the body, neck, and head, and the inside of the limbs very variable, from white to pale reddish, nearly matching the upper side; tail like the body, but black at least in its terminal half. The summer coat is short, sleek and thin, with little or no underwool; the winter coat longer and rougher and moderately thickened with underwool.

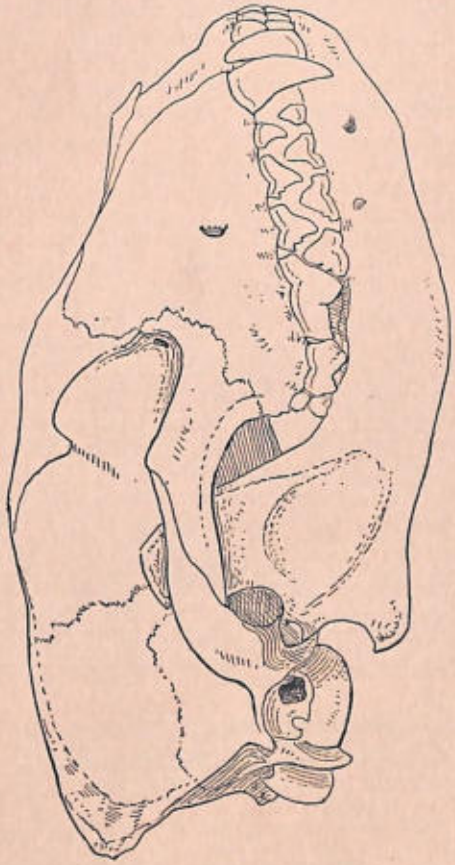


Fig. 25.—Side view of skull of ♂ Wild Dog (*Cuon alpinus dukhunensis*) from Bori, Hoshangabad. Drawn to smaller scale than figures 23 and 24. (For comparison with skull of the Wolf fig 12, p. 83.)

That the marked difference in colour, especially of the under side, are merely individual, is shown by a pair of skins from the Billigirirangan Hills, Coimbatore, 5,000 ft. (R. C. Morris). The general colour of the ♀ is rich tawny-red, with some black speckling above, and there is a good deal of white on the lips, throat, chest, belly, and the inside of the limbs. In the ♂ the reddish of the back and fore leg is much

more obscured by black speckling and the under side is pale reddish-buff. Similar differences in the colour of the underside are observable in a pair from Jhalawar, but in these the ♀ is reddish below and the ♂ very white.

Seasonal differences in the length of the coat may be illustrated by two skins. One from Berars, June, has the hairs of the back, neck, and tail 11, 27, and 45 mm. respectively. One from Hoshangabad, February, has the hairs of the same regions 30, 50, and 95 mm. These two skins exhibit approximately the extremes in hair-length in this race.

The following are the flesh-measurements (in English inches) of some adult specimens :—

Locality and sex.	Head and body.	Tail.	foot.
Hoshangabad ; ♂	38½	16½	9
S. Chanda ; ♂	37	16½	—
S. Chanda ; ♀	36	18½	—
Salem ; ♂	36	13½	8½

The skulls show great individual variation in size in both sexes. The ♂ skull from Hoshangabad stands out as the largest recorded for the genus, although one from Berars is nearly as big. Both are considerably larger than the ♂ skull from Coimbatore (R. C. Morris), the smallest of that sex entered in the table, but the latter is also much smaller than the ♂ skull from S. Coorg (G. C. Shortridge), also a southern Indian specimen. Of the two skulls from S. Chanda (C. S. Pitman), the ♀ is larger than the ♂, which suggests the possibility of a mixture of labels. But whichever be the ♀ from S. Chanda, it is much larger than the ♀ from S. Mysore (G. C. Shortridge), the smallest recorded skull from British India. From a large number of skulls measured, including several from Kanara, there is some evidence that the Wild Dogs of the southern parts of India are on the average rather smaller than those of the Central Provinces and neighbouring districts. But no final conclusion on that point can at present be reached.

62 *b*. **Cuon alpinus primævus** Hodgs.

* " The wild dog of Nepal," Sykes, Proc. Zool. Soc. 1832, p. 15 *.
Canis primævus, Hodgson, Asiat. Res. xviii, p. 2, p. 221, 1833 ; and Proc. Zool. Soc. 1833, p. 111.
Cuon grayiformis, Hodgson, Cat. Mamm. Nepal and Tibet, ed. 2, p. 5, 1863.
Cuon javanicus primævus, Pocock, Proc. Zool. Soc. 1936, p. 45 †.

* The skin of the type of *primævus* was exhibited at the Zoological Society before Hodgson's description of it was published. Sykes, who saw it, remarked that although representing, in his opinion, his *dukhunensis*, it differed in its denser coat and more woolly feet.

† Hodgson's type of *grayiformis* was distinguished specifically from *imævus* by the coat being close and short, with no feathering on the limbs and no " brush," and the colour above deeper rusty-red. Since

Locality of the *type* of *primævus*, Nepal; of *grayiformis*, Sikhim.

Distribution.—Kumaun, Nepal, Sikkim, Bhutan.

Distinguished from *dukhunensis* by having the winter coat longer and more luxuriant with underwool, with the hairs on the paws overlapping and largely concealing the pads, and in being, on the average at least, more rusty-red in hue. The differences in the coat appear at an early age judging from a comparison between cubs of about the same age of *primævus* from Nepal and of *dukhunensis* from Ootacamund in the Nilgiri Hills (P. H. Gosse).

Hodgson's specimens of this race from Nepal, and his unpublished drawings, show that the individual variation in the colour of the upper and under sides and of the limbs is similar to that of *dukhunensis*. A skin from Sipuri, Nepal, collected by the Survey, has aberrant coloration, the back and tail being mostly yellowish-red, with no black, and the legs whitish with horn-coloured claws, but the muzzle and chin are fuscous and the vibrissæ black. Provisionally this skin may be regarded as a pale variety.

Skins from Kumaun vary in an interesting manner. One from Ramnagar 1,100 ft. (Crump), December 3rd, is deep red above, like a skin from Darjeeling, but is clear white below. Another labelled Kumaun, 6,000 ft. (N. C. Troup), December, is a little brighter, paler, more ochreous than the skin from Ramnagar. A third from Almora, 5,600 ft. (Crump), February 10, is unusually "wolf- or jackal-like" in its colour, being light ochreous-tawny heavily overcast with black on the back, with a good deal of grey on the sides of the neck and head, and the under side mostly white. In its general hue this skin recalls that of the type of the Kashmir race described below; but in its less luxuriant coat and black vibrissæ it is like *primævus*. A skin from Hasimara, Bhutan Duars (H. V. O'Donel), is red, like the skin from Ramnagar, Kumaun, but has a good deal of white on the paws as in some Nepal skins.

Measurements.—As the following dimensions (in English inches) show, this race does not differ from *dukhunensis* in size:—

Locality and sex.	Head and body.	Tail.	Hind foot.
Nepal (type of *primævus*)	38	16½	—
Sikkim (type of *grayiformis*)	37	16½	—
Ramnagar, Kumaun; ad. ♀	38½	15	8½
Almora, Kumaun; ad. ♂	36½	17	8½

the skin was collected in June, probably in new summer coat, the differences are no doubt seasonal. Specimens from Darjeeling, 8,000 ft., May, from Gangtok (C. H. Dracott), July 13, and elsewhere bear out that supposition, the skin from Gangtok having the coat long and shaggy, with plenty of wool.

Weights.—Type of *primævus*, said to be thin, 30 lb. ; ♀ from Ramnagar 38 lb., ♂ from Almora 31 lb.

The skull and teeth of *primævus* do not differ from those of *dukhunensis*, except that the carnassial teeth (pm^4 and m_1) are perhaps, on the average, a little larger. The two skulls from Oudh (E. A. Osmaston) entered in the table have no skins, and are assigned to *primævus* on account of their locality. The skull marked ♂ is a good deal smaller than the one marked ♀. Very possibly the two were confused when being cleaned.

Writing of this Wild Dog in Kumaun Crump said that, owing to the large rewards offered by Government for its extermination, its numbers have been greatly reduced in the hills, but it is still fairly plentiful in the Terai and Bhaba.

62 *c*. **Cuon alpinus laniger** Pocock.

Cuon primævus, Adams, Proc. Zool. Soc. 1858, p. 514 ; Scully, Proc. Zool. Soc. 1881, p. 202.
Cyon dukhunensis, Ward, Journ. Bomb. Nat. Hist. Soc. xxix, p. 35, 1928 ; and xxxii, p. 712, 1928 ?
Cuon javanicus laniger, Pocock, Proc. Zool. Soc. 1936, p. 50.

Locality of the *type*, Kashmir *.

Distribution.—Kashmir, Ladakh, Astor in Baltistan ; Gilgit, also Yassin and Chitral, and possibly Lhasa in Tibet.

Distinguished from typical *primævus* by its much more luxuriant winter coat, paler tawnier colour at least on the average, and its pallid, not black, facial vibrissæ, resembling in this last character the races from central and north-eastern Asia.

The type and only example of this race known to me has the wool very thick and long, nearly as long as the contour hairs, which exceed the longest observed in *primævus*. The general colour above is tawny-yellow, with a grey cast owing to the infuscation of the hair-tips, the flanks being buffy-grey, the sides of the neck whitish-grey, the ears and crown buff, the muzzle and the fore legs ochreous-buff, the hind legs paler, all the paws whitish-buff, the tail mainly greyish-brown, with the wool matting in tufts, and the under side whitish.

In this skin the moult of the winter coat was evidently imminent, and the colour may be somewhat faded ; but according to Ward the "Wild Dog of Baltistan is generally very much more tawny than that of the plains." No doubt the wild dogs reported by Scully from Gilgit, Astor, Yassin, and Chitral belonged to this race, despite his statement

* The type is merely labelled Kashmir (Lieut. Abbot) ; but according to Adams Abbott's specimens were collected at Allahabad Serai in the southern ranges of Kashmir.

Cranial and dental measurements of *Cuon alpinus dukhunensis, primævus,* and *laniger.*

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. a. dukhunensis.									
Hoshangabad ; ad. ♂	200	187	115	37	39	40	146	20	21
S.E. Coorg ; ad. ♂	188½	177	111	37	40	39	138	21	21
S. Chanda ; ad. ♂	185	175	102	34	36	35	134	20	22—
Jhalawar ; ad. ♂	184	175	107	33	34	35	138	20	21
Salem ; ad. ♂	178	174	108	35	35	38	136	20	21
Coimbatore ; ad. ♂	175	167	113	31	32	36	130	20	21
S. Chanda ; ad. ♀	188	179	107	37	39	38	—	20	—
Jhalawar ; ad. ♀	175	165	110	32	33	35	135	20½	22
Coimbatore ; ad. ♀	175	165	98	33	34	35	126	20	21
S. Mysore ; ad. ♀	166	156	94	29	30	30	121	19	20
C. a, primævus.									
Kumaun, Almora ; ad. ♂	183	174	105	34	36	35	133	20	22
Nepal ; ad. o	185	175	109	32	40	38	137	22	23
Nepal (type) ; ad. o	183	175	110	32	35	36½	135	22	22
Kheri, Oudh ; ad. ♂	186	176	100	34	33	37	136	20	21
Kheri, Oudh ; ad. ♀	194	182	103	33	34	38	143	22	22½
Kumaun, Ramnagar ; ad. ♀	182	177	110	34½	37	38	136	20	22
C. a. laniger.									
Kashmir (type) ; ad. o	180	173	112	34	35½	37	139	20	—

that the specimens he saw were indistinguishable from *primævus*. The only skin I assign to *primævus* which approaches the type of *laniger* in colour is the "wolf-like" one from Almora, Kumaun, 5,600 ft., but this has the full winter coat much less luxuriant and the facial vibrissæ black. The possibility of the extension of *laniger* into Tibet is attested by a skin in Hodgson's collection labelled Lhasa, which has the coat thick, curled, matted and woolly, and is in full moult, the contour hairs that remain being dead, shrivelled, and broken; but the general colour is very like that of the type of *laniger*. This skin is no doubt one of those referred to by Hodgson (Journ. As. Soc. Beng. xi, p. 278, 1842) as "the breed of Dhole found in Tibet" which is "pale and wolf-like in colour and large."

The skull of the type of *laniger* has no peculiarities by which it can be distinguished from the skulls of *dukhunensis* and *primævus*.

In view of later reports of the occurrence of the Wild Dog in Kashmir the solitary representative of this race, collected considerably more than half a century ago, is of special interest. Writing in 1928 Col. A. E. Ward reported the Wild Dog as fairly common in parts of the Upper Indus Valley, but gradually becoming scarce there, and very rare in the vale of Kashmir. He had not seen one for many years apart from a few skins from Baltistan exhibited in shops. In the same year Col. Stockley ('Big Game Shooting in the Indian Empire,' p. 209) stated that he had made many inquiries about the possibility of the existence of the Wild Dog in Ladakh and Baltistan, and was convinced that all the reports of their presence there were due to the habit of the Kashmiri Shikaris calling the wolf "Jungli Kutta," the Hindustani name for the Wild Dog, and alluding to their colour as "lal" or red, which also means brown. Attempts for thirty years to get a skin from those districts proved abortive. On the other hand, Col. Stockley tells me (*in litt.*) that in October 1927 he saw a wild dog at over 11,000 ft. on the west side of the Liddar Valley in Kashmir. He watched it for some time, and concluded that it was hunting for pheasants, but it got his wind and bolted. Presumably this wild dog was an example of *laniger*.

62 *d*. **Cuon alpinus adustus,** subsp. nov.*

Vernacular.—Taw Khwe or *Taw Khay* (Burmese); *Manai* (Shan); *Chyahkyawn* (Kachin).

* By sportsmen and collectors in Burma this Wild Dog has been cited as *Cyon rutilans*, an inadmissible name given by Blanford to a specimen from Moulmein (see below, p. 158). But Blanford was careful to say

Locality of the *type*, Upper Burma.

Distribution.—Upper Burma and probably Assam; also Laos, Indo-China (Annam and Tong-king), and possibly W. Yunnan.

Distinguished from *dukhunensis*, which it resembles in size, by its deeper, more rusty-red colour, and from *primævus* by its much scantier and shorter winter coat.

The general colour is individually as variable as in *dukhunensis*, the upper side being tolerably uniformly red or heavily overcast with blackish and the under side and limbs may be similarly uniformly reddish, with the under side a little lighter than the upper, or greyish to buffy-white from the chin backwards and on the inner side of the legs, with the front of the paws also pale. The type has very little black above and no white on the limbs or on the under side.

In 1936 I had no specimens from Upper Burma wherewith to compare *dukhunensis*, and I assigned to that race some examples from Mokokchung and Akuk in the Naga Hills (J. P. Mills); but these agree better with the Upper Burmese race. Since that date I have seen skins or skulls from the following localities:—Upper Burma (H. C. Smith), Nam Tisang, Upper Burma (Lord Cranbrook), Palop, Maitaung, Simia in Myitkyina, Nahpaw (P. M. Leonard), Schwebo (C. E. Milner), Mong Mit State (H. C. Smith), Maymyo in Mandalay, the Wesalaung Forest Reserve (C. Hopwood), and 20 miles S. of Toungoo (J. M. D. Mackenzie); also, outside British Indian territory, one from the left bank of the Mekong in French Laos, near the Siamese boundary (G. F. W. Elwes).

Indistinguishable from this race are skins from Kontoum, Annam, and Backan, Tong-king, 500 ft. (Delacour and Lowe), which I left unidentified in 1936, although determined as *rutilans* by Osgood (Field Mus. Nat. Hist. Zool. xviii, p. 265, 1932); and probably two skins from western Yunnan identified as *rutilans* by G. M. Allen (Amer. Mus. Novit. cccIx, p. 4, 1929) also belong here.

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that he did not know whether the northern Burmese Wild Dog was *rutilans* or *dukhunensis*.

A puzzling record connected with this Burmese Wild Dog is a statement written by P. M. Leonard on the back of the label of a skin from Nahpaw, long. 97° 39′, lat. 24° 50′, N.E. of Bhamo, to the effect that there are two kinds found in that locality—a larger which hunts singly, and a smaller which hunts in packs. The skin examined, one of the so-called smaller pack-hunters, is typical *adustus*. It is extremely unlikely that two distinguishable kinds occur in the same place. In this connection it must not be forgotten that an experienced collector like G. C. Shortridge mistook a small feral domestic dog for a Wild Dog on Mt. Popa. Peacock was evidently puzzled by records of the occurrence of *dukhunensis* in Upper Burma, but he was sure that all the specimens he saw were "*rutilans*," and he thought the two "species" must considerably overlap in range.

None of the skins examined was measured in the flesh, but according to E. H. Peacock ('A Game-book for Burma,' p. 197, 1933), who was acquainted with this animal in the upper Chindwin and Katha districts, as well as elsewhere probably, the total length varies from 4 to 4½ ft., of which the tail is about 1 ft. The weight is about 35 or 40 lb. These measurements and weights agree very closely with those of *primævus* recorded above, and the table of measurements of the skulls shows that they are at least as large. The skulls vary considerably in size and other characters; one of special interest is the second on the list from Mong Mit State, which, in addition to having the frontal region exceptionally swollen with air-cells, has the zygomatic width unusually narrow throughout, although it is fully adult. In this respect it serves to connect this race with the next described. The teeth in this race seem to be a little larger on the average than in *dukhunensis*.

62 *e*. **Cuon alpinus infuscus** Pocock.

Cyon rutilans, Blanford, Mamm. Brit. Ind. p. 147, 1888 (in part) (not *rutilans*, S. Müller, 1839 *).
Cuon javanicus infuscus, Pocock, Proc. Zool. Soc. 1936, p. 38, fig. 1, A.

Locality of the *type*, Moulmein.

Distribution.—Tenasserim, inferred from the locality of the type.

Distinguished from the typical Burmese race *adustus*, on the evidence of a single specimen, by its smaller size, shorter, thinner coat, and the characters of the skull mentioned below.

The type, an adult ♀, collected in November (Dr. Hooker), has the coat short, sleek, and thin, with no underwool, despite the lateness of the season. The extensive infuscation of the ends of the hairs above, combined with their reddish bases, gives a brownish tint to the dorsal pelage; the head and front of the limbs are also affected by blackish pigmentation; the under side is buffy greyish-white. Considering the individual variation in the dark pigmentation of the dorsal surface in other races of *C. alpinus*, no reliance can be placed on the darkness of the hue of this specimen. It is not, for example,

* The name *rutilans* was given by Müller to the Javan Wild Dog previously called *javanicus* by Desmarest. This is racially distinguishable from the one found in Sumatra and the Malay Peninsula (*sumatrensis*). Blanford thought they were the same, and that this Wild Dog, which he distinguished specifically from *dukhunensis* on account of its smaller size, more ferruginous colour, and scantier coat, extended into Tenasserim. But he took his description of *rutilans* not from the Moulmein skin, but from skins from Malaya and Sumatra. It does not apply to the Moulmein skin in the matter of colour.

so black on the back as the darkest example of *adustus* from the Mong Mit State.

The skull has slightly smaller teeth and is shorter than the shortest known ♀ skull of *adustus* ; but the difference in length is not so great as that between the two shortest skulls of *dukhunensis* entered in the table. It differs, nevertheless, in a combination of characters from other skulls of British Indian Wild Dogs. It is exceptionally narrow across the postorbital

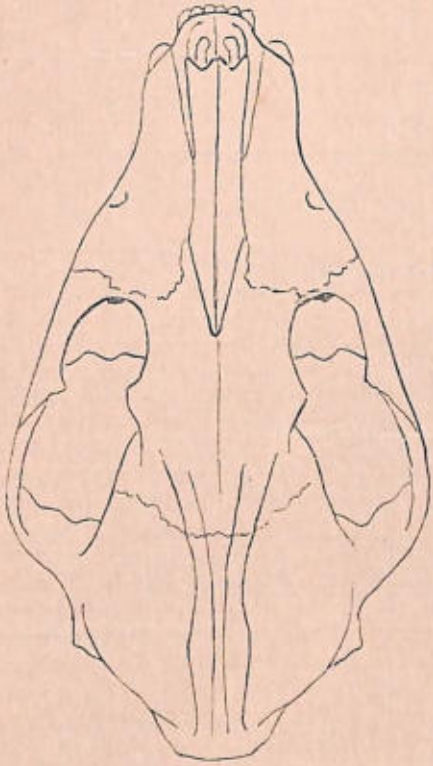


Fig. 26.—Upper view of skull of adult ♀ *Cuon alpinus infuscus* (type) from Moulmein. (Two-thirds nat. size.)

processes and the zygomatic arches and exceptionally wide across the base of the muzzle above the upper carnassial teeth. The muzzle-width at that point is very nearly half the length of the mandible, whereas in *adustus* it is much less, and 20 mm. greater than the width across the postorbital processes, only about 10 mm. in *adustus*. In adults of both sexes of *adustus* the temporal ridges coalesce to form a median crest or ridge

Skull-measurements of the two Burmese races *Cuon alpinus adustus* and *C. a. infuscus*.

Name, 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.
C. a. adustus.									
Maymyo, Upper Burma ; ad. ♂	—	180	114	34	38	39	142	22	23
Mong Mit State ; ad. ♂.....	196	(180±)	106	32	42	37	140	20	21
Upper Burma ; ad. ♂ ?	193	178	113	35	37	39	141	22	22½
Upper Burma ; old ♂ ?	192	—	112	34	38	36	139	20	21
Upper Burma (type) ; ad. ♀ ?	180	168	105	40	37	34	133	20	21
Wesalaung ; ad. ♀	—	(162±)	94	35	34	34	122	20	21
Mokokchung, Naga Hills ; ad. ♀	184	—	112	37	40	37	136	21	22
C. a. infuscus.									
Moulmein (type) ; ad. ♀.....	168	157	88	34	29	33	119	19½	20

on the crown ; in *infuscus* they are separated and define an elongated lyrate area. Similar differences, apart from the total length, occur between the skulls of *infuscus* and of the Malayan Wild Dog. But the skull of *infuscus* is linked with skulls of *adustus* by the example from Annam, above mentioned, as I pointed out in 1936. Unfortunately there was no skull with the skin assigned to *adustus* collected by Mackenzie south of Toungoo. This might have shown *infuscus*-like characters.

Habits.—Much has been written about the Wild Dogs in different parts of British India, from Kashmir and Mysore to Burma, but there does not appear to be any essential difference in their habits wherever they are found. They are essentially forest animals, and prey upon any living mammal they are capable of catching and killing, particularly on wild pig and deer, and in Kashmir, according to Col. Ward, sometimes on markhor, which venture into the forest, and musk-deer. Their frequently described prowess and fearlessness in attacking more formidable game depend mainly on the strength of the pack ; but Peacock gives an instance of a solitary specimen in Burma driving a young stag sambhar into water, where he would certainly have killed it but for the observer's intervention. A large pack may pull down a buffalo, bison (gaur), or banteng (tsaine), their method being a simultaneous attack in the front and rear, those behind concentrating on the flanks of the victim and ultimately disembowelling it. They also leap at the flanks of running deer with the same purpose, and there is no reason to doubt the statement that they may emasculate it. They have been known to stampede a herd of bison, drive out the calves and kill them. Their depredations will soon clear a large area of forest of game, compelling the pack to go elsewhere, sometimes far afield, for food, and the place may be free of dogs for weeks or months, so that there is no certainty of finding them in any particular spot. The confidence and courage that numbers give will induce a pack, possibly only or mainly when pressed by hunger owing to scarcity of other game, to attack the most formidable carnivores, including the Himalayan black bear, the sloth bear, and panther, the last being not infrequently driven from its " kill " and " treed." R. W. Burton, however, records a case of a feeding panther driving off a pack consisting of the dog and bitch and seven young believed to be about seven or eight months old ; and R. C. Morris states that a panther will kill and eat these dogs if he can catch them singly or in pairs. The same observer described the method adopted by a pack in attacking a sloth bear, which they had cut off when attempting to take refuge in a cave. His attention was drawn to the scene

by hearing the howling roar of the bear, which he found surrounded by dogs, those in front of it distracting its attention while those in the rear attacked and lacerated its hind quarters, the contest, so far as the dogs were concerned, being carried on in complete silence. He had no doubt that but for his intervention the dogs would have carried out their purpose.

The evidence that these dogs may at times attack even tigers is too cogent to be set aside. According to one of the latest accounts told by R. C. Morris, on what he considered to be reliable authority, the worried tiger took refuge on the low bough of a tree, below which the dogs waited, leaping and snapping at it, until the beast, springing to the ground to make a bolt, was at once pounced on and disembowelled by the pack.

Singularly enough, despite their fearlessness of other jungle animals, wild dogs never apparently prey on mankind. In this they resemble the African Hunting Dog, and differ from Wolves. Nor apparently do they attack men in self defence. The pack that Pitman interfered with, as described below, was in sufficient strength to overcome him with ease if its members had combined for the purpose.

The ordinary call, usually heard at night, is a yap rather than a bark. As the outcome of a great deal of correspondence and difference of opinion on the subject of their silence when hunting, it seems probable that when running their prey by scent they at most utter a whimpering sound, but as soon as it is sighted they may break into howls of excitement, as described by Col. Ward. According to Major C. R. S. Pitman they make a curious whistling sound when alarmed. This he heard on all sides of him in the Central Provinces from a scattered pack after he had shot two of the number. He watched the pack come to a pool to drink, and reported that, when thirst was satisfied, they entered the water and stayed immersed with only their heads above the surface.

Blanford supposed the period of gestation to be probably about two months, approximately the same as in Wolves and Jackals. But in 1926 * a couple of Wild Dogs in the Zoological Gardens paired and "tied" in the usual canine fashion on January 15th, and the pups were born on March 26th, the period of gestation being 70 days or thereabouts, about a week longer than in *Canis*. According to Hodgson and others the litter consists usually of from two to four pups; but as many as seven have been recorded. Since the bitch may have as many as eight pairs of mammæ, it seems probable that the number of pups may occasionally considerably exceed half-a-dozen. Like the cubs of wolves and foxes they

* I am indebted to Mr. Flewin, the keeper of the Wolves and Dogs, for this information.

are deep dusky in hue ; and the mother lies up with them in a burrow, cave, or rock-cleft until they are capable of following her and the male on hunting trips. Such family parties constitute the smallest packs, varying in individuals according to the number of the young. But the Wild Dog is essentially gregarious, and several females often breed in the same place, their burrows forming a kind of " warren." Hence probably the larger packs that have been recorded as composed of twenty or thirty dogs result from a number of family parties joining forces.

There is a record of a wild dog interbreeding with a jackal in a menagerie at Madras.

Family URSIDÆ.

The Bears.

Large or medium-sized, heavily built beasts, with erect rounded ears, relatively small eyes, a well-developed rhinarium, and the tactile vibrissæ reduced to practically functionless vestiges, but with the lips differing from those of other Carnivora in being free from the gum and protrusible. The tail is short, serving the purpose merely of an anal operculum ; and the anal glands, functionally important in many families of Arctoid Carnivores, are absent or negligible in size. The external genitalia are like those of the Canidæ, the penis being long, with the prepuce far in advance of the scrotum, but the baculum is a solid, unchannelled, subcylindrical bone, with an attenuated apex. The limbs are massive, with the paws short and broad, provided with five subequal digits, the pads of which are arranged in a slightly curved line, that of the first being only slightly behind the second and in contact with the ground ; they are armed with long, powerful, curved, not retractile claws, those of the fore foot being nearly twice as long as those of the hind foot. The plantar pad is large and wide, as wide as the foot, nearly twice as wide as long, and showing scarcely a trace of subdivision into its four fundamental elements. The variations in the pads and other characters of the fore paw are noted under the generic headings. The hind paw is exceptionally short, about as long as the fore paw, and has the sole naked up to the heel or nearly so, the metatarsal pads forming a continuous area confluent externally with the plantar pad, but defined from it internally by a transverse groove, which may be hairy.

Bears are usually said to be plantigrade ; but when walking the Polar and Brown Bears at least rest only the plantar and

digital pads of the fore foot on the ground, exactly like a digitigrade dog, and raise the heel of the hind foot off the ground, resting mainly on the digital and plantar pads and perhaps on the fore part of the metatarsal pad. Only when standing or walking erect on the hind legs is the entire sole applied to the ground.

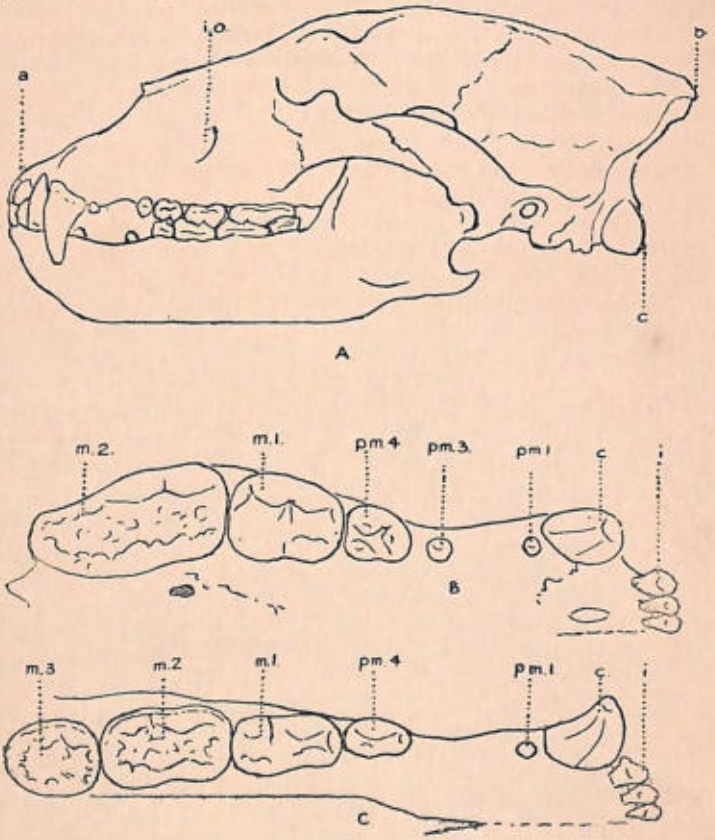


Fig. 27.—Skull and teeth of *Ursus*.

A. Side view of skull of a European Brown Bear (*Ursus arctos*), showing the general shape characteristic of *Ursus*, with the infraorbital foramen (*i.o.*) situated above the first upper molar, the smaller tooth in front of the latter being the upper carnassial (pm^4). *a* to *b* and *a* to *c* indicate the total and condylobasal lengths.

B. Upper teeth of right side of Indian Red Bear (*Ursus arctos isabellinus*). *i*, incisors; *c*, canine, pm^1 to pm^4 (carnassial), the first, third and fourth premolars, the second absent; m^1, m^2 the first and second molars, the postpalatine foramen on a level with the latter.

C. Lower teeth of the left side of the same. Lettering as in B, but the second and third premolars absent and the third molar (m_3) present.

The skull is robust, with powerful, short or long jaws and the dorsal profile strongly or lightly convex on the crown, its highest point typically some distance behind the post-orbital processes, which are stout, short, and blunt; the dorsal profile of the muzzle is usually concave posteriorly; the orbital fossa is small compared with the spacious temporal fossa; the sagittal crest is only well developed behind, where, with the strong occipital crest, it forms a backwardly projecting prominence; the mastoid area is expanded, forming a shelf-like platform beyond the cranium proper; the par-occipital process is salient and remote from the bulla, which is usually flat but has a long tubular auditory meatus; the alisphenoid canal is present; the palate is everywhere narrow between the parallel rows of cheek-teeth and is considerably produced posteriorly beyond the last teeth; the posterior palatine foramina are set far back on a level with the last upper molar.

The dental formula, as in typical Canidæ, is fundamentally: $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{4}{4}, m.\frac{2}{3}$; but the dentition as a whole is very different and highly characteristic. The incisors form a nearly straight line and the canines are large or moderately so; but the first three premolars above and below are small, unicuspid, usually with a single root, spaced when the jaws are long, crowded when they are short, but typically one or more is shed early, the second being the most fugitive, the first the most persistent; there is no functionally differentiated "carnassial" tooth either above or below; the fourth upper premolar (pm^4) is small, much smaller than the first upper molar, is usually provided with three cusps, one in front and a pair behind, but is unique in having only two roots and in being set far forwards in advance of the anteorbital foramen and of the point of "maximum mechanical efficiency" of the jaws; the two upper molars (m^1, m^2) are large, with broad, crushing crowns, the first with four large paired tubercles separated by a median longitudinal groove; the second is usually longer than the first and longer than wide, with a long "heel" and with a wide median sulcus bordered on each side by a crest which in the anterior part of the tooth seems to be composed of two tubercles; the fourth lower premolar is small, conical; the first lower molar is long, with the three typical cusps on its anterior portion and a well developed "heel," with at least two cusps; the second lower molar is usually broader than the first, with a median groove bounded on each side by a crest containing the elements apparently of two cusps; the third lower molar is smaller than the others, circular or ovate, with a flat, minutely tuberculated surface bounded by a low rim.

The teeth of the second set are cut very early, and from the hard work to which they are subjected by masticating vegetable

fibre, for which they are adapted, the back teeth are generally more or less worn in adult skulls, and in later life the component cusps of the crowns may be almost or quite obliterated.

General Habits of Bears.—On account of their heavy build and short, wide, almost plantigrade hind feet Bears are incapable of leaping and mostly slow and inactive in their movements, but can cover the ground in a shambling, clumsy gallop at greater speed than their appearance would lead one

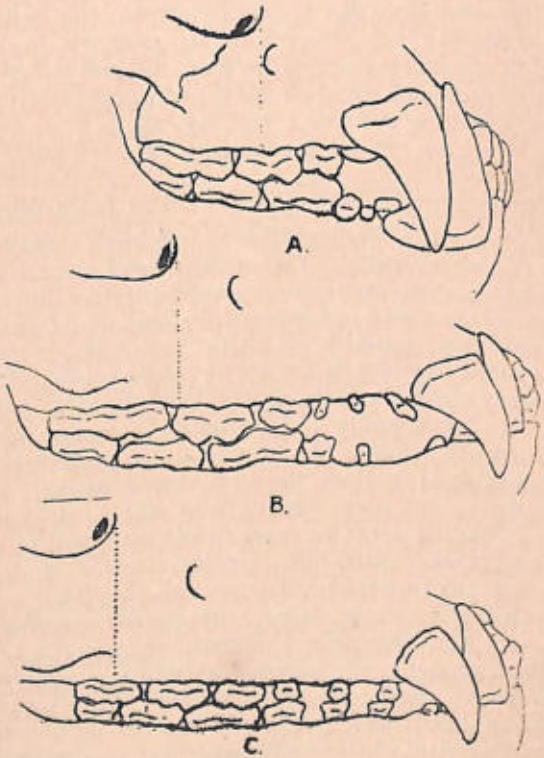


Fig. 28.—Side view of the jaws and teeth of three genera of British Indian Bears.

A. Malayan Bear (*Helarctos malayanus*), ad. ♂, showing the short jaws, huge canines and crowded cheek-teeth.
B. Himalayan Black Bear (*Selenarctos thibetanus*), showing the longer jaws, more spaced teeth, with the open space behind the canine.
C. Sloth Bear (*Melursus ursinus ursinus*), showing the long jaws, smaller cheek-teeth and the closed space behind the canine.

The dotted vertical line shows the position of the anterior edge of the orbit in relation to the two molars below it.

to suspect. Apart from the Polar Bear, which inhabits a different environment from the rest, all the species have certain habits in common. They are skilful, if slow climbers, and by means of their powerful limbs, the shape of their feet, and their long, strong claws, especially of the fore feet, they are able to swarm up the trunks of trees, not too wide to clasp, and move about amongst the bigger boughs ; but they always descend a tree tail first *. The incentive to climb is the search for food ; and many of the larger kinds of Brown Bears seldom have occasion to exercise their powers in that direction.

In his treatment of the Bears of British India Blanford followed the custom of zoologists of his time in referring them to two genera—*Ursus*, containing the Brown or " Red " Bear of the Western Himalayas, the Himalaysan Black Bear, and the so-called Malayan Bear; and *Melursus*, containing the Sloth Bear. But this classification is most misleading in its suggestion of affinities, since it implies closer kinship between the Brown and the Malayan species than between the Brown and the Sloth Bear. The Sloth Bear is a highly modified representative of the Brown Bear type and the Malayan of the Black Bear type. The differences between the four species are now expressed by assigning to each a distinct generic name.

The distribution of the four genera in British India is interesting. *Ursus* is, or was, found all over Europe, temperate Asia, and North America, mostly in forested districts to the south of the area occupied by the Polar Bears (*Thalarctos*). Along its southern limit in the Old World it just overlaps everywhere the range of *Selenarctos*, which extends from Baluchistan through the Himalayas to China and the adjoining large islands, and to Amurland. To the south of its range and almost touching it occurs *Melursus* in the plains of India, Peninsular India, and Ceylon, and *Helarctos* in South Asia to the east of the Bay of Bengal, the two overlapping in Burma, Siam, and Indo-China, although *Helarctos* extends through the Malay Peninsula into Sumatra and Borneo, apparently missing Java.

* The sureness of their balance is remarkable. I have often seen full-grown brown bears at the Clifton Zoological Gardens stand with all four feet pressed close together on the top of a pole about a foot in diameter, with a drop of some thirty feet below, and swing the head to right or left to catch unerringly, like a dog, pieces of bread or bun thrown to them by visitors standing on the edge of the pit. They knew to an inch how far they could reach, making no attempt to catch a piece they perceived to be out of range almost as soon as it left the feeder's hand Their skill did not in the least suggest that their eyesight was poor, although most sportsmen state that it is.

Blanford, quite correctly, pointed out that the proverbial " hugging " of a bear as a method of attack is a pure myth.

Key to the Genera of British Indian Bears based upon External Characters.

a. Fore foot with a single external cordate carpal pad, and at most a small internal pad or area of naked skin representing it. Digital pads more closely united, sometimes completely fused.

b. Carpal area thickly overgrown with long hair, surrounding the external pad, concealing the internal and isolating both from the plantar pad; area of the digits between the plantar and digital pads also hairy. Rhinarium with normal non-valvular nostrils and distinct philtrum dividing the hairy upper lip; lips only moderately protrusible ..... [p. 169. URSUS Linn.,

b'. Carpal area and the area between the plantar pad and the fused digital pads naked; rhinarium with valvular nostrils but no philtrum; lips almost naked and highly protrusible ..... [p. 187. MELURSUS Meyer,

a'. Fore foot with a single large piriform carpal pad as wide as the plantar pad and nearly or quite as long as it externally; digital pads never fused.

c. Ears as in *Ursus* and *Melursus*, long, basally tubular, distally expanded, mobile and strengthened by vertical cartilaginous ridges; rhinarium and lips nearly as in *Ursus*..... [Heude, p. 201. SELENARCTOS

c'. Ears short, not tubular at the base or noticeably expanded distally, hardly mobile, and without cartilaginous ridges; rhinarium and lips adaptively foreshadowing those of *Melursus* ..... [Horsfield, p. 222. HELARCTOS

Key to the Genera based on Skull Characters.

a. Skull long relatively to its width, its mastoid width seldom exceeding the length of the palate; the tympanic bulla flat, its width with the auditory tube much less than the length of the upper cheek-teeth; canines relatively small.

b. Median upper incisors present; palate flat or only slightly concave between the back cheek-teeth, which are comparatively large, its postdental portion much shorter than the length of the last three upper cheek-teeth; a distinct postcanine space in the jaws due to the reduction in size, sometimes in number, of the anterior premolars; last upper molar larger than the first.

c. Jaws longer in comparison with the cranium; crushing teeth more strongly cusped and set more forwards, so that the anterior edge of the last upper molar is in front of the antero-inferior edge of the orbit ..... URSUS Linn., p. 169.

c'. Jaws shorter, crushing teeth less strongly cusped and set farther back, the anterior edge of the last upper molar not in front of the antero-inferior edge of the orbit. [Heude, p. 201. SELENARCTOS

b'. Median upper incisors absent; palate markedly vaulted between the back cheek-teeth, which are set forwards and reduced in size, so that the postdental portion of the palate is not less than the length of the last three upper cheek-teeth; no distinct postcanine space, the anterior premolars being less reduced; last upper molar subequal to the first ..... [p. 187. MELURSUS Meyer,

a'. Skull short and broad, its mastoid width equal to the length of the palate and mesopterygoid fossa combined or longer; tympanic bulla swollen, its width with the auditory tube about equal to the length of the upper cheek-teeth, excluding the canines, which are relatively very large ..... [Horsfield, p. 222. HELARCTOS

Two additional genera of Bears * are usually admitted, the Polar Bear (*Thalarctos maritimus*), a modification of typical *Ursus*, adapted by its more hairy feet for movement on snow and ice, and by its more powerful canine teeth and relatively smaller back teeth for preying and feeding on seals and other animals; and the small Spectacled Bear (*Tremarctos ornatus*) of South America, a very different genus from the rest, and calling for no further notice.

Genus **URSUS** Linnæus.

Ursus, Linn., Syst. Nat. ed. 10, p. 47, 1758 (in part); Miller, Cat. Mamm. Western Europe, p. 285, 1912; Pocock, Proc. Zool. Soc. 1914, p. 940 (external characters).
Myrmarctos, Gray, Proc. Zool. Soc. 1865, p. 694.
Ursarctos and *Melanarctos*, Heude, Mém. Soc. Hist. Nat. iv, pt. 1, p. 18, 1898.
Mylarctos, Lönnberg, Proc. Zool. Soc. 1923, p. 85.

Type of *Ursus*, *arctos* (Sweden); of *Myrmarctos*, *eversmanni* (Norway)=*arctos*; of *Ursarctos*, *yesoensis* (Yeso, Japan); of *Melanarctos*, *cavifrons* (N.W. Manchuria)=*lasiotus*; of *Mylarctos*, *pruinosus* (Tibet and Kansu).

Distribution.—The Northern Hemisphere as far south in

* The North American Black Bear (*Ursus americanus*) is sometimes separated as a distinct genus or subgenus (*Euarctos*); but it is probably nothing more than a well-marked species of *Ursus*, with many local races. I am quite unable to accept the view of G. M. Allen (Mamm. China and Mongolia, p. 330, 1938) that the American Black Bear and the Tibetan or Asiatic Black Bear are closely allied, merely representing species of the same genus which takes the name *Euarctos*, an older name than *Selenarctos*. Allen associated them on account of the comparative shortness of the muzzle; but *Euarctos* agrees with *Ursus* in the characters diagnostic of *Selenarctos* (p. 201).

the Old World as the Atlas Mountains, Syria, S. Persia, the WESTERN HIMALAYAS and Tibet (recorded, but probably erroneously, from the Shan States in Burma, see p. 185), and in the New World as far south as Mexico.

Muzzle usually long; the rhinarium large and naked, with its upper profile lightly biconvex seen from the front; nostrils large, with rather narrow, mesially grooved septum, the infranarial portion very deep, the philtrum present and

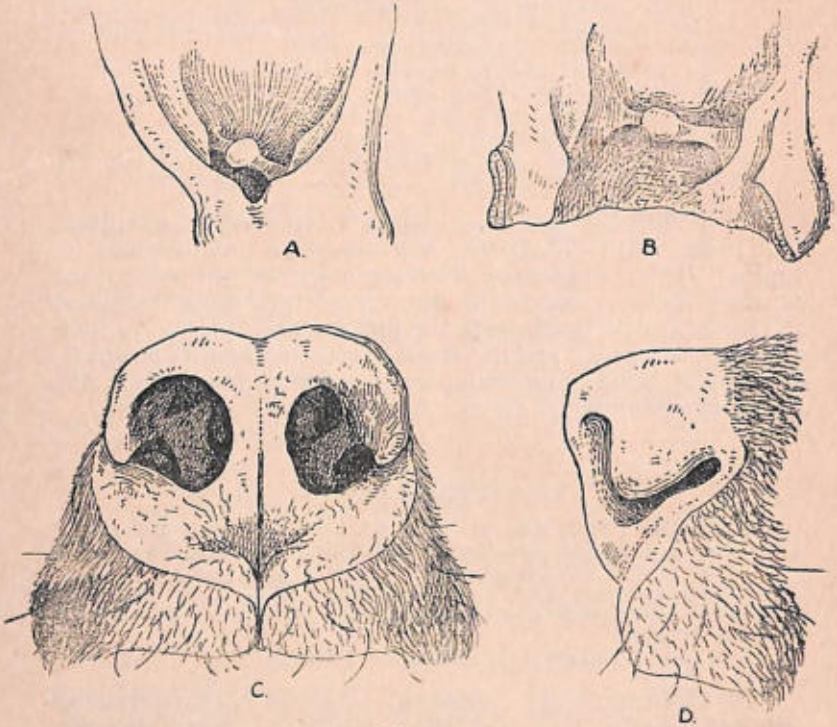


Fig. 29.

A. Base of the ear of European Brown Bear (*Ursus arctos arctos*), with the hairs removed to show its tubular shape characteristic of *Ursus*, *Melursus* and *Selenarctos*.
B. The same cut open, showing its supporting cartilages.
(For comparison with the ear of *Helarctos*, fig. 43, p. 221.)
C and D. Rhinarium of Grizzly Bear (*Ursus arctos ferox*) from Montana, from the front and side, showing the shape characteristic of *Ursus*.

short. Lips moderately protrusible, hairy up to the rhinarium and philtrum. Ears tolerably large, rounded, mobile, expanded and rounded above, narrowed below, where they are strengthened by thick vertical, cartilaginous ridges in addition

to the transverse supratragus, which has a nearly globular thickening. Feet with the digital pads generally free, so that the hairs clothing the inner surfaces of the toes project downwards between them, but sometimes united nearly as far as their tips; lower sides of the digits between the digital pads and the plantar pad clothed with hair, often forming definite mats with a median naked parting; fore foot with plantar pad broad, longer externally than internally, but showing hardly a trace of division into its four elements; area behind it thickly hairy except for the cordate external carpal pad and the remnants of the internal carpal pad; the hind foot

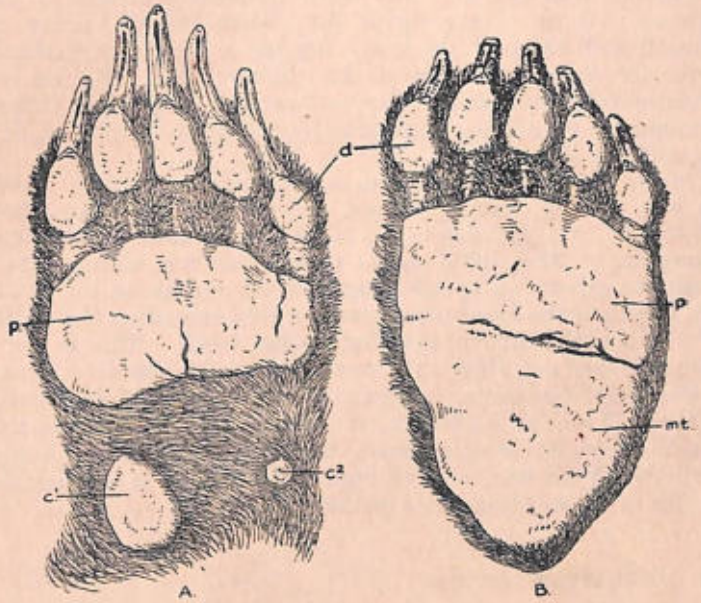


Fig. 30.

A. Lower side of right fore foot of Red Bear (*Ursus arctos isabellinus*), with the hairs cut short to show the pads.
B. Lower side of right hind foot of the same. *d*, digital pad of first digit of fore foot and of fifth digit of hind foot; *p*, plantar pad; c^1, outer lobe of carpal pad, c^2, nearly aborted inner lobe of the same; *mt*, confluent metatarsal pads separated by a groove on inner side of foot from the plantar pad.

mostly naked from the anterior edge of the plantar pad to the heel, but the transverse groove on its inner side, marking the division between the plantar pad and the metatarsal area of the foot, sometimes invaded by hair.

Skull with muzzle deep and comparatively long, the post-orbital processes typically nearly midway between its anterior

and posterior extremities; the anterior nares large, inclined at about an angle of 45°; forehead, especially in old males, often strongly elevated, forming a pronounced concavity at the base of the muzzle; zygomatic arches strong and salient posteriorly; the sagittal crest complete from behind forwards to the parieto-frontal suture, where it divides into two ridges diverging to the post-orbital processes. Palate nearly flat. Upper incisor teeth normal in number, the medians present; anterior premolars occupying a longish space between the canines and the main grinding teeth, small, peg-like, tolerably widely spaced, the second generally early deciduous, and the first and third frequently absent in old animals; those of the upper jaw, when present, never in contact with those of the lower, leaving a deepish postcanine space for the penetration of the canines; pm^4, m^1, and m^2 progressively increasing in size, m^2 nearly as long as the others combined; m_1 and m_2 approximately equal in length, m_2 not shorter (fig. 27, p. 164).

In his Key to the three genera of Asiatic bears with which he was dealing, namely *Ursus*, *Selenarctos* (which he called *Euarctos*), and *Helarctos*, G. M. Allen (Mamm. China and Mongolia, p. 325, 1938) stated that *Ursus* was distinguished from the other two by the length of the muzzle of the skull, the length of the nasal bones considerably exceeding the width of the maxillæ above the first molar tooth. This is very generally but not always the case. In an old ♀ skull of *Ursus arctos isabellinus*, collected by Col. Stockley south of the Deosai Plateau, Kashmir, 13,500 ft., the nasal length is less than the maxillary width at that point, the two measurements being respectively 68 mm. and 76 mm. The muzzle is as variable in this genus as other parts of the skull.

63. **Ursus arctos** Linnæus.

Ursus arctos, Linn., Syst. Nat. ed. 10, p. 47, 1758, and of subsequent authors, including Miller, Cat. Mamm. Western Europe, p. 285, 1912; Lönnberg, Proc. Zool. Soc. 1923, p. 94; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 780, 1932.

Locality of the *type*, Sweden.

Distribution.—As under the genus.

In Europe this bear exhibits, or exhibited, since it has been exterminated in many districts, great variation in colour and cranial characters; and in his Catalogue Miller gave a list of over twenty names it has received on that account. Possibly more than one subspecies was represented on the continent, but there is not sufficient material to establish that conclusion; and in 1932, following Miller, I assigned all the European Bears to the race *Ursus arctos arctos* and adopted Lydekker's



Red Bear (*Ursus arctos isabellinus*), Shingo Shigar River.



Photographs by Col. C. H. Stockley.

Black Bear (*Selenarctos thibetanus*), north side of Pir Panjal.

view that all the described forms of *Ursus* inhabiting Europe, Asia, and North America, including the "grizzlies" of the latter continent, are subspecies of *Ursus arctos*. I could find no evidence from skins or skulls that enabled me to define any of the European or Asiatic forms as distinct species. The typical European race is of interest in this volume from its kinship with the western Himalayan "Red Bear."

63 *a*. **Ursus arctos isabellinus** Horsfield. The Snow Bear or Red Bear of sportsmen. (Pl. IV.)

Ursus isabellinus, Horsfield, Tr. Linn. Soc., Zool. xv, p. 322, 1826; and of many Indian sportsmen and naturalists *.
Ursus arctus, Blanford, Mamm. Brit. Ind. p. 194, 1888.
Ursus arctos isabellinus, Lydekker, Proc. Zool. Soc. 1897, p. 420.
Ursus leuconyx, Severtzow, Nachr. Ges. Mosc. viii, p. 79, 1873.
Ursus pamirensis, Ognev, 'Nature and Sport in Ukraine,' p. 5, 1924.
Ursus arctos isabellinus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxv, p. 814, 1932 (containing other bibliographical references).

Vernacular.—*Barf-Ka-rinch*, *Safed-bhalu*, *Lal-bhalu*, *Sialareech* (Hindi); *Háput or Harput* (Kashmiri); *Drengmo* (Balti); *Drin-mor* (Ladak); *Brabu* (Kishtwar); *Dúb* (Nepal).

Locality of the *type* of *isabellinus*, mountains of Nepal; of *leuconyx*, Tian Shan; of *pamirensis*, the Pamirs.

Distribution.—The Tian Shan, Pamirs, Afghanistan, Waziristan, and the NORTH-WESTERN HIMALAYAS from the "Valley of Chitral in the west to the basin of the Bhagirathi in 'Tehri Garhwal' in the east" (Burrard) †, and possibly to Nepal.

Distinguished from the typical European bear (*Ursus arctos arctos*) and from the Syrian race (*U. a. syriacus*) by its skull being a little smaller and more strongly curved in its dorsal profile from the brow to the occiput, at least on the average. The colour also seems to be on the average paler than in *arctos* and a little darker than in *syriacus* ‡.

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* In accordance with his custom of adopting only names of specific rank, Blanford quite correctly considered this bear to be the same as the European Brown Bear (*Ursus arctos*). It is, in my opinion, a definable and tolerably well-marked race of that species, as Lydekker maintained. Severtzow clearly suspected that the bear from the Tian Shan Mountains, which he named *leuconyx*, might prove to be the same as *isabellinus*; but not knowing from Horsfield's description the colour of the claws of *isabellinus* he distinguished *leuconyx* from it on account of its pallid claws. This supposed difference does not exist, and St. George Littledale and Mr. F. Lort Phillips shot in the Tian Shan bears which I am unable to separate from *isabellinus*. The description of *pamirensis* has little value; but since the Pamirs lie geographically between Tian Shan and the Western Himalayas, there is no reason to doubt that *pamirensis* is a synonym of *isabellinus*.

† Horsfield's typical specimen recorded from the "mountains of Nepal" was possibly traded from Tehri Garhwal or Kulu.

‡ These two names antedate *isabellinus*, and one or the other would take its place if *isabellinus* did not connote a distinguishable form.

Winter coat very long and full, with abundance of underwool, soft when fresh, harsher and matted into elongated tufts when old. General colour varying from dark brown to nearly white, but usually fawn, reddish, or tawny-brown, especially in the old winter coat before the moult, the newly erupting coat being darker brown ; legs typically darker brown than the body, but sometimes with a paler brown sheen. Attached to a skull in the British Museum from Kashmir (Lieut. Abbott) is a label stating that the bear itself was " white " ; and there is a skin in the British Museum (Maj. R. Dane) from the Dandwar Nullah, 6,000 ft., at the top end of the Kashmir Valley, close to the foothills, which is superficially nearly as white as a Polar Bear, but when the hairs are parted the colour below is rusty, darker on the back than on the flanks. A white collar is frequently present on the sides and lower surface of the neck, but this is generally absent in the old winter coat at least. The claws are mainly white or mainly blackish, with every gradation between the two.

The following skins, arranged according to date, show the seasonal changes of the coat and individual variations in colour :—

May 31. Dumdar Valley, 10,700 ft., in Tehri Garhwal (Major G. Burrard).—♂. Coat with abundance of underwool, from 3 to 4 inches long, forming long, matted tufts, the hairs tolerably uniformly coloured golden-brown throughout, with no sharp contrast between the tip and the base.

May. Manali Nullah, 10,500 ft., in Kulu (Capt. D. Lowndes).—♂. Coat like the last in length, thickness, and coalescence in tufts, but with the long hairs extensively pallid at the ends and contrasted with the brown basal part.

June 25. Solang Nullah, 7,000–8,000 ft., in Kulu (H. Whistler). —Very similar to the skin from the Manali Nullah. When shot this bear was light golden-yellow along the back, browner below.

July. Jalandu Gad-ca, 10,500 ft., in Tehri Garhwal (Capt. D. Lowndes).—♂ (young). Coat in full moult, but with abundance of the long, harsh hairs of the winter coat, shaggy and tufted, retained, and reddish-brown in hue, but with their tips extensively whitish-tawny. The newly erupting coat is soft, with very little wool, and everywhere deep blackish-brown in colour, with the extreme tips of the hairs faintly pale. A patch of white hair on each side of the neck marks the collar.

September 1. Matyal Village, Shingo Shigar River, 13,500 ft., south of the Deosai Plateau (Col. C. H. Stockley).—♀. Coat mostly new and soft, very different from the harsher, tufted coat of May and June, of which at most a few of the hairs remain, but there is very little underwool.

The colour is everywhere deep blackish near the skin, but the free ends of the new hairs vary from pale buff to reddish, the spinal area and belly being redder than the flanks. The hairs of the shoulder-mat are about 105 mm. (just over 4 in.), the back and flanks about 80 mm. (just over 3 in.). There is a good deal of white on the ears and a conspicuous collar.

October. Gidhara-ca, 12,500 ft., in Tehri Garhwal (Capt. D. Lowndes).—Coat as in the last, new and soft, and about 4 in. long, but differing in having abundant underwool and also in colour, the hairs being brown with their free ends extensively whitish.

This list proves that the long, thick winter coat, which, after hibernation, is tufted and comparatively harsh with its dying, shrivelling hairs, is carried until the end of June, that the moult sets in in July, and that the new coat gradually increases in length during the ensuing three months, and is fully developed by October and ready for the bear's retirement again to winter quarters.

The pale reddish-brown hue of the first three skins might lead to the conclusion that after hibernation the coat is always that tint ; but Major Burrard tells me (*in litt.*) that although, according to his observations, it is usually that colour, it is not always so. On one occasion he saw above the tree-line in April a bear of this species so dark brown in colour that at a distance of 250 yards he at first took it for a black Himalayan bear (*Selenarctos*), but later at 15 yards range he identified it as a "red" bear. That the newly erupting coat is deep blackish-brown, at least close to the skin, is shown by the two specimens killed respectively in July and September. According to Col. Stockley ('Stalking in the Himalayas and Northern India,' p. 194, 1936) the normal colour of the old winter coat after hibernation is light brown or *café au lait* with lighter points to the hairs, so light, indeed, that the legs, back, and ears may be almost white, and are so usually at that time in specimens from the Kishenganga Valley. During summer [the new coat] is considerably darker, and in autumn may be *café au lait*, without white points, or any shade of brown. Quite correctly he insists that no bear is "red," in the strict sense of the word, the epithet "lal" applied to this bear and translated as "red" meaning "brown" as well as the other colour.

Size.—The recorded dimensions of this bear show great individual variation, due perhaps in some cases, but not in all, to differences in the method of measuring them—that is to say, "between pegs" or "over the curves." Scully stated that at Gilgit the total length ranged from 5 ft. 8 in., presumably in a big ♂, to 4 ft. 8 in., presumably in the small ♀. These

lengths are no doubt correct. At all events, they agree approximately with the quite reliable measurements published by Col. Stockley in 1926 and with those of Major Burrard's bear, which, judging from its skull, was not quite full grown. These lengths were as follows, taken " between pegs " :—

Garhwal (Burrard), yg. ad.	♂ :	total length	5 ft. 4 in.
Loc. ? (Stockley),	? ♂ :	,,	,,	5 ft. 5 in.
,, ,,	? ♂ :	,,	,,	5 ft., 3 in.
,, ,,	♀ :	,,	,,	5 ft. 1 in.
,, ,,	? ♀ :	,,	,,	4 ft., 10 in.

Major Burrard's specimen was 5 ft. 10 in. " over the curves."

In 1936, on the other hand, Col Stockley (' Stalking in the Himalayas and Northern India,' p. 194) stated that a big ♂ may be 7 ft. in length in a straight line, the ♀ being much smaller, about 5½ ft. As regards the ♂ that statement is supported by Major Dane's information to me that his ♂ from the Dandwar Nullah was 6 ft. 9½ in. between pegs, nearly 1½ ft. longer than Major Burrard's ♂, although there is only a difference of 15 mm. in the condylobasal lengths of their skulls. Col. A. E. Ward (Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 70, 1929) recorded from the Gurgai, Kashmir, an even bigger ♂, which was 7 ft. between pegs from the nose to the root of the tail. This would have given a total length of about 7 ft. 3 in., which approaches Adams's largest bear said to have been 7½ ft., perhaps probably over the curves. But Rowland Ward's ' Records,' 1928, contain some entries more difficult to accept. Two bears from Kashmir, measured by Major Powell Cotton and Col. Biddulph, were respectively 5 ft. 5½ in. and 5 ft. 10½ in. There seems to be no reason to doubt their accuracy. In others the length ranges from 6 ft. 8 in. to 8 ft. 3 in. In one, said to be 7 ft. 4 in.—that is to say, 2 ft. longer than Major Burrard's bear—the skull is only a fraction of an inch longer. In another, entered as 6 ft. 8 in., the skull is nearly 1 in. shorter.

Estimated shoulder-heights show similar, equally irreconcilable differences. Burrard's ♂ was 27 in. ; Major Powell Cotton's specimen, which was only a little longer, was 10 in. higher ; Col. Biddulph's specimen, 6½ in. longer, was 9 in. higher ; and Adams's largest specimen, which was 14 in. longer, was also 14 in. higher, which is very improbable. The records are clearly unsatisfactory.

The skull is variable in shape and size. Large ♂ skulls range from about 12½ to 13½ in. in total length, whereas large European skulls are between 14 and 15 in. ; but the teeth are approximately the same size in the two races. The skull of *isabellinus* is, however, on the average more vaulted and has the brow more elevated, with a more marked concavity at the

base of the muzzle than in typical *arctos*. The temporal ridges may coalesce to form a low sagittal crest well in advance of the fronto-parietal suture ; but usually the crest is shorter, sometimes very short, and at the hinder end of the skull, especially in the ♀.

Of the skulls of *isabellinus* entered in the table of measurements those from the Dandwar Nullah and the Dumdar Valley belong to the skins above referred to collected by Major R. Dane and Major G. Burrard respectively. The

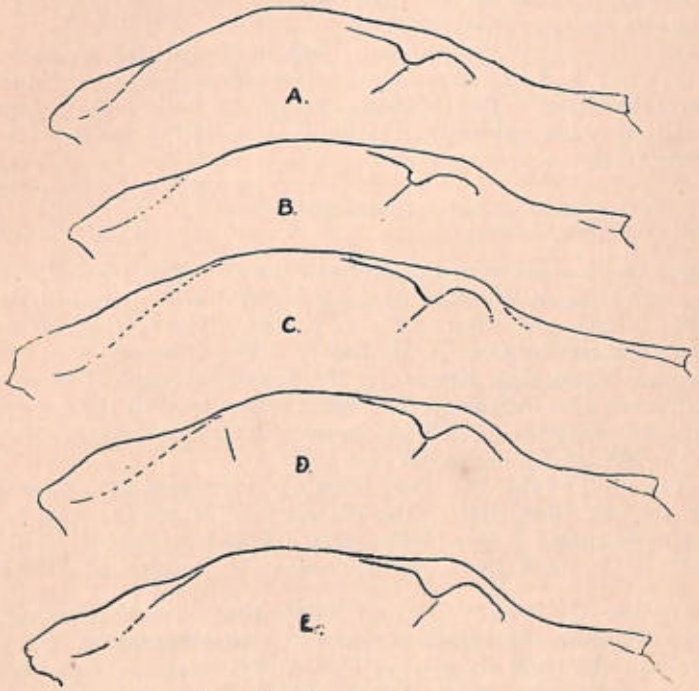


Fig. 31.—Upper portion of skulls of adult examples of the Red Bear (*Ursus arctos isabellinus*), showing variations in the length of the muzzle and the shape of the dorsal profile.

A. Old female from Kashmir (Stockley).
B. Young adult female from Kashmir (Abbott).
C. Old male from Kashmir (Littledale).
D. Old male from Kulu (Whistler).
E. Old male from Kashmir (Littledale).

second skull from Kashmir belongs to the specimen Abbott recorded as white. The ♂ skull from the Kulu Valley is that of the ♂ bear shot by Col. Stockley which had killed twenty-three sheep in a week, as recorded below (p. 180). The one from the Bheling Valley, Tehri Garhwal, was shot

by Capt. Searight. It is small for a ♂ and may be wrongly sexed. The first ♀ skull from Kulu was shot by Major D. G. Lowndes, and the second belongs to the specimen shot by Col. Stockley in Matyal Village, Shingo Shigar, 13,500 ft., S. of the Deosai Plateau. This skull is of exceptional interest from the shortness and breadth of the muzzle, the length of the nasal bones being less than the width of the maxilla above the first upper molar, an exceptional character in the genus *Ursus* as recorded above (p. 172). The table gives the dimensions of the largest and smallest skulls of both sexes available for examination.

There are several additional skulls in the British Museum, both adult and immature, some unsexed and some without special localities. The following two young skulls with unworn dentition show interesting individual variation in the size of the teeth :—

	pm^4.	m^1.	m^2.	m_1.	m_2.	m_3.
Jalandu Gad-ca, Tehri Garhwal (Lowndes) ; ♂	14	20	30	20	23	13
Kulu (Whistler) ; unsexed	15	22	34	21	23	19

For comparison with the skulls of the Red Bear (*isabellinus*) two of the so-called Blue Bear (*pruinosus*) are entered in the table. Both are referred to on p. 185. The ♂ from Tibet was procured by Col. F. M. Bailey. The ♀ was shot in the Minshin Mountains, Kansu, by Mr. Fenwick Owen. Measurements are also included of the skull of the type of the alleged Brown Bear of the Shan States because it was claimed to belong to the British Indian fauna (see p. 185).

The skull of the Red Bear is on the average a little longer, sex for sex, than that of the Himalayan Black Bear, and has typically rather larger teeth ; but it is barely so large as the skull of the Sloth Bear, and has noticeably larger molar teeth.

Habits.—It is agreed on all hands that these bears spend the winter in the torpid state known as hibernation, buried beneath the snow in any suitable shelter such as is supplied by a cave, rocks, fallen tree-trunks, or the roots of big trees at an altitude of about 8000 ft. When the warmer spring weather sets in they emerge, but if snow recurs they retreat temporarily to their winter quarters. On resuming activity they gradually ascend the hills, following the melting snow up to its permanent level, feeding mainly on the new grass growing on the open slopes above the tree-line ; but if disturbed at this period they may make off for miles over the still frozen snow. According to Col. Stockley they continue grazing until the grass gets too coarse for their liking. In August and September they dig for roots, ploughing up great patches of ground near the upper tree-line. In late autumn they occasionally raid the highest fields of peas. Up the

Skull-measurements (in mm.) of *Ursus arctos isabellinus*, *pruinosus*, and *shanorum*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4, m^1, m^2.	m_1, m_2, m_3.
isabellinus.									
Dandwar Nullah, Kashmir; ad. ♂ ...	343	320	196	157	72	71	70	13½, 21, 35	21, 23, 20
Kashmir; yg. ad. ♂	337	313	183	150	68	62	71	16, 21, 34	21, 24, 21
Dumdar Valley, Garhwal; ad. ♂	328	305	198	155	70	73	70	15, 22, 34	21, 23, 19
Kulu Valley, 8,000 ft.; ad. ♂	317	294	197	144	64	60	67	14, 22, 37	22, 23, 19
Bheling Valley, Garhwal; ad. ♂	297	275	183	139	66	69	64	12, 20, 29	17, 22, 15
Kulu; ad. ♀	285	270	164	122	65	59	63	14, 20, 32	20, 21, 16
S. of Deosai Plateau; old ♀.....	272	252	177	127	70	65	63	11, 17, 30	18, 21, 17
pruinosus.									
Tibet; yg. ad. ♂	370	347	206	165	85	78½	76	17, 23, 39 & 36½	26, 27½, 22
W. Kansu; ad. ♀	338	—	205	149	81	79	73	15, 23, 38	25, 26, 23
shanorum.									
? Shan States, Burma (type); yg. ad. ♂	334	312	162	141	63	59	72	16, 22, 36	23, 25, 19

Shingo Shigar at 12,000 ft. he saw one so occupied, and shot it 1,000 ft. higher as it was making its way back to its retreat in a jumble of enormous scree. At this time of the year they may descend low enough to prove a considerable nuisance to cultivators of the soil by raiding their orchards and maize-fields. They eat as well wild parsnips, berries, and fruits of various kinds ; and, according to Col. Stockley, it is about this time of year that old males take to killing cattle and sheep. With the autumn food they fatten themselves for their winter sleep, and with the first snows retire to their selected shelters for hibernation.

Their carnivorous propensities are abundantly attested by records of the killing of sheep, cattle, and ponies. When they once take to this habit they may, according to Col. A. E. Ward, become a great pest ; and on more than one occasion Col. Stockley has seen them devouring disabled cattle and ponies while still alive. The same sportsman also states that in the spring they sometimes dig out from the snow the bodies of ibex overwhelmed by avalanches ; and he has seen them tearing open the burrows of voles to get at the food stored for the winter and grabbing at the same time the voles disturbed by the operation. Col. Ward mentions a case of one killing and eating a large buffalo calf in the Lidder Valley, although there was plenty of vegetable and insect food available at the time. This shows that the flesh-eating habit is not at all events always adopted on account of the scarcity of their more normal vegetarian diet *.

There is also evidence that at times they are cannibals. Dr. J. L. Stewart, for example, saw a large bear kill in succession two smaller ones and eat portions of them (Journ. As. Soc. Beng. 1867, p. 175) ; and Col. Stockley saw a female feeding on the carcase of a male he had shot and skinned the previous day. Dead bodies of other animals are likewise eaten.

Insects are found by turning over stones and small boulders. Their partiality for this kind of food may be illustrated by Col. Ward's account of his being told by a Kashmir Shikari that when he was once out on a shooting trip with a sahib a cloud of locusts appeared and fell in huge numbers upon the snow ; whereupon no fewer than fourteen red bears came out and started to feed upon them.

Red bears are good climbers, although less expert than the Himalayan black bears in that respect ; but being usually

* In ' Stalking in the Himalayas and Northern India,' p. 200, 1936, Col. Stockley says that old males commonly kill sheep, and occasionally cattle or ponies, in late autumn ; but in May 1933 he shot one in the Kulu Valley, 8,000 ft., which had killed twenty-three sheep in a week, charging into the flock entirely regardless of the yelling, stone-throwing natives. The spring was very late that year, and the scarcity of vegetable food, he thought, drove the bear to its predatory habits.

met with above the tree-line during the eight or nine months of their active life, descending to woods only in autumn, they are seldom seen to ascend trees. Col. Ward's experience was that they might be observed at the foot of trees, but that they never climb them. Col. Stockley, on the other hand, has seen them up rowan-trees after the berries, and at 10,500 ft. on the Kashmir Valley–Wurdwan divide detected undoubted evidence of one or more having climbed to a height of 50 ft. above the ground a tree which produces bunches of purple berries in October.

The Red Bear is not nearly so destructive to human property as the Himalayan Black Bear ; nor is he so dangerous to man. A wounded animal will sometimes charge upon his aggressor, but as a rule it tries to escape, and the species never becomes a " man-eater."

There is general testimony to the effect that their senses of sight and hearing are comparatively poor ; their sense of smell is, on the contrary, keen.

There are discrepancies in the accounts of the period of gestation and of the pairing season. On unstated authority Blanford declares that pairing takes place at the end of September, October, and November, and that the cubs are born in April or May, the gestation being about six months. Col. Stockley (' Big Game Shooting in the Indian Empire,' 1928) also mentions October as the pairing time, adding that the cubs are probably born in February, thus making the period of gestation to be at most five months ; but in 1936 (' Stalking in the Himalayas and Northern India ') he says that the rutting time occurs in May or June, and that the young are born under the snow during hibernation. There is, I think, no doubt that Blanford's statement regarding the birth of the cubs in April or May, when hibernation is over, may be set aside ; and since Heinroth says the gestation period in the brown bear is seven months, Stockley's later statement that pairing occurs in May or June is most likely correct *.

* Dr. G. M. Vevers, however, obligingly tells me (*in litt.*) that the records he has collected at the London Zoological Gardens show that the period of gestation in Brown Bears, probably European, which should agree in its duration with that of the "Red Bear," is approximately 240 days—that is to say, about eight months, the precise number of days being uncertain because pairing is continued over a period of three or four weeks. The mating season, moreover, is in March, and the cubs are born at the end of December or the beginning of January, bringing the gestation up to as much as nine months at least. It is about the same in Polar Bears, pairing taking place in January or February and the cubs being born in October or November. Perhaps captivity alters the time of pairing in these species. His records of the American Black Bear and of the Grizzly make the gestation period 247 and 236 days respectively.

The cubs, one or two in number, are comparatively small at birth, about the size of puppies of large dogs, and, like, the latter, are born with eyes and ears closed, but are covered with short sleek hair, not naked as Blanford stated. Their eyes are said to open about a month after birth ; and when three or four months old the cubs are stated to venture from the place of their birth and to accompany the mother on her rambles. Not uncommonly cubs of two successive seasons may be seen with her. Blanford even asserts that they remain with her, as a rule, until they are about three years old, by which time they are nearly full grown ; but according to Stockley the cubs, if two in number, keep together up to the fourth year, and seem to reach maturity in their fifth year, but grow considerably after that.

Major R. Dane, writing from personal knowledge of this bear in Kashmir, kindly permits me to quote the following from his letter :—" The colour variation is great. I have shot one which was really yellow and another which was much whiter than the specimen from the Dandwar Nullah now in the British Museum [see above p. 174]. I have also had specimens which truly answered the Indian name for these bears, ' Lál Bhálú ' or red bear. The lightest in colour was buff at the base of the fur, but the tips were so light that the bear appeared to be pale cream. It had only come out from its winter quarters that day, and was very thin, but the fur was fully 9 inches long.

" The bear I shot in the Dandwar Nullah, 6,000 ft., was quite exceptional in being so low down. One other I shot at about 10,500 ft. was just inside the tree-line. All the others were just above it or just at the topmost level of stunted birch and rhododendrons. From a distance of about 20 ft. I watched for a quarter of an hour or so a fine specimen eating grubs on the slopes of the Bhabeb Pass between Bashahr and Spiti at about 15,000 ft., where a patch of snow had melted. I would not shoot him, and finally when he got my wind he went off over the pass at 16,500 ft. This pass was often used by them, as they were known in Spiti near Pusa. The Red Bear is generally harmless to humans unless wounded. Usually they smell or see men from a greater distance than a forest bear [the Himalayan Black Bear], and have a greater chance of clearing off when out of range of any encounter."

I am indebted to Mr. F. Lort Phillips for a few particulars about one of these bears which he shot in the Yuldus Valley in the Tian Shan and kindly presented to the British Museum. The bear was killed about 5½ hours march from the Karagaitash, a small mountain range with castellated summits and rising amongst great grassy downs. The altitude was 9,850 ft., and the place was absolutely treeless, with not a bush or even a clump of grass, consisting of a great hilly, rolling prairie

land. At about 5 A.M. the bear was seen making its way along the hillside to lie up for the day. Disabled by the shot, the bear tried to gather himself together, but the hillside was so steep that he began to roll down and down, and in spite of one or two attempts to stop his descent he continued to roll over and over until, reaching the edge of the cliff, he went over it and was killed by the drop of a couple of hundred feet. He was an old male, and measured 75 inches from the soles of his feet to the crown of his head, which would give him an erect standing height of about 6 ft.* Although these bears may be encountered in the daytime Mr. Lort Phillips thinks they are mainly nocturnal and that they feed partly upon ground-hogs or marmots (*Arctomys*), and may prey on *Ovis ammon*.

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* The skull of this bear shows it to have been an old beast. It is very massive, and has greatly worn teeth, its total length being 326 mm., a trifle over 13 in., and a little shorter than Burrard's skull of *isabellinus* from Tehri Garhwal. The skull of an adult ♂, shot by Littledale in the Tian Shan, is approximately the same length as Lort Phillips's bear. Although large skulls they are decidedly smaller than Dane's skull from the Dandwar Nullah, Kashmir. Schwarz (Journ. Mamm., xxi, p. 209, 1940) revives the name *leuconyx* for the Tian Shan bears because he claims 'they are obviously larger' than *isabellinus*. This statement, unsupported by any evidence worth repeating, is contradicted by the adult skulls from Tian Shan and Kashmir I have measured.

The Abominable Snowmen.—Under this sensational heading the London 'Times' published in 1937 some correspondence about the alleged native belief in the existence of such beings in the Western Himalayas. It was started by Mr. Smythe, who secured at Garhwal photographs of foot-tracks in the snow stated by the hillmen to have been made by one of these legendary monsters. My identification of these tracks as those of the "Red Bear" (*U. arctos isabellinus*) brought me, from Major G. Burrard and Major R. Dane, letters expressing surprise at the publicity given to so trivial a matter, both, like all other sportsmen acquainted with that part of India, being familiar with the legend and its explanation. Major Dane wrote:—"A common name for bears amongst Indians of all northern races is Adamzad or 'Son of Adam,' because they can walk on their hind legs. That the 'Gadis,' or nomad shepherds, should consider them 'abominable' is not surprising, as they are terrible killers if they get into a sheepfold. I have seen the mass of remains where one was reported to have killed 30 sheep in one night. The bear had chewed the heads of one or two, but had evidently killed, like a fox among poultry, for the excitement of it. In another case that I know of 15 sheep were killed, and next night the shepherd shot the bear when it came for more." In another letter he wrote:—"With further reference to the 'abominable snowmen' I may mention that my uncle, Sir Louis Dane, when Assistant Commissioner in Kulu, was asked by the natives to make a special trip to the Hamta Pass to kill a red bear which had killed 20 of their ponies. He found the bear just at the top of the last bushes and shot it. In this case the wounded bear 'went for' him, and they actually had a struggle on the ground. He managed, however, to throw it off and it rolled down the hill." In conclusion, Major Dane suggested that reports of such incidents by hillmen to European travellers with insufficient knowledge of the language, and little or none of natural history, are foundation enough for the promulgation of the myth.

The Brown Bear of the Mekran Coast, Baluchistan.

There is a possibility, as was suggested in my paper quoted above (Journ. Bomb. Nat. Hist. Soc. xxxv, p. 792, 1932), that *Ursus* may be represented in the British Indian fauna by the "brown bear" sent to Blanford from 12 miles north of Gwadar on the Mekran coast of Baluchistan, and named by him *Ursus gedrosianus* (Proc. As. Soc. Beng. 1877, p. 204). But in his later works he referred this bear to *U. torquatus*; and in this volume it is dealt with as a subspecies of *Selenarctos thibetanus* (see p. 218). But I am indebted to Mr. C. E. Capito, late of the Anglo-Persian Oil Co., for the information that he was well acquainted with a small brown bear, like the European animal, which frequented the hills of S. Persia to the north of the Gulf, a habitat very similar to the "arid districts of the Mekran coast." *Ursus arctos* is known to occur in Syria and N. Persia. Unfortunately Blanford's specimens of *gedrosianus* cannot be traced, and it would be unwise to place implicit confidence in his determination of this bear based upon the examination of a skull.

The so-called "Blue Bear" of Tibet (Ursus arctos pruinosus).

Vernacular.—Tom Khaina (Tibet).

As a questionable synonym of this race of the Brown Bear Blanford entered *Ursus pruinosus* Blyth (Journ. As. Soc. Beng. xxii. p. 589, 1853), based upon a skin traded from Tibet to Darjeeling. I quoted what I believe to be the full and correct synonymy of this bear in my paper of 1932, cited above. It is not the same as *isabellinus*; but no race or species of *Ursus* has been the subject of greater divergence of opinion, the extremes being the view of W. L. Sclater, who thought it was indistinguishable from *isabellinus*, and the view of Lönnberg, who considered it to represent a distinct subgenus of *Ursus*, which he called *Mylarctos*. This subgenus was based mainly upon the fusion of the digital pads nearly to the end, and the large teeth of the specimens known to Lönnberg; but both these characters are too variable individually in *pruinosus* to warrant the rank he assigned to the species. This I pointed out in some detail in 1932, when I gave *pruinosus* subspecific rank under *Ursus arctos*. Its nearest ally is not *isabellinus* but the so-called Manchurian "Black Bear" (*Ursus arctos lasiotus*, which is not to be confused with the other Black Bear of Manchuria (*Selenarctos thibetanus ussuricus*) *.

* The latest contribution to the literature of this bear, *pruinosus*, is the account of it published by G. M. Allen (Mamm. of China and Mongolia, p. 326, 1938). This author gave it full specific rank, severing it from *arctos* on account of the alleged greater length of the last upper

U. a. pruinosus occurs in Shensi, Kansu, and eastern Tibet, but it has not as yet been recorded from the Himalayas. There is, however, always the chance of its discovery in the extreme eastern part of that mountain range or in the extreme north of Upper Burma to be borne in mind. As in *isabellinus* the colour is individually very variable, but on the whole the ground-colour is blacker and the white collar is much better developed and apparently always present. Skins in fresh coat are wonderfully handsome, the pale tips of the hairs showing an elusive silvery or bronze sheen under the play of light, the difference depending on the whitish or reddish hue of the tips, the former occurring in a skin from Lhasa (Sir C. Bell), the latter in two from the Minshin Mountains, W. Kansu (Fenwick Owen). But in a skin in old winter coat, which is very long, thick, and tufted, from N.E. of Lhasa (H. Bower), the tips of the hairs are grey, with scarcely any sheen, and the wool is brown, not black, as in the skins in fresh coat. Also the skull of *pruinosus* is about 1 inch longer on the average than in *isabellinus*, and the back teeth are on the average larger.

In Rowland Ward's 'Records,' 1928, the following particulars about one of Fenwick Owen's skins, probably the ♂ which is a young adult, are entered :—Length in the flesh 5 ft. 2 in., height 3 ft. 4 in., weight 242 lb. The two dressed skins in the British Museum are respectively : ♂ 5 ft. 2 in., ♀ (adult) 5 ft. 4½ in. The skulls are : ♂ 13·6 in., ♀ 13·3 in. in total length, with their last upper molars 41 and 39 mm. ; but a ♂ skull from Tibet (Col. Bailey) is 14·7 in. long, with the last upper molar 37 and 38½ mm., as stated above.

The alleged Brown Bear of the Shan States.

As representing an undescribed Burmese race of the Brown Bear, Thomas (Proc. Zool. Soc. 1906, p. 231, fig.) described as *Ursus arctos shanorum* a specimen sent to him from Calcutta by Annandale, who received it from a live-animal dealer with the information that it was captured in the Shan States. But since no bears of the *U. arctos* group have been recorded from

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molar, which he stated to be about 40 mm. long, whereas in the Manchurian Bear, which he cited as *U. arctos lasiotus*, the tooth is about 37 mm.

In the skulls of *pruinosus* in the British Museum the length of this tooth varies as follows :—35 mm., unworn, in a young adult ♀ from N.E. of Lhasa (Capt. H. Bower) ; 36½ mm. on one side, 39 mm. on the other, unworn, in a young adult ♂ from Tibet (Col. F. M. Bailey) ; 39 mm. in an adult ♀ and 41 mm. in a young adult ♂, in neither appreciably worn, from the Minshin Mountains, Kansu (Fenwick Owen). Since the claimed difference clearly does not hold, I see no reason to change my opinion, expressed in 1932, that *pruinosus* is merely a subspecies of *Ursus arctos*.

anywhere near that part of tropical Asia, and since dealers' localities for their livestock are frequently untrustworthy, the Shan States cannot be accepted as the home of this bear without further evidence. The typical specimen in the British Museum is a young male apparently reared in captivity from cubhood, since its fore claws are over $3\frac{1}{2}$ in. long, indicating probably that it had been kept in a cage with wooden boards. A peculiarity of the colour is a broad blackish-brown band extending from the nape over the middle line of the back and emphasized by the grey tips of the long hairs of the

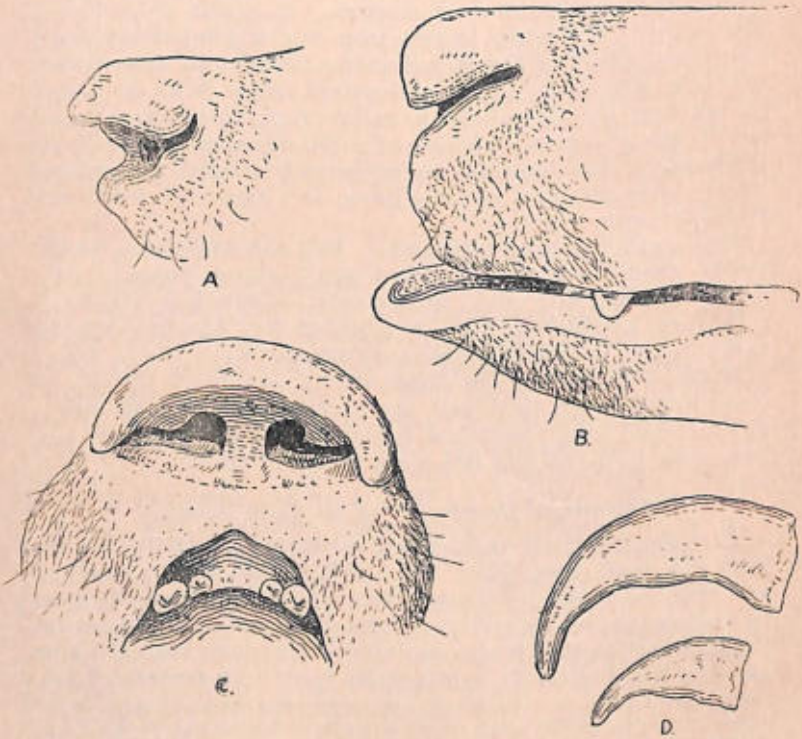


Fig. 32.

A. Side view of rhinarium of the Sloth Bear (*Melursus ursinus*) with the valvular upper portion raised to open the nostrils.
B. End of the muzzle of the same, showing the upper portion of the rhinarium depressed and the lower lip protruded.
C. Front of the muzzle of the same, showing the absence of the philtrum on the upper lip which is practically naked, the upper portion of the rhinarium overhanging the nostrils and the absence of the median incisors on the upper gum.
D. Claw of front foot (above) and hind foot (below) of the same.

sides of the body; the legs are not darker than the body and the coat is tolerably long, from 2¼ to 4 in. in length, and is thickened with abundance of underwool which is darker or lighter grey everywhere. The claws are black. The skull, although young, as shown by the open sutures, is long but exceptionally narrow for its length, especially about the forehead. As the measurements show, the interorbital width is much less than the width of the muzzle above the canines, a very unusual feature in a bear skull of its age; and the width of the palate between the last pair of upper molars is only equal to the length of one of these teeth.

In my paper upon the Bears of Europe and Asia (p. 805), above quoted, I described and discussed this bear, and stated that owing to the immaturity of the skull and the uncertainty as to the extent to which it had been affected by growth in captivity the determination of the animal's status is not possible. In some respects the skull resembles that of a bear of about the same age from Yeso in Japan, named *yesoensis* by Lydekker, which I am unable to distinguish from the Manchurian Bear, *U. arctos lasiotus*; and it was with *yesoensis* that Thomas compared it. There is a possibility of confusion between "Shan" and "Tian Shan" for the locality. But the Tian Shan bears that I have seen are *U. arctos isabellinus*, and the type of *shanorum* cannot be affiliated with that race of Brown Bear because it has black claws and larger teeth. At all events, the evidence that *shanorum*, despite its reputed history, comes within the limits of the British Indian fauna amounts to very little.

Genus **MELURSUS** Meyer.

The Sloth Bear.

Melursus, Meyer, Zool. Entdeck. p. 155, 1793, and of all recent authors, including Blanford, Mamm. Brit. Ind. p. 200, 1888, and Pocock, Ann. Mag. Nat. Hist. (9) i, p. 383, 1918 (external characters), and Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 101, 1932.
Arctus, Goldfuss, Verh. Nat. Säug. p. 301, 1809.
Prochilus, Illiger, Prodr. Syst. Mamm. p. 109, 1811.
Chondrorhynchus, G. Fischer, Zoogr. iii, p. 142, 1814.

Type of the four genera quoted, *Bradypus ursinus*.

Distribution.—India from the foothills of the Himalayas and Assam to Cape Comorin, but not in the western desert; Ceylon.

Distinguished principally from *Ursus* in characters connected with differences in the method of feeding. The lips and tongue more protrusible, the area round the rhinarium naked or nearly so, the rhinarium itself transversely elongated,

with no philtrum dividing the upper lip and no median groove, its upper edge movable, overhanging the nostrils and capable of being depressed so as to close them ; its lateral edges also projecting. The fore feet differing in being naked round the carpal pads, which are similar to those of *Ursus*, and also on the lower side of the digits in front of the plantar pad ; the digital pads fused nearly to their tips, as occasionally happens in *Ursus*, but distinguished by forming a much straighter, less curved line ; hind foot similarly differing in its digital pads

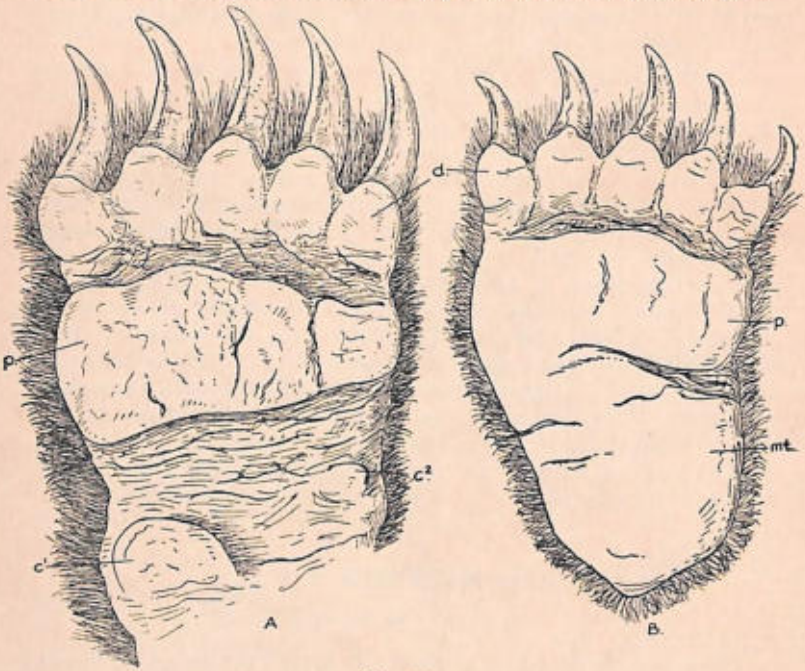


Fig. 33.

A. Lower side of right fore foot of the Sloth Bear (*Melursus ursinus*) with the hair cut short, showing the fused digital pads forming a less curved line than in *Ursus*, the naked soles and the general resemblance of the plantar and carpal pads to those of *Ursus* (fig. 30, p. 171).

B. Lower side of right hind foot of the same, showing the principal characters as in A. *d*, digital pad of first digit of fore foot and fifth digit of hind foot ; *p*, plantar pad ; c^1 and c^2 outer and inner elements of carpal pads ; *mt*, metatarsal pad.

and in the nakedness of the area between them and the plantar pad.

The skull differs from that of *Ursus* in many respects. It is the same general shape but is less muscularly moulded,



Sloth Bear (*Melursus ursinus*). Adapted from photograph by W. W. A. Phillips.



Malayan Bear (*Helarctos malayanus*).

has smaller postorbital processes, the postdental part of the palate much wider and longer, overlapping the mesopterygoid fossa to a considerably greater extent, and the main part of the palate is hollowed between the cheek-teeth, convex in the region of the canines and from that point sloped gently upwards to the incisor teeth. These modifications of the palate are no doubt subservient to the suctional power of the mouth well known in Sloth Bears. Peculiarities of the dentition are the overlapping of the upper incisors by the lower and the loss of the median upper incisors, also associated with sucking; the first three premolar teeth are better

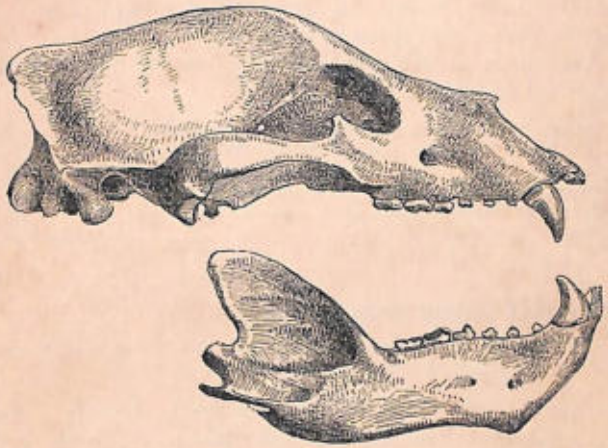


Fig. 34.—Side view of skull of Sloth Bear (*Melursus ursinus*), with the lower jaw detached. (From Blanford.)

developed, the 2nd and 3rd being usually at all events two-rooted, and those of the upper jaw, unless much worn, meet the 2nd, 3rd, and 4th of the lower jaw when the mouth is closed, there being no postcanine space, and the back cheek-teeth are smaller and less noticeably different in size.

64. **Melursus ursinus** Shaw. The Sloth Bear. (Pl. V.)

Bradypus ursinus, Shaw, Nat. Misc. ii (unpaged), pls. 58–59, 1791; id., Zool. Mamm. i, p. 159, pl. 47, 1800.
Melursus lybius, Meyer, Zool. Entdeckung, p. 156, 1793.
Arctos niger, Goldfuss, Verh. Nat. Säug. p. 301, 1809.
Ursus labiatus, Blainville, Bull. Soc. Philom. 1817, p. 74.
Ursus longirostris, Tiedemann, Abhandl. p. 1, 1820.
Melursus ursinus of all recent authors, including Blanford, Mamm. Brit. Ind. p. 201, 1888; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 103, 1932.

Locality of the *type* of *ursinus*, *lybius*, *niger*, *labiatus*, and *longirostris*, Patna on the Ganges in Bengal *.

Distribution as under the genus.

A bear of moderate size with a large head, powerful fore quarters, but weaker hind quarters. Coat sometimes very long, thick, and shaggy from the ears backwards over the upper parts and limbs, noticeably long on the sides of the neck, and forming a mat behind the shoulders, sometimes comparatively short and thin and always more scanty below. General colour, except the face, which is "mealy" back to the eyes, and a pale crescentic or V-shaped patch usually present on the chest, typically black, sometimes with a little brown or grey, occasionally brown all over. Claws, which are very long on the fore feet, typically ivory-white.

The two races of *Melursus ursinus* here admitted may be distinguished as follows :—

a. Size larger, average condylobasal length of skull in ♂ about 310 mm., in ♀ about 290 mm. (India.) ..... [p. 190. *ursinus* Shaw,

b. Size smaller, average condylobasal length of skull in ♂ about 264 mm., in ♀ about 250 mm. (Ceylon.) ..... [p. 197. *inornatus* Puch.,

64 *a*. **Melursus ursinus ursinus** Shaw.

(Bibliographical references and synonymy as under the species ; for definition of the subspecies, Pocock, 1932.)

Vernacular.—Rinch or *Rich*, *Adam-zád* (Hindi) ; *Bhalúk* (Beng.) ; *Riksha* (Sanscr.) ; *Aswal* (Mahr.) ; *Yerid*, *Yedjal*, *Asal* (Gond) ; *Bir Mendi* (Oraon) ; *Bana* (Kal.) ; *Kaddi* or *Karadi* (Can.) ; *Pani Karudi* (Mal.).

Locality of the *type*, Patna, north of the Ganges, Bengal.

Distribution.—As under the genus, omitting CEYLON †.

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* The type of this Bear was a living specimen exhibited in London and described and figured by Shaw, who, misled by the loss of its incisor teeth, took it for a new species of sloth (*Bradypus*). Hence its popular name. The account of it excited a good deal of interest. Delaméterie published a description and figure of it (Journ. de Physique, xl, pp. 136 & 404, pl. i, 1792), and said it had been imported from the interior of Africa ; consequently Meyer, who perceived that the animal was a bear, called it *Melursus lybius*. Goldfuss, Blainville, and Tiedemann followed with the three additional names quoted in the synonymy ; and the name *labiatus* was adopted by many subsequent writers, including Elliot, Tickell, Blyth, Kelaart, and Jerdon.

† Blanford was doubtful about the occurrence of this bear in Assam. But in the early part of the last century Cuvier recorded it from Sylhet, and H.H. The Maharajah of Gauripur recently sent a specimen killed at Gauripur to the British Museum. The most southern localities in India whence I have seen specimens are Coorg (G. C. Shortridge) and Coimbatore (R. C. Morris).

Coat varying in length and thickness according to the season and also to a certain extent independently of the season; at its best exceedingly long and thick, with the hairs straight or wavy and, before the moult, coalescing into long tufts as in *Ursus*; the underwool sometimes, but not always, distinguishable from the contour hairs. Colour typically black except on the areas mentioned above, but sometimes a white

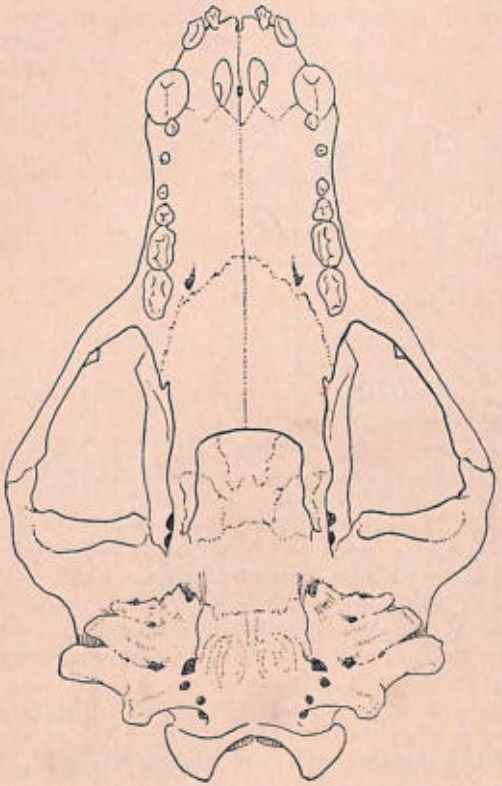


Fig. 35.—Lower view of skull of the Sloth Bear (*Melursus ursinus*), showing particularly the small cheek-teeth, the long postdental portion of the palate and wide mesopterygoid fossa.

patch is present on the chest behind the fore legs and some white hairs on the paws. In the dead coat the hair-tips may fade to brownish; but now and again specimens are wholly brown from birth. The pale breast-patch varies greatly, in colour from white to brownish-buff and in size from about 12 in. long and 3 in. wide at the summit on each side to about

half those dimensions, and one half of it may be much larger than the other.

Some individual differences may be illustrated by one or two skins. The shortest coated skin examined came from the Central Provinces (The Maharaj Kumar Sahib of Bikanir). Although undated it appears to be in new black summer coat, the hairs being harsh, about 4 in. on the neck and $1\frac{3}{4}$ in. on

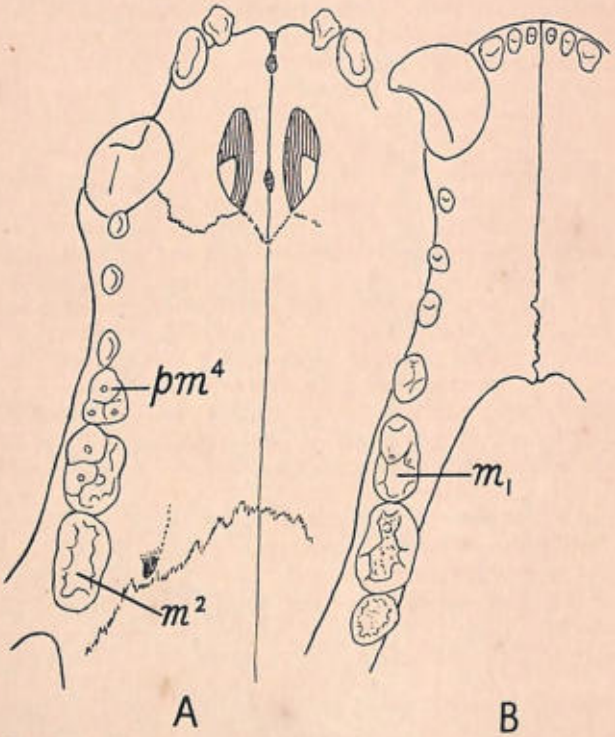


Fig. 36.—Dentition of the Sloth Bear (*Melursus ursinus*).

A. Teeth of the right side of the upper jaw of specimen from Roul in the Manella District, C.P. (Col. Carlisle), showing the loss of the median incisors and the small size of the second molar (m^2), which scarcely exceeds the first molar in length.

B. Fore part of lower jaw of the left side of the same, showing especially the long symphysis extending backwards to the level of the fourth premolar; pm^4 and m_1 upper and lower carnassial teeth.

the loins, with no appreciable wool. A skin from Nimiaghat, Hazaribagh (Crump), June 12, has the moult imminent, the coat being very shabby, dull and dead-looking, consisting largely of thick, tangled, woolly brown hair which, when the

black-tipped hairs are disarranged, gives a brown hue to the skin, and there is a good deal of brown on the head and paws; the hairs on the sides of the neck are about 6 in., on the loins 4½ in. Of two ♂ skins from Dakhua, near Guginal (Major W. D. Lindsay), one is dark, dull chocolate-brown all over, with the coat very thick and long, about 7 in. on the side of the neck and flanks, 5½ in. on the hind back, and the collar the maximum size indicated above. The other is normally black, with the coat about 1 in. shorter everywhere and the collar about half as extensive, each arm being about 6 in. long and 2 in. wide at the summit.

In addition to the brown sloth bear from Dakhua shot by the late Major W. D. Lindsay, one has been recorded from Hazaribagh; and Dunbar Brander referred to three from Melghat in Central India, and further stated that of a pair of cubs produced by a black ♀ one was brown, the other black.

The only trustworthy flesh-measurements with which I am acquainted are those of the first three bears included in the list below. The first is a record by Dunbar Brander of a ♂ rather above the average in size, of which he cited the length including the tail as 5 ft. 7 in. and the standing height 2 ft. 8 in. Allowing 3 in. for the tail and deducting that amount from the total gives the approximate length of the head and body. The second and third are records of skins received from Mrs. Lindsay since my paper was written. The remaining two specimens are flat dressed skins in the British Museum, which may be a little stretched, but are not likely to be less than the animal before being stripped. The standing height of these specimens has been estimated by folding the skins and measuring from the top of the shoulder, excluding the hair, to the foot flexed at the wrist in the natural way. The dimensions taken from flat skins are bracketed.

Locality, collector, and sex.	Head and body.		Tail.	Standing height.	
	ft.	in.	in.	ft.	in.
Central India (Dunbar Brander); ad. ♂	5	4	3	2	8
Dakhua, near Guginal (Maj. W. D. Lindsay); ad. ♂	5	0	—	(2	9)
Dakhua, near Guginal (Maj. W. D. Lindsay); ad. ♂	4	10½	3	(2	4)
Balaghat (Sir R. Dane); ad. ♂	(5	3)	(3½)	(2	7)
Coimbatore (R. C. Morris); ad. ♀	(4	6½)	(2)	(2	2)

In Rowland Ward's 'Records,' 1928, p. 501, there are five entries of specimens measured from the nose to the tip of the tail. Four of these, ranging from 6 ft. to 7 ft. 1 in., may be dismissed as exaggerated, probably from being taken

"over the curves." The other, entered as 5 ft. 4 in., and recorded by Major Powell-Cotton, of a ♂ from the Central Provinces may be accepted as correct from being taken probably "between pegs."

The weight is very variable. According to Dunbar Brander the average in Central India of the ♂ is about 260 lb., of the ♀ 230 lb. His smallest ♂ was 198 lb. and his largest ♀ 273 lb. But a ♂ weighed by the Maharajah of Cooch Behar scaled 423 lb. according to Rowland Ward's 'Records.'

There is a large series of skulls of this bear in the British Museum, but unfortunately a comparatively small number of them was sexed by the collector. Of those entered in the table of measurements, the first on the list, which is easily the "record" in size for the species, being about 13½ in. long *, was presented by Sir Richard Dane, who, however, did not measure the animal in the flesh. The one from N. Bihar was presented by Mrs. R. C. Campbell Martin; the two from S. Chanda by Capt. C. R. S. Pitman, the ♂ from Gauripur by H.H. The Maharajah of that district, the pair from Kollegal in the Billigirirangan Range, Coimbatore, by Mr. R. C. Morris, the one from Melghat by Mr. Dunbar Brander, and the old ♀ from the Sál forest, Bankura, Bengal, by Mrs. McGregor. This specimen and the one from Gauripur came from localities nearer to the type-locality of the species than any I have examined (fig. 37, A, B, p. 198).

The table shows that ♂ skulls are on the average at least larger than ♀ skulls; also that there is a general agreement in size between specimens from northern and southern India. This is further attested by a specimen from Karadi in S.E. Coorg obtained by G. C. Shortridge which is a little larger than the one from Gauripur. Although unsexed by the collectors, these two skulls are no doubt ♂.

The skull varies individually in size and shape, especially in the inflation with air-cells of the area behind the postorbital processes. This is particularly well marked in the skull from Balaghat, which, although unsexed, I have no doubt is a ♂. It is old, with a dome-shaped cranium, and has lost most of its teeth. Variation in the size of adult ♂ skulls from the same locality is attested by the two ♂ skulls from S. Chanda.

The measurements of the teeth attest their small size as compared with those of the Red Bear (*U. arctos isabellinus*). This no doubt is connected with the general difference between the two species in the method of feeding. The back teeth of the Sloth Bear are generally more worn, and in old skulls

* In Rowland Ward's 'Records of Big Game,' 1928, p. 504, four skulls are recorded ranging in total length from 12½ to 12⅞ in. These are narrower across the zygomata and, apart from one, shorter than the ♂, or supposedly ♂, skulls enlisted below.

Skull-measurements (in mm.) of the Indian and Ceylonese races of *Melurus ursinus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4, m^1, m^2.	m_1, m_2, m_3.
M. u. ursinus.									
Balaghat, C.P.; old ♂	345	326	219	165	82	80	83	— — —	— — —
N. Bihar, S. of Nepal Tarai; old ♂	—	313	204	149	84	74	79	— — —	— — —
S. Chanda, C.P.; ad. ♂	329	310	192	149	83	76	75	11, 18, 20	18, 16, 11
Gauripur, Assam; ad. ♂	327	—	205	160	73	79	77	12, 18, 19	17, 15, 12
Kollegal, Coimbatore; ad. ♂	320	—	200	160	75	75	73	12, 19, 20	18, 18, 10
Melghat, C.P.; ad. ♂	300	305	189	148	77	75	74	12, 18, 19	18, 17, 11
S. Chanda, C.P.; ad. ♂	314	295	194	143	73	69	72	13, 19, 20	19, 16, —
Kollegal, Coimbatore; old ♀	311	295	187	136	70	66	68	10, 15, 18	— — —
Bankura, Bengal; old ♀	295	287	178	132	72	66	67	11, 16, 20	16½, 16, —
M. u. inornatus.									
Punanai, S. Ceylon; yg. ad. ♂	277	265	162	122	71	65	64	11, 18, 16	16, 14½, —
Yala, Ceylon, S.P.; old ♂	282	264	185	125	72	68	68	12, 18, 18	17, 16, (11±)
Mankalam, W.P.; ad. ♂	279	264	183	—	74	68	67	12, 18, 18	17, 16, 11
Delugowella, E.P.; ad. ♂	282	262	171	125	66	62	64	12, 19, 18	17, 15, —
Pallanarua, N.C.P.; ad. ♀	262	251	163	117	68	60	62	10, 16, 15	15, 14, 9½
Paymadu, N.C.P.; old ♀	260	250	168	115	65	63	68	11, 16, 17	15, 15, 9

may be lost, their position being merely marked by shallow sockets; but whether the loss occurred before or after death in the cases observed is not certain. Probably, I think, the wear of the teeth is due to grit masticated in connection with the eating of white ants.

Habits.—Of the habits of this bear Blanford gave a full account based on his own observations and those of other writers on the Indian fauna, and Dunbar Brander devoted a chapter to it in his volume already quoted. It is everywhere less plentiful than formerly, and has been exterminated in many districts. At one time it was found in sufficient numbers in the more open plains to be pursued on horseback and speared, but now it inhabits mainly bush, forest-jungle, and hills, especially rocky situations where shelter is provided by caves or recesses beneath piled-up boulders. During wet or cloudy weather it may sometimes be seen abroad at any time of the day, but for the most part it is nocturnal, starts its rambles a little before sunset, and retires to rest an hour or two after sunrise. The greater part of the night is spent hunting for food, which, according to season and locality, consists of wild and cultivated fruits of many kinds, leguminous plants and various sorts of grain, sugar-cane, and in southern India the fermented juice of the date-palm, the bears' liking for which is shown by their climbing the trees to reach the pots, and, it is said, intoxicating themselves by drinking it. They also climb trees after the combs of wild bees, being particularly fond of the honey, but according to Dunbar Brander a bear will only take one nest at a time, knocking it to the ground and descending to devour it in peace, unmolested by the bees which congregate near the spot on the tree to which the nest was attached. In cultivated districts they may cause considerable loss to the owners of sugar-cane plantations, crops of maize, and orchards of fruit.

This vegetable diet is supplemented by ground insects and their grubs, which they find by digging or by turning over stones and the trunks of fallen trees, and by the larvæ of bees in the cells of the honeycomb. White ants or termites are, however, their chief insect food; and these they secure by digging a tunnel at the base of the mound to its centre, dispersing the dust and débris with violent puffs, and sucking the insects out of their galleries by means of forcible inhalations, the noise of which can be heard at a considerable distance. The larvæ of a large beetle (*Ateuchus*) are similarly extracted from their tunnels in the soil. The peculiar modifications of the mouth of this bear are no doubt adapted to this method of feeding by suction, and the closing of the nostrils prevents

the entry of dust and grit into the nasal passages. Eggs and carrion are also eaten at times, and Dunbar Brander refers to a case of a female and a couple of nearly full-grown young becoming " man-eaters " and being a terror of a jungle tract near Chanda. But as a rule they avoid human beings and make off when apprised by scent of their approach. When suddenly startled by being stumbled upon in the jungle they will often, however, make a blind charge at the disturber of their peace, knock him down and, after mauling his face with claws or teeth, gallop off into the jungle, without attempting to kill or eat him.

64 *b*. **Melursus ursinus inornatus** Pucheran. The Ceylon Sloth Bear.

Melursus inornatus, Pucheran, Rev. Mag. Zool. v, p. 392, 1855 *.
Melursus ursinus inornatus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 105, 1932.
Melursus ursinus, Phillips, Man. Mamm. Ceylon, p. 204, 1935.

Vernacular.—Usa, *Walaha* or *Waelahinna* (Sinhalese); *Karradee* (Tamil).

Locality of the *type*, Ceylon.

Distribution.—CEYLON, " practically confined to that part of the low country which lies in the dry zone " (Phillips).

Distinguished from the typical Indian race at least by its considerably smaller skull, that of the ♂ being about 1 in.

* Pucheran gave this name to a young Ceylonese specimen because it differed from Indian specimens known to him in having no white crescent on the breast. In 1932 I tentatively adopted *inornatus* for the Ceylon Sloth Bear on the evidence of two skins from Uva (E. W. Mayor) which had the coat much less luxuriant than in Indian skins, and of two immature skulls in which the teeth were a little smaller. In 1935 Phillips reverted to Blanford's view that the Ceylonese and Indian Bears are inseparable, without reference to the possibility of them proving distinct. But in 1936 Mr. E. C. Fernando, of the Colombo Museum, most obligingly sent to me for the British Museum, through the kind offices of Mr. W. W. A. Phillips, skins and skulls of adult Ceylonese specimens which, in my opinion, show conclusively that they represent a well-defined local race distinguished mainly by its smaller skull and teeth and presumably smaller flesh-dimensions, although the published flesh-dimensions suggest otherwise (see p. 199).

When in 1932 I provisionally adopted the subspecific name *inornatus* for the Ceylonese Sloth Bear it was evident from what I wrote that sufficient material was not available to establish the point; and I hoped that by drawing attention to the circumstances I should induce some zoologist on the spot to look into the matter. I was consequently disappointed and surprised to see that Osman Hill, in his " Revised Check-list of the Mammals of Ceylon " (Ceylon Journ. Sci. (B) xxi, p. 158, 1939), dismissed the Ceylonese Sloth Bear with the remark that " in his opinion " I had separated it from the Indian Sloth Bear " on insufficient grounds."

shorter in condylobasal length than in the ♀ of typical *melursus*. The teeth, too, are correspondingly smaller; and, judging from the available skins, the coat is on the average shorter and thinner, although a photograph, presumably of a Ceylonese specimen, published by Phillips appears to have a long, shaggy coat.

Colour typically mainly black as in the Indian race, but also variable. Phillips refers to a specimen, captured in about 1856, as being dark above but tawny yellow below and on the

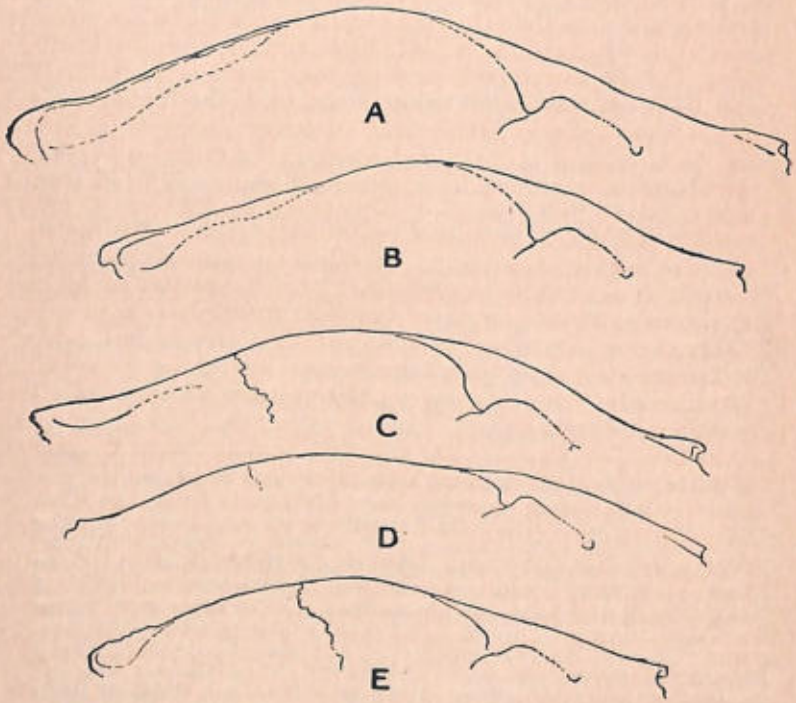


Fig. 37.

A. Dorsal profile of old male skull of Sloth Bear (*Melursus ursinus*) from Balaghat, C.P.
B. The same of old female from Bankura, Bengal.
C. The same of adult male Himalayan Black Bear (*Selenarctos thibetanus*) from Vekohomi, Naga Hills.
D. The same of an older male from Liramon, Naga Hills.
E. The same of adult female from Mokokchung, Naga Hills.

chest, adding that this variety was reported to be well known in the country north-east of the Padawiya tank in the North-Central Province about the middle of the last century. One specimen was said to be "scarcely more than half the size of the Sloth Bear."

Of this race I have seen only five skins. Two from Kumbukkan in Uva (E. W. Mayor), May 13, have the coat thin, with no underwool, and quite short, the hairs being from 3 to 3½ in. on the sides of the neck and dorsal mat, 1 to 1½ in. on the loins. In this respect they resemble the skin above referred to from the Central Provinces, and, as in the latter, I believe them to have completed the moult. If so, the moult is earlier than in the typical Indian race, judging from the skin from Hazaribagh which was carrying its old, thick dead coat in June. One of these specimens has the collar of about average size; in the other it is smaller than in Indian skins. A skin from Pollaranua, N.C.P., June, and one from Paymadu, Sept. (E. C. Fernando) still have no wool, but the coat is longer, about 5 in. on the sides of the neck and 3½ in. on the back. In the first the collar is quite small, each arm about 2½ in. long and 1½ in. wide at the top; in the second it is much larger, each arm being about 6 in. long and 2 in. wide. A third skin, undated, from the N.P. (E. C. Fernando) has the coat a little thicker, but not so long, and the collar is represented merely by a few whitish hairs only. In the inconspicuousness of the collar this specimen, a youngish ♀, comes nearest of all to Pucheran's also young type of *inornatus*, in which it was absent.

These skins suggest that the coat of *inornatus* may prove to be shorter than in typical *Melursus*, which is likely enough, and that the collar may be on the average smaller, but the evidence is incomplete.

In the following table are entered the dimensions given by Phillips, who received them from Messrs. Tutein, Nolthemius, and E. C. Fernando, and of two ♀ specimens from the N.C.P. presented to the British Museum by Mr. Fernando; but in every case the tail-length includes the hairs at the tip, the foot, I suspect, includes the claws, and since the dimensions of the head and body are approximately the same as in Indian specimens they were presumably taken over the curves, because it is hardly credible that the Ceylonese Sloth Bear, with the skull so much smaller (see table, p. 195), is as big in the body.

	Head and body.		Tail.	Hind foot.	Ear.	Height at shoulders.
	ft.	in.	in.	in.	in.	
Largest; ad. ♂	5	2	6	8	4	♂ about 3 ft.
Average of 4 ad. ♂♂	5+		5+	8	4	♀ about 2 ft.
Largest; ad. ♀	4	9½	6½	7½	4	—
Average of 3 ad. ♀♀	4	5½	6	7¼	4	—
Pollaranua, N.C.P.; ad. ♀ .	4	11	6	7	3½	—
Paymadu *; old ♀	4	2½	5	7	3½	—

* The label on the skin of this specimen gives the head- and body-length as 4 ft. 2½ in., but on the label attached to the skull, containing the flesh-measurements, the entry is 4 ft. 4½ in.

The dressed skin from Pollaranua has the head and body 4 ft. 3½ in. and the tail 3 in., the same areas in the Paymadu skin being 4 ft. 6 in. and 2 in., the " standing height " of both being estimated at 1 ft. 9 in. approximately. I have seen many adult examples of Indian Sloth Bears, but none that was nearly 3 ft. at the withers ; and it is incredible that the ♂ of the Ceylonese race is 12 in. higher than the ♀ if there is only 6 in. between them in length.

Of the skulls of *inornatus* entered in the table of measurements (p. 195) all were received from Mr. E. C. Fernando except the one from Delugowella, which was collected by E. W. Mayor for the Bombay Mammal Survey. They call for no special comment since they differ from those of typical *ursinus* merely in size and the smaller last upper molar and three lower molars.

Habits.—According to Phillips this bear " is common in suitable country all over the Northern, North-Central, and Eastern Provinces, and the eastern part of the Southern Province. On the west coast it is found as far south as about Puttalam, but in the east its range extends south to the Hambantota district. It is not generally found either in the hills or in the wet zone in the south-west of the Island, but in times of severe drought it has been known to wander from its ordinary range in search of water, and it has then been found in the hills to 4,000 ft." Phillips's account of the habits of this bear agrees so closely with what has been said about the Indian race as to need no repetition ; but commenting on the difference of opinion as to whether it is a courageous and vicious animal or not he remarks, " the fact remains that he is one of the most dangerous animals of the Ceylon jungles ; he is more feared by the jungle villagers than any other creature, with the exception of a rogue elephant." This Phillips attributes not to the bear's innate aggressiveness leading him to seek encounters with human beings, but to his blindly charging an intruder when startled by being suddenly disturbed. After bowling him over and giving him a bite or two or a severe clawing, generally on the face, the bear gallops off into the jungle, exactly as described by Dunbar Brander in the case of the Indian race. Living in parts of the island where the rainfall is least, the bears in dry weather are often compelled to travel long distances to find a water-hole or to dig deep pits in the sandy bed of a dried-up stream till water is reached.

There appears to be no special breeding season, as is the case with many Ceylonese mammals, though probably mating occurs usually in the first half of the year.

Genus **SELENARCTOS** Heude.

The Asiatic Black Bear.

Selenarctos, Heude, Mém. Hist. Nat. Emp. Chin. v, p. 2, 1901; Sowerby, Journ. Mamm. i, p. 216, 1920; Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 108, 1932.
Arcticonus, Pocock, Ann. Mag. Nat. Hist. (8) xx, p. 129, 1917.
Euarctos, G. M. Allen, Mamm. Mong. and China, p. 330, 1938 (in part); not of Gray, Proc. Zool. Soc. 1864, p. 692, and Merriam, Proc. Biol. Soc. Wash. x, p. 78, 1896 *.

Type-species of *Selenarctos* and *Arcticonus*, *thibetanus*; of *Euarctos*, *americanus*.

Distribution.—From the Hindoo Koosh southwards to Baluchistan, and eastwards through the Himalayas to Assam, thence north-eastwards into China, Hainan, Formosa, Japan, and Manchuria, and eastwards and southwards to Burma, Siam, and Indo-China.

Closely resembling *Ursus* in the lips, rhinarium, and ears, but differing essentially in the structure of the fore foot, which has the area behind the plantar pad naked and occupied by a single large, irregularly piriform pad as wide as the plantar pad, and as long externally but shorter internally, and representing the two carpal pads of *Ursus*; between this pad and the plantar pad there is a narrow naked area of flexible creased skin. Mammæ six, pectoral, the anterior pair almost axillary.

The skull has the muzzle shorter in comparison with the cranial portion than in *Ursus*, and the shortness of the muzzle

* Reference has already been made (p. 169) to G. M. Allen's opinion that this bear, known to Indian sportsment as the "Himalayan Black Bear," belongs to the same genus as the equally well known North American Black Bear. This opinion was upheld on the grounds of the general shortness of the muzzle in the two species and some resemblances between them in dental characters. But the American Black Bear has the carpal pads of the fore paw as in *Ursus*, thus lacking the essential character on which I founded the genus *Arcticonus*. The teeth, moreover, of the Asiatic species differ from those of the American in certain particulars, pointed out by Merriam as diagnostic of the latter when he distinguished *Euarctos* from *Ursus*. In the lower carnassial (m_1) in the American form the median and posterior cusps on the inner side (metaconid and entoconid) have a broad smooth space between them with no intervening tubercle or tubercles, such as are present in *Ursus*, and the two posterior tubercles of the heel are set more obliquely, the outer (hypoconid) being in advance of the inner (entoconid). In the unworn lower carnassial (m_1) of *Selenarctos* there is a definite, finely tubercular ridge between the metaconid and the entoconid, and the entoconid and hypoconid are as nearly as may be on the same level, the two in the worn tooth forming the ends of a horseshoe-shaped scar.

When I proposed the name *Arcticonus* for the Asiatic species I was unaware that Heude had already, but for no very convincing reasons, given the name *Selenarctos* to the same species, as was pointed out by Sowerby.

is accompanied by a more backward position of the cheek-teeth, so that a vertical tangent from the anterior rim of the orbit passes in the adult in front of the line of contact of the two upper molars, and not behind it as in *Ursus*. Also the cusps and ridges of the main cheek-teeth are less trenchant, the areas between them are smoother, and the first lower molar has a relatively smaller heel.

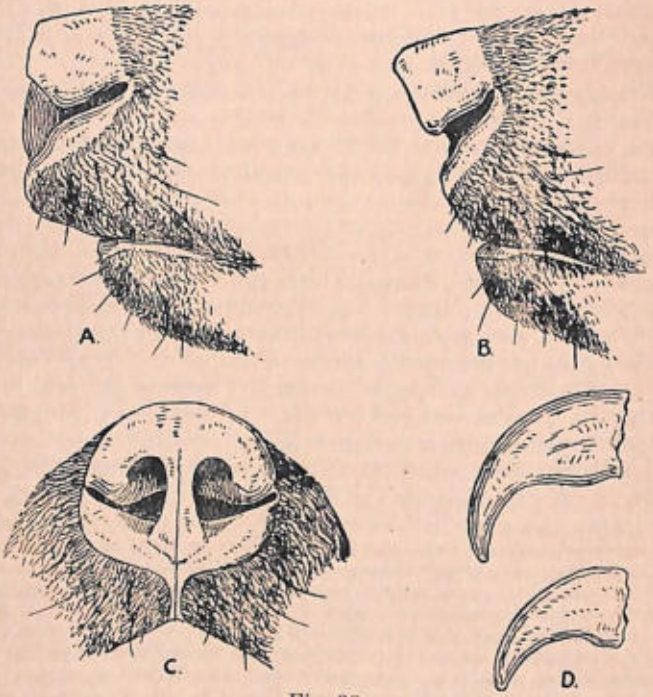


Fig. 38.

A and B. Side view of rhinarium of two examples of Himalayan Black Bear (*Selenarctos thibetanus*), from unknown localities, exhibited in the Zoological Gardens, showing unusual variation in shape, B being normal.
C. Front view of rhinarium.
D. Claw of fore foot (above) and of hind foot (below) of the same.

65. Selenarctos thibetanus G. Cuvier. The Asiatic Black Bear. (Pl. IV.)

Ursus thibetanus, G. Cuvier, Ossemens Foss. iv, p. 325, 1823.
Ursus tibetanus, F. Cuv., Hist. Nat. Mamm. ii, pt. xxxix, 1824; and of many later authors.
Ursus torquatus, Wagner, in Schreb. Säug., Suppl. ii, p. 144, 1841; and of many subsequent authors, including Blanford, Mamm. Brit. Ind. p. 197, 1888.

Selenarctos thibetanus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 111, 1932 *.

Vernacular.—*Mam* (Baluchi) ; *Rinch, Rich*, or *Reench, Reech, Bhalu, Kala Bhalu, Kala Reech* (Hindi) ; *Haput* (Kashmiri) ; *Sanár, Hingbong* (Nepalese) ; *Dom* (Bhotia) ; *Sona* (Lepcha) ; *Mágyen* (Limbo) ; *Sulūm* (Daphla) ; *Situm* (Abor) ; *Mapol* (Garo) ; *Muphur, Musu-bhurma* (Kachari) ; *Vumpi* (Kuki) ; *Sawam* (Manipuri) ; *Húghúm, Thágua, Thega, Chúp, Seván, Sápá* (Naga) ; *Wek-won* (Burmese) ; *Tsap* (Kachin).

Locality of the *type*, Sylhet †.

Distribution as under the genus.

The coat is very variable in length and thickness either seasonally or racially, sometimes with abundance of underwool, sometimes with hardly any or none in accordance with altitude and latitude. There is no definite mat on the shoulder, but there is a crest on the side of the neck formed by the meeting of a downward stream of hair from the nape with an upward stream from the throat. The general colour is typically nearly uniformly black ; in one race it is reddish-brown or deep brown ; the muzzle is usually tan or brown, the chin white or buff, and there is an irregularly crescentic, V-shaped or Y-shaped white, buff, or even ochreous mark on the breast, the hairs forming this mark directed backwards like those of the surrounding area.‡

Apart from its general colour and characteristic breast-patch

* I adhere to the original spelling of this specific name, although most authors who adopted it took F. Cuvier's rendering. Wagner proposed *torquatus* as a substitute for the older name because of its inappropriateness for a species not found, as he thought, in Tibet. Blanford adopted that name for the same reason. But the discarding of names on that score is not now admissible ; and it is highly probable that this bear exists in the wooded districts of S.E. Tibet.

† I take Sylhet as the typical locality because Cuvier gave the name *thibetanus* to a bear from that district of which Duvaucel sent him a description. This Cuvier printed in full, and at the same time referred, on Wallich's authority, to the occurrence of what he believed to be the same bear in Nepal.

‡ There is sometimes some brown hair on the paws, and in one skin of the Kashmir race from Dachigam (Major R. Dane) there is a decidedly brownish tinge on the belly, on the fore legs behind, on the edges of the paws, and to a certain extent on the rump. Col. Stockley, moreover, informed me (*in litt.*) that in October 1919 he shot, " right and left," a ♂ " red " bear and a ♀ " black " bear on the eastern side of the Shanshibir Mountains at the western end of the Kashmir Valley. In 1928 he presented to the British Museum the alleged skull of the " red " specimen, and it is unmistakably the skull of *S. thibetanus*. If it belonged to the skin, as stated, proof that the Himalayan Black Bear may occasionally be brown is supplied. But collector's skins and skulls sometimes get mixed, and I suspect the skull in question belonged in reality to the black ♀. It is a decidedly small skull, suggesting that sex. The two Himalayan species may sometimes be seen feeding side by side. This was observed by Mr. H. Whistler in the Solang Nullah, Kulu.

this bear may be distinguished superficially from the red bear by the more prominent ears, shorter face, the absence of distinct shoulder-mat, and the crest of hair along the side of the neck. Other characters are contained in the generic diagnosis.

On the available evidence this species is represented by three local races in British India. They may be distinguished as follows :—

a. Smaller ; general colour brown or reddish-brown ..... [p. 218. *gedrosianus* Blanford,

a'. Larger ; general colour black, at most occasionally tinged with brown in parts.

b. Coat short and thin, with no underwool or at most a very small quantity..... [p. 205. *thibetanus* Cuvier,

b'. Coat much longer and thicker, with abundant underwool at least in winter .. [p. 212. *laniger* Pocock,

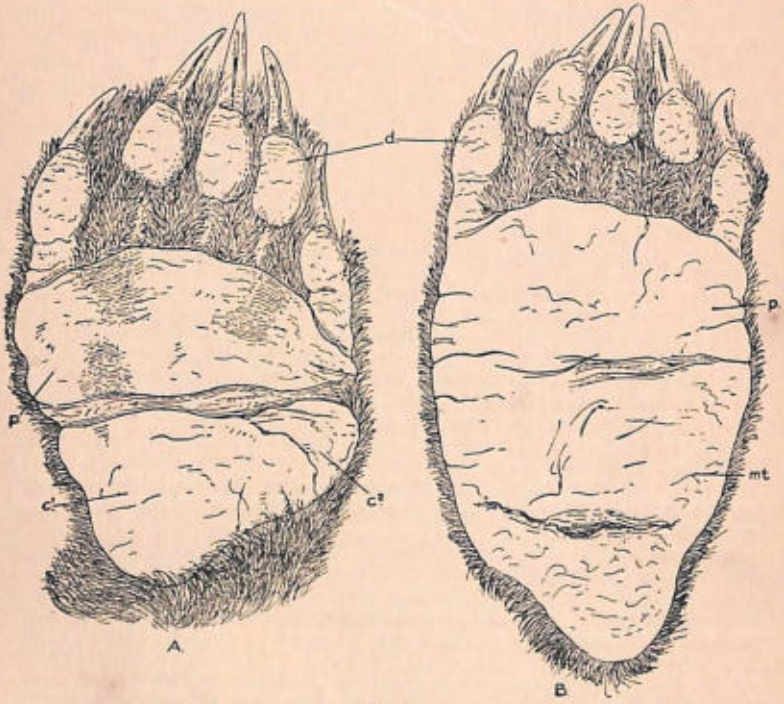


Fig. 39.

A. Lower side of right fore foot of Himalayan Black Bear (*Selenarctos thibetanus*) with the hairs clipped short.

B. The same of the right hind foot.

d, digital pad of second digit of fore foot and of fifth digit of hind foot ; *p*, plantar pad ; c^1 and c^2 outer and inner coalesced elements of carpal pad, which is nearly as large in area as the plantar pad. (For comparison with fore feet of *Ursus* (fig. 30, p. 171) and *Melursus* (fig. 33, p. 188) ; *mt*, metatarsal pad.)

65 *a*. **Selenarctos thibetanus thibetanus** G. Cuvier.

Ursus thibetanus, G. Cuvier, Ossemens Foss. iv. p. 325, 1823.
Ursus tibetanus, F. Cuvier, Hist. Nat. Mamm. ii, pt. 39, 1824.
Ursus torquatus, Wagner in Schreber's Säugeth., Suppl. 2, p. 144, 1841.
Ursus torquatus, Blanford, Mamm. Brit. Ind. p. 197, 1888 (in part).
Selenarctos thibetanus thibetanus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 111, 1932.

Locality of the *type*, Sylhet in Assam.

Distribution.—From ASSAM up to about 3,000 ft., perhaps more, westwards apparently to NEPAL and eastwards and southwards through BURMA as far south as MERGUI; also Siam and apparently Annam.

This typical race is distinguished from the more western Himalayan race by its short, thin coat, with little or no underwool. In an example from Okotso in the Naga Hills (J. P. Mills), dated October, the hairs are about 37 mm. (1½ in.) on the body and up to about 75 mm. (3 in.) on the crest on the side of the neck, and there is no underwool. One from Manipur, dated February, when the coat should be at its best, has the hairs on the body about the same length as in the skin from Okotso, the neck-crest is rather longer, but there is no underwool. Peacock stated that all the specimens he shot in Burma were "coarse-haired."

The muzzle varies in tint from very deep brown, black in the type, according to Duvaucel, to tan or greyish, and the collar, which ranges from creamy-buff to ochraceous or buffy-brown in tint, varies in shape in the same district. In two specimens collected in the Naga Hills (J. P. Mills), for example, one from Wokha has the collar V-shaped, the arms being about 11 inches long and 2 in. wide and meeting at a point without extension down the breast, another from Okotso has it very wide and long, Y-shaped, extending 7 in. laterally in front of the shoulder and 6 in. posteriorly along the middle line of the breast, apparently resembling in its extent that of the type from Sylhet.

Notes on some other skins in the British Museum.—In addition to the two skins mentioned above, collected by Mills in the Naga Hills, he sent a third, from Mokokchung, which has the coat coarse and scanty, without underwool, although a little longer than in the others; and on the labels attached to three skulls, without skins, Mills stated that one from Lakhuni, 1,500 ft., had the coat short and coarse, the collar narrow and yellow; another from Aré, 3,000 ft., October, had longish, sparse hair and a narrow yellowish collar; a third from Aichisigama, 3,000 ft., August, had the coat short and thin but the collar white.

Two undated skins in Hodgson's collection, probably from the Nepal Terai, have the coat short and coarse and without underwool; both have V-shaped collars, the arms of which in one are about 13 in. long and the colour yellowish-brown, whereas in the other the arms are 11 in., with the colour creamy-white.

The skin of a cub, 2½ ft. long, from Duragiri in the Garo Hills, 3,000 ft. (H. W. Wells), March 16, differs from the Naga Hills

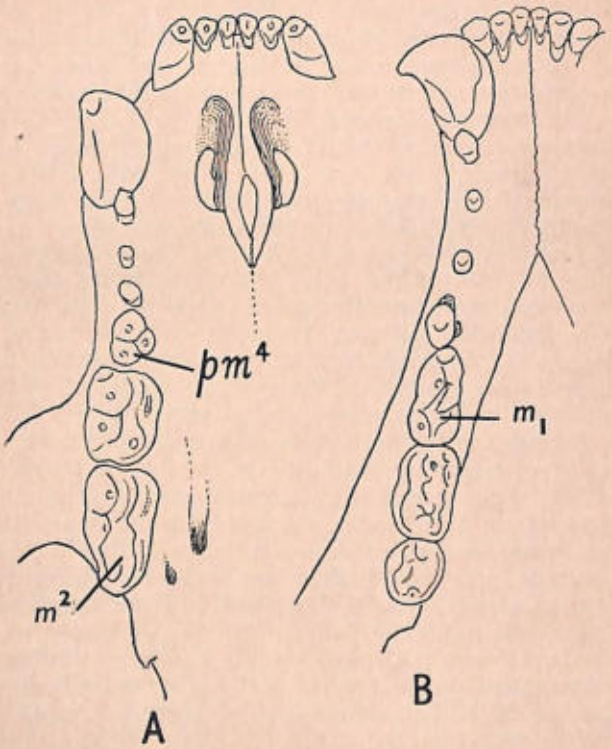


Fig. 40.—Dentition of Himalayan Black Bear (*Selenarctos thibetanus*).

A. Upper teeth of the right side of specimen from Jaunsar (B. B. Osmaston).

B. Teeth of lower jaw of left side of the same, showing the short symphysis reaching to the level of the third premolar, as also in *Ursus*, but not *Melursus* (fig. 36, B, p. 192). pm^4 upper carnassial, m^2 second upper molar, m_1 lower carnassial.

specimens in having a comparatively long and thick coat, provided with underwool. The general colour is black, with the muzzle brown, but the head is speckled with shining

grey hairs as far back as the ears, and there are some dirty white hairs on the paws behind the digital pads. The collar is white, angular, and narrow. This cub, relatively for its size, has the coat as long and thick as in the race next described.

In addition to the skin from Manipur above referred to I have seen three from the northern parts of Upper Burma collected by Ronald Kaulback. A young example from

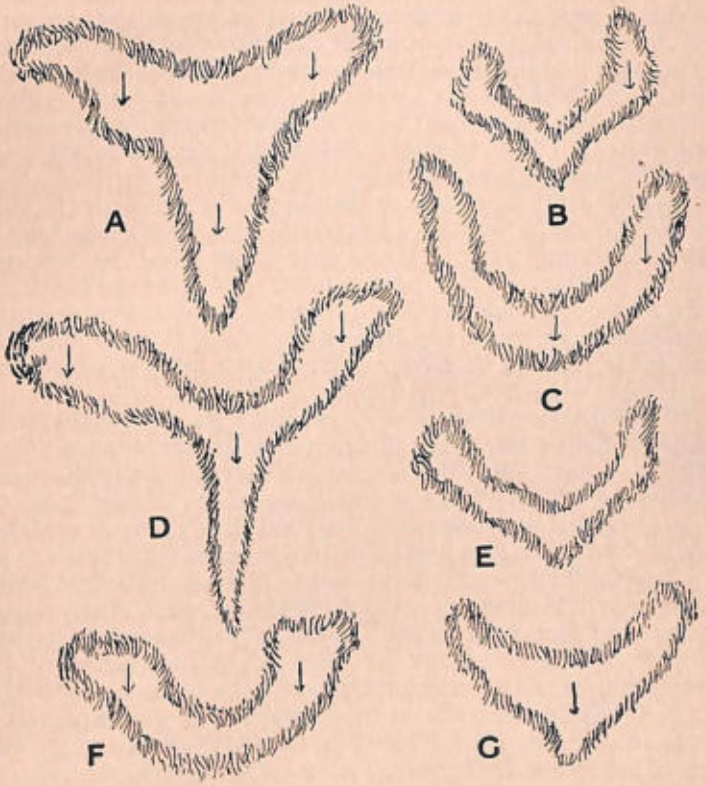


Fig. 41.—Individual variations in the size and shape of the "collar" or breast patch in the Himalayan Black Bear (*Selenarctos thibetanus*).

A, from Okoteo, Naga Hills; B, from Wokha, Naga Hills; C, from Nepal; D, from Sikkim; E, from Upper Lidder Valley, Kashmir (type of *laniger*); F, from Szechwan (*mupinensis*); G, from Formosa (*formosanus*).

The arrows show the direction of the hair-growth.

Nam Tamai Valley (27° 42′ N., 97° 54′ E.), August 20, has the coat short and thin, 23 mm. on the body and 45 on the side of the neck. The skin of a cub from Adung Long (28° 8′ N.,

97° 50′ E.), 5,500 ft., November 30, has, on the contrary, a long, thick coat with plenty of underwool, from 45 to 50 mm. on the body and 65 mm. on the side of the neck. In its coat this skin resembles that of the cub from the Duragiri Hills, Assam, suggesting that the cubs of typical *thibetanus* may be long- and thick-coated. The third is the skin of an adult ♀ from Htingnan, 3,500 ft. (26° 36′ N., 97° 52′ E.), February 16. The coat, which should be at its best, is coarse and harsh, about 50 mm. on the back and 90 mm. on the side of the neck, but has no appreciable amount of underwool, thus agreeing with typical skins from Assam, although rather longer in the coat. These skins are black, with the breast-patch buff or soiled white; the chin is white, the upper lip brownish, but the rest of the muzzle is black as described in the type from Sylhet by Duvaucel.

From localities outside British Indian territory to the east of the Bay of Bengal there is a young skin from Hué, Annam (Delacour and Lowe), and one, not adult, from the Meklong Valley, 3 miles east of Um Pang in Siam, shot by Col Stockley, who told me he was convinced that this specimen represented a different race from the Himalayan Black Bear of Kashmir and other parts of the Western Himalayas, with which he was well acquainted.

No flesh-measurements were recorded on any of the skins of this race of the Black Bear in the British Museum; but according to E. H. Peacock the average length of Burmese specimens is from 5 to 5½ ft., including the tail, which is about 3 in. long. The weight is about 250 lb. These dimensions and weight are rather less than those recorded below (p. 214) for the Kashmir race, but the weight is the same as the maximum weight for the species cited by Blanford, and may have been copied from his volume. If based upon Peacock's personal experiences they indicate a more lightly built animal. In Burma, however, there would presumably be no need for the bears to lay on fat in the autumn against the winter period of comparative scarcity of food. Peacock states, nevertheless, that there is usually a great deal of fat underlying the skin.

The skulls from the Naga Hills entered in the table were collected for the Mammal Survey by J. P. Mills at heights varying from 3,500 to 6,000 ft. Those from Toungoo and Htingnan were collected by E. W. Oates and R. Kaulback respectively. The series from the Naga Hills shows remarkable individual variation in the shape of the dorsal profile and in other particulars, also a good deal of difference in the size of the teeth, due partly to wear. Extremes in the shape of the dorsal profile are exhibited by two adult ♂ skulls from Vekohomi and Liramon, 2,500 ft. respectively. The former has the frontals greatly inflated with air-cells from in front

of the postorbital processes backwards, making this area strongly convex in profile view and the area of the muzzle to the tip of the nasals lightly concave. In the skull from Liramon, which is older, there is, on the contrary, no perceptible inflation of the frontals over the postorbital processes, its dorsal outline behind those processes being nearly flat and inclined slightly upwards posteriorly towards the fronto-parietal suture, and the summit of the muzzle from the frontal processes to the tip of the nasals is tolerably evenly and gently sloped downwards, with no perceptible concavity. Most of the other skulls intergrade between these two in the particulars described *.

The longest skull on the list, from Aichisigami, 4,000 ft., is a comparatively young skull with most of the sutures still open, indicating that its growth had not ceased. Its teeth, however, are a good deal worn, attesting that worn teeth are not always a proof of old age. The dimensions of a youngish skull from Nungkamchung are inserted to attest the size of the unworn teeth.

Female skulls vary similarly. The most arched in dorsal profile is that of a very old, broad-muzzled skull from Mokokchung. Its teeth are much worn—more worn, but only slightly smaller than in the younger but oldish ♀ from Mongsendi, which is smaller in all dimensions.

Individual variation in the size of the teeth in skulls from the same locality is illustrated by three skulls from Nungkamchung; in the one entered in the table the teeth are a good deal worn; in another the three upper teeth are 13, 19, 28 mm., and the lower 20, 20, 17 mm.; whereas in a third, a young specimen with unworn teeth, the upper and lower are respectively 14, 21, 31 mm. and 23, 22, 16 mm., all the teeth except the last lower molar being bigger than in any skull of this bear examined.

Very few adult skulls from the east of the Bay of Bengal are available. The young adult skull from Toungoo was unsexed, but I have entered it as ♂ from its size. It agrees in all essentials with those from the Naga Hills. The adult ♀ skull from Htingnan in Upper Burma is longer than the other skulls of that sex, but otherwise like them. R. Kaulback also secured two immature skulls, without lower jaws, in Upper Burma. One from Mahkawng Ga (26°, 49′ N., 98° 10′ E.),

* As explained above under *Ursus* (p. 172) G. M. Allen stated that that genus differs from *Selenarctos* by the length of the nasals greatly exceeding the width of the maxillæ above the first upper molar. In both genera the dimensions are very variable. The extremes in the skulls of *Selenarctos* from the Naga Hills entered in my table are shown by the ♂ from Vekohomi, in which the nasals and maxillæ are alike 68 mm., and the ♀ from Mokokchung, in which the nasals are 51 mm. and the maxillæ 71 mm.

Skull-measurements (in mm.) of *Selenarctos thibetanus thibetanus* from Assam and Burma.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4, m^1, m^2.	m_1, m_2, m_3.
Aichisigami, Naga Hills ; ad. ♂.....	306	—	200	—	76	74	65	13, 19, 29	21, 20, 16
Aichisigami, Naga Hills ; ad. ♂.....	304	—	182	160	75	77	64	13, 19, 29	21, 21, 18
Vekohomi, Naga Hills ; old ♂	305	—	192	155	80	81	70	13, 19, 29	20, 21, 18
Okotso, Naga Hills ; very old ♂	300	—	187	166	68	74	69	12, 17, 26	20, 20, 16
Okotso, Naga Hills ; old ♂.....	287	—	182	—	66	71	62	12, 19, 26	20, 19, 15
Liramon, Naga Hills ; ad. ♂	281	—	176	—	65	65	65	13, 18, 26	20, 20, 16
Toungoo, Lower Burma ; yg. ad. ♂ ..	296	—	180	152	70	70	65	12, 19, 25	20, 18, 15
Nungkamchung, Naga Hills ; ad. ? ♀.	273	(257±)	179	136	74	74	62	13, 17, 25	20, 19, 13½
Mokokchung, Naga Hills ; old ♀	264	245	176	143	72	79	65	10, 17½, 25	19, 19, 15
Mongsendi, Naga Hills ; ad. ♀.....	255	242	167	139	68	64	57	12, 18, 25	20, 19, 16
Htingnan, Upper Burma ; ad. ♀	279	—	169	149	70	69	60	12, 17, 24½	19, 19, 15

4,000 ft., has the upper teeth 13, 18, 26 mm., the other from Nam Tamai Valley (27° 42′ N., 97° 54′ E.), 3,000 ft., has the upper teeth 12, 18, 25 mm.

There is also a young unsexed skull from the Meklong Valley, 3 miles south-east of Um Pang, Siam (Stockley), which is indistinguishable from the Assamese series. The teeth are larger than in the skulls from Toungoo and Upper Burma, although in both they are alike unworn, their dimensions being 13, 20, 27 mm. and 21, 21, 16 mm.

Habits.—In Burma, according to E. H. Peacock (' A Game Book for Burma,' etc., p. 190, 1933), this bear is fairly common throughout the country and occurs in all kinds of tree-forest, its favourite habitat being very steep, heavily afforested hills, especially, what he calls " good serow country." According to Col. Stockley it is found as low as 1,200 ft. in Burma and Siam.

It is largely nocturnal and arboreal, making in large trees rough platforms of branches, known as *wun-thaik* (bears' nests), on which it may sit and rest. During the rains on one occasion Peacock tracked an old bear which had wisely collected a mass of leaves whereon to sit on the wet, muddy ground. They feed chiefly on fruits, roots, the shoots and stems of some fleshy plants, raid crops and orchards when opportunity offers, will eat carrion and tiger " kills " when they find it, and various grubs and white ants as well. They are particularly partial to honey, and will go to endless trouble to open out the beehives hidden in the hollow stems of trees, biting large holes, if necessary, through several inches of hard wood. Such holes, known as *wun-kaik* (bear bite), the platforms, above referred to, claw-marks on the stems of trees, overturned stones and demolished ants' nests are the principal indications of the presence of bears. They are powerful swimmers and fond of bathing in pools and streams in hot weather. The sounds they utter have a wide vocal range, described as roaring, whining, screaming, and snuffling. " When wounded, alarmed, or angry they make an appalling row."

Owing to their nocturnal habits they are infrequently seen, and are usually met with during chance encounters when the sportsman is out after other game. They are most uncertain tempered beasts, and Peacock states that, if unarmed, he would rather meet any other animal. " When suddenly startled they lose their heads completely and may charge in a panic or through sheer cussedness. I have been charged on two or three occasions without the shadow of an excuse, and there are more men injured by bears in Burma than by any other kind of wild animal." Although their sense of smell is very acute, their sight and hearing are poor.

The period of gestation, Peacock states, is about six months, and the cubs, usually two in number, are born at the beginning

of the hot weather in hollow trees or caves. But the adult ♀ skin sent by R. Kaulback from Htingnan in Upper Burma has the three pairs of pectoral teats large, with the skin around them naked, suggesting that she was either suckling cubs or imminently "expecting" them at the time of her death, which was in February.

65 *b*. **Selenarctos thibetanus laniger** Pocock.

? *Ursus torquatus* var. *arboreus*, Gray, Proc. Zool. Soc. 1864, p. 688; id., Cat. Carn. Brit. Mus. p. 220, 1869 *.
Selenarctos thibetanus laniger, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 115, 1932.

Locality of the *type* of *arboreus*, Darjiling; of *laniger*, Upper Lidder Valley, Kashmir.

Distribution.—KASHMIR, elsewhere not ascertained, but probably at tolerably high elevations in the HIMALAYAS eastward perhaps to SIKKIM.

Distinguished from *S. thibetanus thibetanus* by its longer, thicker coat which at least in the winter is furnished with abundance of underwool; the breast-mark also is apparently on the average a little smaller and whiter. It is white in all the Kashmir skins I have seen.

The length of the coat may be illustrated by the following two skins shot respectively at the end of autumn and the end of spring. A young ♂ from Malawan, Pir Panjal, 8,000 ft. (Col. Stockley), October 23, has the hair on the nape 83 mm. (3¼ in.), on the side of the neck 113 mm. (4½ in.), and on the back 50 mm. (2 in.), longer everywhere than in the specimen of the typical race from Okotso in the Naga Hills, also shot in October. An adult ♀, the type, from the Upper Lidder Valley (Capt. Magrath), shot in May, still carrying its long winter coat, has the hairs on the sides of the neck 123 mm.

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* This name is tentatively inserted here, but when the Black Bears from Darjeeling are better known they may prove to be indistinguishable from typical *thibetanus* or conceivably to represent a race differing from both the Himalayan forms here recorded. The name was taken by Gray from an immature skull inscribed in MS. by Oldham "*Ursus hindaicus arboreus*," which was copied by Gray, thus excluding *hindaicus* from future use in the genus *Ursus*. It is not clear why Oldham thought the skull justified a new name, but Gray mentioned some features of it which he apparently took to be distinctive. They have, however, no systematic value, since they fall within the limits of individual variation, as a glance at the typical skull in the British Museum shows. So far as I can judge from the adult skulls examined from Nepal (Hodgson), Sikkim (Blanford) and Jaunsar near Dehra Dun (B. B. Osmaston) they differ in no respects from skulls of typical *thibetanus* from Assam and of *laniger* from Kashmir. But there are hardly any skins available from the central portion of the Himalayas to suggest to which of the two, if to either, *arboreus* belongs.

(4·8 in.), on the back 63 mm. (2½ in.), and on the flank 82 mm. (3¼ in.). An undated skin from Shalkood (Entwistle) has the hair as long as in the last, a little longer indeed on the flank, where it is 95 mm. (3¾ in.). These may be compared with the skin of typical *thibetanus* from Manipur in full winter coat, which has the hair of the body about 37 mm. (1½ in.) and on the neck-crest about 100 mm. (4 in.).

But two skins from Dachigam, Kashmir (Major R. Dane), shot late in November, have the coat less luxuriant, there being some scanty underwool detectable practically only on the fore quarters and neck. In one the hair on the neck-crest is about

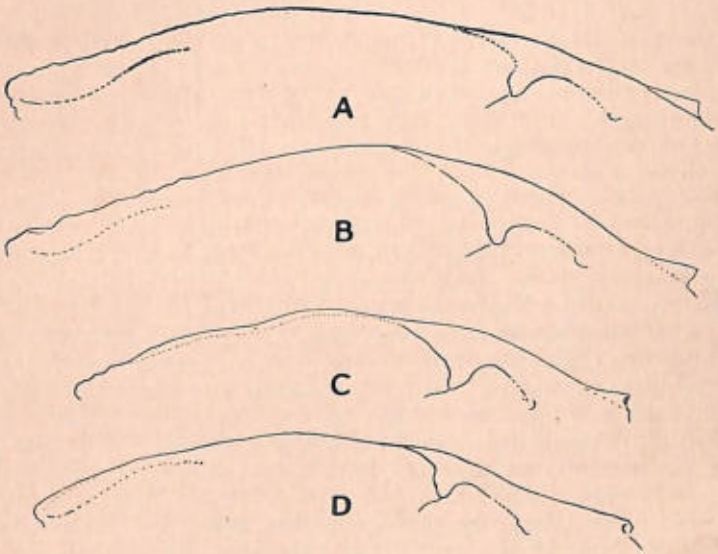


Fig. 42.—Variations in the shape of the dorsal profile of the skulls of *Selenarctos thibetanus laniger*.

A. Oldish male from Jaunsar, Dehra Dun.
B. Very old male from Dunga Gali, Murree.
C. Old ♀ (type of *laniger*) from the Upper Lidder Valley, Kashmir.
D. Reputed "red" male from Shanshibir Mountains, Kashmir.

114 mm., on the back and upper flanks about 50 mm., low down on the flanks about 90 mm. In the other * the hairs of the neck-crest are about 95 mm., and on the back and flanks from about 37 mm. to 50 mm.

* This specimen was referred to above (p. 203, footnote) as being unusual in showing a brown tinge on certain parts of the body.

Col. A. E. Ward gives the following measurements, " between pegs," of several specimens from Kashmir (Journ. Bomb. Nat. Hist. Soc. xxix, p. 318, 1923) :—

Locality and sex.	Head and body. ft.	in.
Bringh Lanor ; ad. ♂	6	9
Bringh Lanor ; ad. ♂	6	4
Lidder Valley ; ad. ♂	6	1
Lidder Valley ; ad. ♂	6	0
Bringh Lanor ; ad. ♂	5	11
Chakrata ; ad. ♀	5	3

These dimensions agree tolerably closely with Col. Stockley's statement that the ♂ is up to 6 ft. in length and the ♀ 5 ft. 4 in., the weight of the ♂ being 400 lb. or over and of the ♀ 200 lb. Blanford states that the weight of full-grown males is from about 200 to 250 lb. No doubt it varies greatly according to the season. A bear fattened on rich autumn diet would be much heavier than at the end of the winter or in early spring.

Of the skulls of *S. th. laniger* entered in the table of measurements, the largest from Dunga Gali, Murree, was collected by Capt. C. R. S. Pitman ; the next from Dachigam, Kashmir, by Major R. Dane ; the following two ♂♂ by Col. Stockley ; the ♀ from Sind Valley by Brig. Gillies ; the following two ♀♀ by Col. Stockley and the type from Aru in the Upper Lidder Valley by Capt. Magrath. I can find no cranial or dental differences between skulls from Kashmir and Assam, but the following notes may be of interest.

Adult ♂ skulls differ considerably in the shape of the dorsal profile and may or may not have a tolerably well developed sagittal crest. The skull from Dunga Gali, Murree, is old and has the frontals markedly elevated, swollen with air-cells, both in front of the postorbital processes and behind them and the sagittal crest, rising about 20 mm. in front of the parietals, is 11 mm. high on the posterior part of those bones and 15 on the occiput. The skull from the Shanshubi Mts., fully adult but not old, is much lighter in the bone and narrower everywhere, the sagittal crest, beginning at the fronto-parietal suture, is low, only 2 and 5 mm. at the above-mentioned points and the forehead is flat, not elevated and swollen with air-cells. The skull from Dachigam is about the same age as the last, is much heavier in the bone and everywhere broader, except on the postdental palate, but has no sagittal crest, except on the occiput, the crest being represented on the frontals and parietals by two strong, parallel temporal ridges 23 mm. apart ; the posterior palate and mesopterygoid fossa are respectively 37 and 24 mm. as against 42 and 29 mm. and the sides of the fossa are much more strongly curved and

Skull-measurements (in mm.) of *Selenarctos thibetanus laniger* and of *S. th. gedrosianus*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4, m^1, m^2.	m_1, m_2, m_3.
laniger.									
Dunga Gali, Murree ; ad. ♂	303	(282±)	206	163	69	86	66	13, 19, 29	— — —
Dachigam, Kashmir ; ad. ♂	285	273	194	151	73	79	63	12, 19, 28	19, 20, 15
Tungal, Pir Panjal ; ad. ♂	294	266	186	147	70	75	62	12½, 19, 28	20, 20, 15
Shanshubi Mt., Kashmir ; ad. ♂	269	256	170	138	65	70	60	11, 18, 28	18, 19, 14
Sind Valley, 15 m. from Srinigar ; ad. ♂	263	251	175	135	65	68	57	11, 18, 28	19, 20, 15
Malawan, Pir Panjal ; ad. ♀	257	248	163	131	63	61	54	11, 17, 26	19, 19, 14
Vernag, Kashmir ; ad. ♀	253	240	162	133	65	67	61	12, 18, 28	20, 20, 15
Lidder Valley, Kashmir (type) ; old ♀	250	—	171	127	73	70	56	11, 18, 26	19, 19, 15
gedrosianus.									
Mekran Coast (Blanford) ; ? ad. ♂ ...	266	—	175	—	—	74½	66	— — —	— — —
Baluchistan ; ? ad. ♀.....	242	—	149	120	—	56	55	— — 27	— 20 —
Baluchistan ; ? ad. ♀.....	232	220	145	114	57	56	54	12, 18, 25	19, 19, 14
Baluchistan ; immature	—	—	—	—	—	—	—	13, 20, 29	23, 22, 16

convergent behind than in the Shanshubi skull. The skulls of the ♀ vary much less and the sagittal crest is confined to the occiput (fig. 42, p. 213).

Habits.—Apparently the same as those of the last race (p. 211). Although overlapping the range of the Red Bear, the Black Bear is typically found at lower altitudes, being essentially a forest species. According to Major Burrard it is never found in the Himalayas above the tree-line at about 11,000 ft. He observed it in the trough between the Great Himalayan and the Zaskar Ranges, but as a general rule it seldom occurs on the northern slopes of the Great Himalayan Range, although it is common in all the lower ranges between the main axis, the Dhauladhar, and Pir Panjal ranges, and frequently in the jungles of the Terai. Like the Red Bear it usually descends to lower levels in winter; and, according to Col. Stockley, it may be fairly plentiful in a particular locality in one year and absent from it the next.

With certain negligible variations, due to average differences in environment, the omnivorous feeding habits of Black Bears are to all intents and purposes the same as those of Red Bears, both varying a mainly vegetable diet with fresh flesh of animals they kill, or even with carrion. Black Bears live on grass, corn, roots, fruits, berries, and nuts of various kinds, such as pears, apricots, mulberries, rowan berries, walnuts, hazelnuts, chestnuts, and acorns, and Col. A. E. Ward records that they destroy hundreds of young blue pines, from 8 to 10 ft. high, by stripping the fresh green bark to get at the resin. When the corn crops are ripening or ripe, and the orchards laden with fruit, they inflict great loss upon the owners by their depredations, climbing the trees for the fruit and raiding the maize-fields, where they destroy perhaps more crops than they actually devour by trampling down the stalks. They are expert climbers, and Col. Stockley says he has seen them up trees to a height of 75 ft. from the ground. In the way of flesh they eat goats, sheep, and occasionally cattle and ponies, and pounce on newly born fawns lying low in the forests. Col. Stockley records that two Black Bears on one occasion killed 42 sheep in a night in Kashmir, and that in 1926 he shot one that was said to have destroyed over 300 sheep and a score of cows. Like other bears the species is fond of honey, sometimes even robbing the beehives of the villagers, and eats insects as well, turning over stones in its search for them.

The senses of sight and hearing are said to be keener than those of the Red Bear and Sloth Bear.

There seems to be general agreement amongst sportsmen acquainted with the two species that Black Bears are more

dangerous to man than Red Bears—at all events the records of their killing or mauling human beings are more numerous. This, however, is doubtless due not to their being more powerful or more formidable antagonists at close quarters, but to the greater frequency of their encounters with human beings owing to their habit of haunting the neighbourhood of villages to raid the orchards, maize-fields, and sheep-pens, and to their general preference for districts overgrown with trees and bushes providing cover, which increases the likelihood of unexpected meetings. A bear suddenly startled in this way may charge at sight without further provocation; a wounded bear is almost always dangerous, and females are particularly savage when accompanied by cubs. Most of the accidents, however, that happen arise from the attempt to drive the bears from the crops or orchards by villagers armed only with sticks or other inadequate weapons. In this way many get severely wounded, if not worse. Col. Stockley tells us that in 1930 he met in the Bundipur Valley in one week three men who had recently been mauled by bears that had been raiding their fields; and the bear, above referred to, that was reported to have destroyed the sheep and cows had killed one man and crippled another for life. The bears almost invariably attack the face and scalp with their claws and the injuries they inflict he described as "ghastly." Major Burrard states that they have no fear of man; and the late Major C. S. Rodon told me that he once saw a Black Bear drive a leopard from its kill.

The evidence regarding the hibernation of the Black Bear is conflicting. Blanford probably nearly expressed the truth of the matter in his summary of the data known to him when he wrote :—"The fact is doubtless, as stated by Kinloch, that they do not hibernate completely as *U. arctus* [the Red Bear] does, but that they remain in a state of semi-torpor, often in a hollow tree, during the cold months, moving about and feeding a little on milder days." This, however, applies only to such specimens as spend the winter at tolerably high altitudes. Major Burrard definitely states that they do not hibernate, adding that in hard winters they often come down in large numbers to the jungles at the foot of the Himalayas, the country round Dehra Dun one year being infested in this way, several being shot in cantonments and in the outlying parts of the town itself. C. H. Donald, on the contrary, thinks that those that are caught by December snows at fairly high altitudes are compelled to lie up, whereas those that are able to make their way down to the oak-forests at about 3,000 or 4,000 ft. remain active, as was attested by his shooting them in January and February below Mussooree (Journ. Bomb. Nat. Hist. Soc. xii, p. 576). This appears to be the

view of Col. A. E. Ward, who states that they do not as a rule willingly hibernate, but that some females, with cubs, and old males which have taken up their abode in the higher mountains lie up in the winter, being unable to travel far over the frozen snow, which cuts their paws. He adds, however, that when driven by the snow to the shelter of caves or hollow trees they can be heard in their retreats and dislodged from them. This clearly proves that they are not hibernating in the true sense of the word, which implies complete inactivity due to torpid sleep (Journ. Bomb. Nat. Hist. Soc. xxix, p. 318, 1923 ; and xxxiii, p. 70, 1929).

According to Col. Stockley they seem to hibernate more or less completely from late December to about the middle of March at tolerably high altitudes. He saw them at 9,000 ft. on March 21st. At lower levels in Kashmir their hibernation is described as partial and may be broken during any spell of mild weather. But in the lower levels of the eastern Himalayas they may be seen at any time of the year, and he observed them out and about in thick snow in January on the Takht-i-Suliman massif in Baluchistan. From the observations above quoted there seems to be no evidence that this bear hibernates in the sense that the habit is practised by the Red Bear.

The breeding habits are very similar to those of the Red Bear. Except in the rutting season, which, in the Himalayas at least, occurs in October, the sexes are generally found apart. The cubs, generally two in number and small and blind at birth, as in other bears, are born in late winter or early spring, the female always lying up with them in thick jungle or undergrowth, sometimes availing herself of the shelter of a cave or hollow tree-trunk. The young stay with the mother at least apparently until the following winter, sometimes longer, even until the cubs of the next season are active and about with her. This seemingly accounts for the parties of four or more that may occasionally be observed.

65 *c*. **Selenarctos thibetanus gedrosianus** Blanford.

Ursus gedrosianus, Blanford, Proc. As. Soc. Beng. 1877, p. 204 ; id., Journ. As. Soc. Beng. pp. 46, 317, 1877 ; id., Proc. As. Soc. Beng. 1879, p. 4.
Ursus torquatus, Blanford, Mamm. Brit. Ind. p. 198, 1888.
Selenarctos thibetanus gedrosianus, Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 116, 1932.

Locality of the *type*, Tump, 70 miles north of Gwadar on the Mekran coast, Baluchistan.

Distribution.—Southern Baluchistan, range northwards unknown.

This provisionally admitted race is distinguished on the available evidence from the preceding two races of *Selenarctos* by the colour, at least in Mekran coast examples, being very dark brown or rufous-brown, instead of black, and by its slightly smaller skull. (See also under *Ursus arctos isabellinus*, p. 184).

Blanford originally described this bear as a distinct species on the evidence of a skin and skull sent to him from the typical locality. The skin was dark rufous-brown, with the muzzle whitish, a white spot on the chin and a narrow white semi-circular collar, not produced in front of the shoulder; the coat was harsh, thin and short, 1½ in. long on the body and 2½ in. on the shoulder. He subsequently received from the same place a second skin which was very much darker brown than the type but "far from black like the Himalayan Black Bear." The skull of this specimen, of which he gave some measurements, he declared to be scarcely distinguishable from that of a Black Bear from Alipore with which he compared it; but a second skull, said to be that of an adult animal, he dismissed, without supplying measurements, as "very much smaller than any full-grown skull" of the Himalayan Black Bear. Naturally, and probably rightly, he concluded these skulls to belong to a male and female of the same race. In 1879, however, he expressed the opinion that *gedrosianus* was to be regarded as "little more than a race or subspecies" of the Himalayan Black Bear, and in 1888 he went a step further, adding *gedrosianus* to the synonymy of *thibetanus*, or *torquatus* as he called it, with the remark that he had been deceived by a discoloured skin into thinking that it represented a valid species. It is not clear whether he thought the skin was artificially discoloured or not. Moreover the second skin, although darker, was also brown.

Blanford's specimens of this bear have unfortunately disappeared. At all events they are not preserved in the Indian Museum, Calcutta, as I was informed by the Director, Col. Seymour Sewell, to whom I wrote in 1932 to inquire for them. He very kindly sent me, however, a couple of adult, but unsexed skulls, and a fragmentary immature skull labelled "Baluchistan," without further history. The adult skulls are a little smaller than any skulls of the two Himalayan races I have seen. I provisionally regard them as ♀ examples of *gedrosianus*. The smaller of the two is the older and has a better developed occipital crest, but its teeth are a little smaller. The teeth of the cub, which are quite unworn, are larger than those of either of the adults, and the teeth of the three specimens collectively are at least as large as in the Himalayan races of the species, as shown by the table of measurements. In this table are inserted the dimensions

given by Blanford, converted from inches into millimetres, of the larger of the two skulls he received from the Mekran coast. It is larger than either of the two skulls regarded as ♀, and I follow Blanford in considering it as probably the skull of a ♂. It is smaller on the average than ♂ skulls of the Himalayan races.

Since the arid environment of these bears from the Mekran coast is, as Blanford pointed out, very different from the woodland habitat of Himalayan races, there is nothing surprising in their being subspecifically distinct. Nor is their smaller size surprising considering that their food must be much less plentiful; and their paler brown hue is probably associated with the semi-desert conditions under which they live. All Baluchistan bears of this race, however, are not brown. Col. Stockley, as recorded above (p. 218), saw a black one on the Takht-i-Suliman plateau; and a living example exhibited some years ago in the Zoological Gardens, London, was, I recollect, indistinguishable in colour from typical Himalayan specimens, from which it differed merely in being rather smaller.

Several local races of *Selenarctos*, apart from those occurring within British Indian precincts, were discussed in my paper in 1932, and in 1929 and 1938 by G. M. Allen, who was the first to point out that certain skull-characters used by previous authors to differentiate some of the alleged races of this bear have no systematic significance, being due to individual variations with age or to other factors.

Allen admitted as valid the race from Hainan * described by Matschie as *S. melli*. I entered this name interrogatively as a synonym of typical *thibetanus*, but more likely as a synonym of *formosanus*, the Formosan race. But in 1938 Allen gave the skull-measurements of an old ♂ bear from Fokien which he identified as *Euarctos thibetanus melli*. This skull has a condylobasal length of 260 mm., which agrees with that dimension sufficiently well in typical *thibetanus* to justify the conclusion that the latter race extends into S. China, whether it be the same as the Hainan bear or not. On the other hand, the only adult ♂ skull of *formosanus* that I have seen with the condylobase measureable has that area 248 mm., suggesting that the Formosan race is a smaller form. The rest of the information supplied by Allen about this Fokien bear also agrees with typical *thibetanus*.

The Japanese race, *S. thibetanus japonicus* Schlegel, 1857, of which *rexi* Matschie, 1897, is a synonym, is the smallest of all the races of the species, with the condylobasal length

* In my paper, as pointed out by Allen in 1938, I wrongly stated that Kwangtung (Canton) was the typical locality for this form.

of the ♂ skull 225 mm. and of the ♀ 218 mm. or thereabouts, Temminck, who first described it in 1844 as *Ursus thibetanus*. being unable to distinguish it from the type of the latter as described by Cuvier, stated that it is found in the mountainous parts of the Japanese Archipelago.

A western Chinese race from Moupin, Shensi, and Szechwan, described as *Selenarctos mupinensis* and *leuconyx* by Heude, 1901, as *Ursus torquatus mcneilli* by Lydekker in 1909, and as *Ursus clarki* by Sowerby in 1920, I provisionally admitted

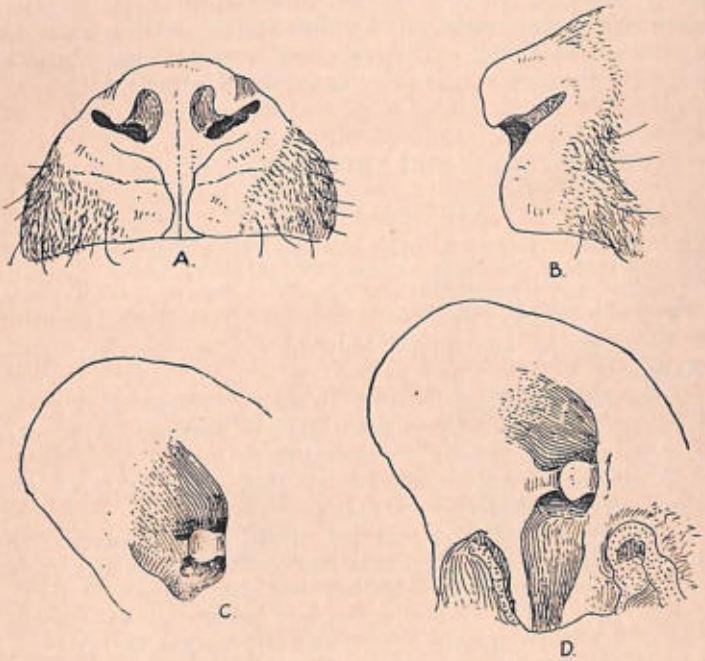


Fig. 43.

A and B. Front and side views of the rhinarium of Malayan or Sun Bear (*Helarctos malayanus*).

C. Right ear of the same, showing its small size and broad, not tubular base.

D. The same, cut open to show absence of supporting cartilages. These two figures of the ear for comparison with fig. 29, A, p. 170, showing the tubular shape of the mobile ear in *Ursus* and also in *Melursus* and *Selenarctos*.

as valid, the material to ascertain its precise status being inadequate. It is a thick-coated form like the Kashmir race *laniger*, thus differing from its geographically nearer ally from Assam, typical *thibetanus*. It is also noteworthy that

the only skin of this race I have seen, namely that of a subadult ♀ of *mcneilli* collected by Berezowski at Loung-ngan-fou in the mountains of Szechwan, and dated October 28, when the coat would hardly be fully developed, differs in its abundance of underwool from the skin from Htingnan, Upper Burma, collected by R. Kaulback in February, when the coat should be at its fullest.

The most northern race of all from Amurland, Manchuria, and Chihli, was identified as *S. thibetanus ussuricus*, described by Heude as a distinct species from Ussuri on the Russian boundary of Manchuria, and by Howell as *S. thibetanus wulsini* in 1928 from Chihli. This race has a longer coat than the more southern races and also apparently a larger skull.

Genus **HELARCTOS** Horsfield.

The Malayan Bear.

Helarctos, Horsfield, Journ. Zool. ii, pp. 221 & 233, 1826; Pocock, Ann. Mag. Nat. Hist. (9) i, p. 383, 1918; id., Bomb. Nat. Hist. Soc. xxxvi, p. 131, 1932; G. M. Allen, Mamm. China and Mongolia, pp. 325, 339, 1938.

Type of the genus and only known species, *malayanus* Raffles.

Distribution.—From North Burma, possibly Assam, and parts of Indo-China through the Malay Peninsula to Sumatra and Borneo, but apparently absent from Java.

Distinguished * from the other genera of the family by external, cranial and dental characters.

The ear is small and rounded, broad not narrowed at the base, or distally expanded, is capable of very little movement, and has no supporting cartilaginous ridges apart from the supratragus. The rhinarium is not nearly so well defined below and in front as in *Ursus* and *Selenarctos*, the skin here being naked on the upper lip, which is more protrusible than

* In his key to the three genera of bears included in the Chinese and Mongolian fauna, namely *Ursus*, *Selenarctos* (his *Euarctos*) and *Helarctos*, G. M. Allen (Mamm. China and Mongolia, p. 325, 1938), cited as diagnostic of *Helarctos* the suppression of one of the anterior premolars of the upper and lower jaws. They are very commonly absent, especially in adult skulls, but by no means always. In an old ♀ from Sai Yoke in Siam (Gairdner) in the British Museum pm^3 is present but displaced externally so that pm^1 and pm^4 are nearly in contact, and in the lower jaw the four premolars are present and form a normal straight line, pm_2 and pm_3 being smaller than pm_1 and pm_4. The same feature is found in the lower jaw in an old ♀ from Acheen, Sumatra (Frost). Also in a young skull from Quangtoi, Annam (Delacour and Lowe) the four permanent premolars, with the second and third displaced, are present, above and below, behind the milk-canines. (Text-fig. 49, C–F, p. 229).

in those genera, and this is associated with a longer, more protrusible tongue, both the lips and tongue foreshadowing the extreme modification they exhibit in *Melursus*. The fore foot has its pads as in *Selenarctos*, the two carpal pads forming a wide piriform area behind and in contact with the plantar pad; the digital pads are mostly free from webbing, which extends only to their proximal ends, and there is a patch of hair on each of the four interdigital webs; the hind foot has similar digital pads and webs and the rest of the sole, apart from the hairy heel, has a practically continuous pad with very little differentiation between its plantar and metatarsal

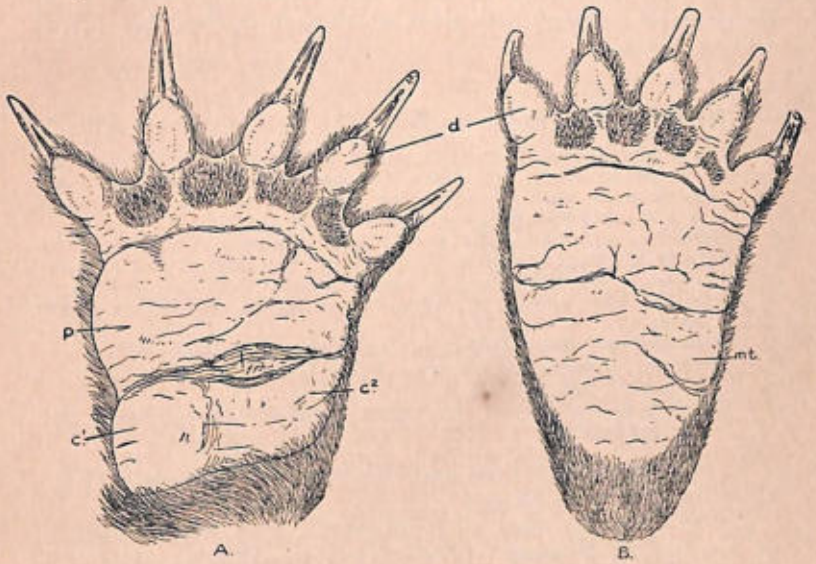


Fig. 44.

A. Lower side of the right fore foot of Malayan or Sun Bear (*Helarctos malayanus*) with the digits spread to show the extent of the webs, with the interdigital patches of hair, and the size and shape of the carpal pad resembling that of *Selenarctos* (fig. 39, A, p. 204).

B. Lower side of the hind foot of the same.

d, digital pad of second digit of the fore foot and fifth digit of the hind foot; *p*, plantar pad of fore foot; c^1, c^2, coalesced outer and inner elements of the carpal pads to form a single large pad; *mt*, metatarsal pad with the heel hairy behind it.

elements. Some other external differences are mentioned under the specific description.

In the skull the chief distinguishing features are the shortness of the jaws, the relatively large canine teeth expanding the muzzle in front, so that its width often considerably

exceeds that of the postorbital area, and shortening the dental area behind so that the second and third premolars may either be absent or displaced and the first and fourth sometimes almost in contact. Also the posterior parts of the skull, to which the muscles of the jaws and neck are attached, *e. g.* the zygomatic arches and the mastoid processes, are exceptionally wide, the width across the mastoids equalling or surpassing the length of the palate and mesopterygoid fossa; the auditory bulla is distinctly swollen and the width of the tympanic bone from the inner edge of the bulla to the orifice is about equal to the length of the upper series of premolar and molar teeth, the molar teeth, above and below, being shorter as compared with their width than in the other British Indian bears.

66. **Helarctos malayanus** Raffles. The Malayan Bear. (Pl. V.)

Ursus malayanus, Raffles, Tr. Linn. Soc., Zool. xiii, p. 254, 1822; Horsfield, Zool. Res. Java (unpaged), 1824; and of many subsequent authors, including Blanford, Mamm. Brit. India, p. 199, 1888 (quoted as *malaianus* by F. Cuvier).

Helarctos malayanus, Horsfield, Zool. Journ. ii, p. 234, 1826; Cantor, Journ. As. Soc. Beng. xv, p. 191, 1846; and of recent authors, including Pocock, Journ. Bomb. Nat. Hist. Soc. xxxvi, p. 132, 1932, and G. M. Allen, Mamm. China and Mong. p. 339, 1938.

Helarctos euryspilus, Horsfield, Zool. Journ. ii, p. 234, 1826.

Helarctos annamiticus, Heude, Mém. Hist. Nat. Chin. v, pt 1, p. 1, pl. i, figs. 1–2, 1901.

Ursus malayanus wardi, Lydekker, Proc. Zool. Soc. 1906, p. 997, fig. 142 (skull).

Vernacular.—*Wek-won* and *Kywe-wun* (Burmese); *Tsap* (Kachin); *Bruang* (Malay).

Locality of the *type* of *malayanus*, Bencoolen, Sumatra; of *euryspilus*, Borneo; of *annamiticus*, Annam; of *wardi*, alleged to be Tibet.

Distribution.—As under the genus.

Distinguished from the other species of bears occurring in British India by its small size, somewhat bowed front legs with the paws more inturned. The coat, in good condition, is short and sleek, thickened with some underwool, but thin and harsh without wool during the moult. On the shoulders above there are two whorls whence the hair radiates in all directions, running forwards along the nape and to a varying distance on the crown, an arrangement not present in other bears; but on the sides of the neck there is, as in *Selenarctos*, a crest formed by the meeting of the downward stream from the nape and the upward stream from the throat. An additional peculiarity is the presence of a whorl in the centre of the breast-patch. The colour is typically jet-black, but

the dead coat may be tinged with brown or faintly speckled on the hair-tips with buff, and the paws are sometimes brownish at the edges; the muzzle is always greyish-tan or mealy above and below, and this tint blends with brownish hairs on the head. There is always a pale patch on the breast, but this varies individually in shape and colour, as in *Selenarctos*; it is usually buff, cream, or dirty white, more rarely ochreous; its shape is typically more or less crescentic, but one arm may be much bigger than the other and they may coalesce in front to form an irregularly circular or triangular mark or the patch may be shield-shaped owing

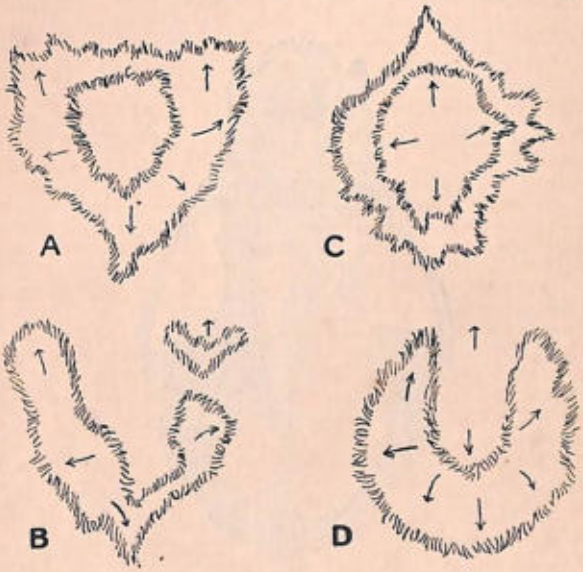


Fig. 45.—Variations in the shape of the breast-patch in the Malayan or Sun Bear (*Helarctos malayanus*).

A and B, from the Malay Peninsula; C, from Sumatra; D, from Cochin China.

The arrows indicate the radiating direction of the hair-growth.

to the invasion of the central area by yellow hairs. The claws are typically at all events black.

The only specimen measured in the flesh that has come to hand is an adult ♀ collected by J. M. D. Mackenzie in the Zamayi Reserve, 20 miles north of Pegu. The head and body were 3 ft. 5 in. long, and the ear 2 in. According to Peacock the average length in Burmese specimens is 4 ft., including the tail, which is 2 inches. Blanford quoted the same lengths

for the head and body and the tail, adding that the hind foot is 7 inches. The weight may vary from 50 to 100 lb.

In the synonymy of this species are cited the three names *euryspilus*, *annamiticus* and *wardi*. The first is dealt with below under the heading discussing the status of Bornean examples of this bear. The name *annamiticus* was given by Heude to three skulls from Annam which he claimed as distinct from skulls of the typical form from Sumatra in the steeper slope of the muzzle and in some dental differences; and to illustrate the steepness of the muzzle-slope he figured the skull of a very old specimen which had no cheek-teeth left. But the slope of the muzzle in this bear is a very variable individual

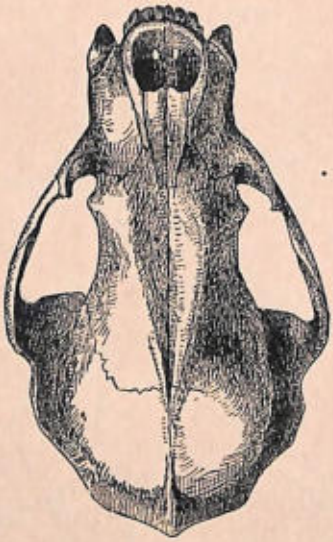


Fig. 46.—Upper view of skull of young Malayan or Sun Bear (*Helarctos malayanus*) for comparison with fig. 47 (p. 227) of an adult ♂ specimen to show variation in shape with age. After Blanford.

feature, depending on the development of air-cells in the frontal bones as in other bears; and since the unworn cheek-teeth of skulls from Annam and Cochin China that I have seen differ in no respects from those of skulls from Sumatra and elsewhere, it is impossible, on the evidence, to admit *annamiticus* even as a local race of *malayanus*.

With regard to *wardi*, the name was given by Lydekker to a skull said to have come from Tibet which he admitted was indistinguishable from the skull of typical *malayanus*. The pretext for naming it was a similar skull previously

reported to have come from Tibet with its skin which carried a thick coat quite different from the coat of southern examples of typical *malayanus*. This skin, with its skull, was mounted and sent to Bergen ; but the photograph Lydekker procured of it and published in his paper clearly represents a *Selenarctos*, as shown by its large ears and long coat. Lydekker, however, thought it might represent a *Helarctos*. I have no doubt whatever that the skin was the skin of a *Selenarctos* which may have come from Tibet ; but since the skull certainly did

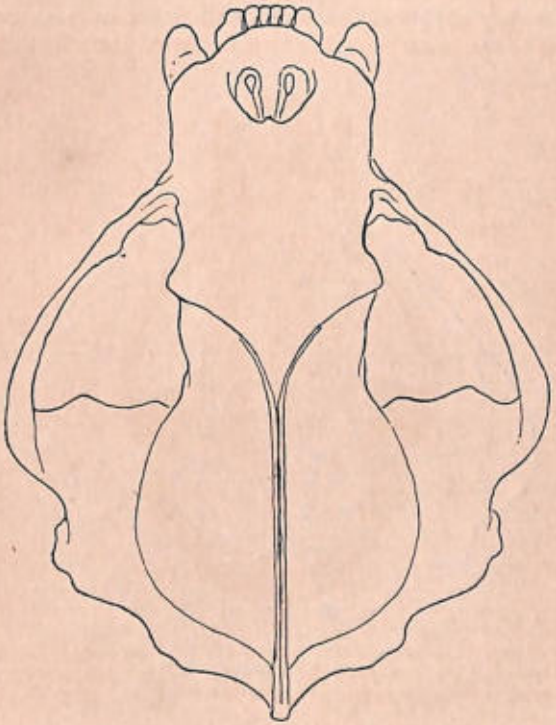


Fig. 47.—Upper view of skull of an old ♂ Malayan or Sun Bear (*Helarctos malayanus*) from Toungoo, Burma (E. W. Oates).

not belong to it the evidence that it came from Tibet amounts to very little.

Since, however, the species, as proved by R. Kaulback's specimen, referred to below (p. 232), occurs far to the north in Upper Burma, it may also be found in the forested districts of south-eastern Tibet, and perhaps the typical skull of *wardi* came from that district. I can, however, find no feature in

this probably ♂ skull to justify the opinion that it represents a race distinct from typical *malayanus*, as here understood, in view of the great individual differences exhibited by the skulls I have seen. Some of these differences in dimensions are brought out by the table of measurements; the shape of the dorsal profile differs as much as in *Selenarctos*.

The Bornean Race of Helarctos malayanus.

In 1932 I dismissed *euryspilus*, the name given by Horsfield to a Bornean representative of this bear, as a synonym of

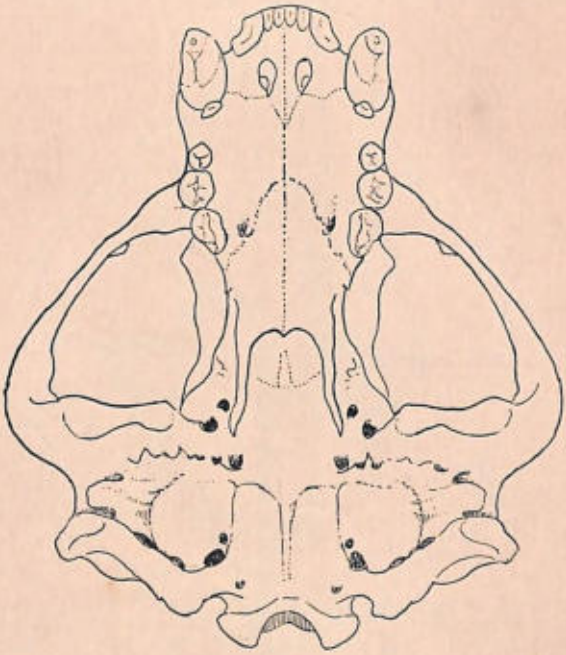


Fig. 48.—Lower view of the skull of the old ♂ Malayan or Sun Bear (*Helarctos malayanus*) from Toungoo, with the occipital condyles restored from another specimen.

malayanus because the character relied upon, namely the shield-shaped, wholly yellowish breast-patch, was not found in two Bornean skins in the British Museum, the feature being regarded merely as an individual variation; and in the discussion of two adult skulls, one from British North Borneo (Brit. N. Bornean Co.) and one from Sarawak (Wallace), both unsexed, but differing considerably in size, I treated them as probably ♀ skulls, the larger of the two being about equal

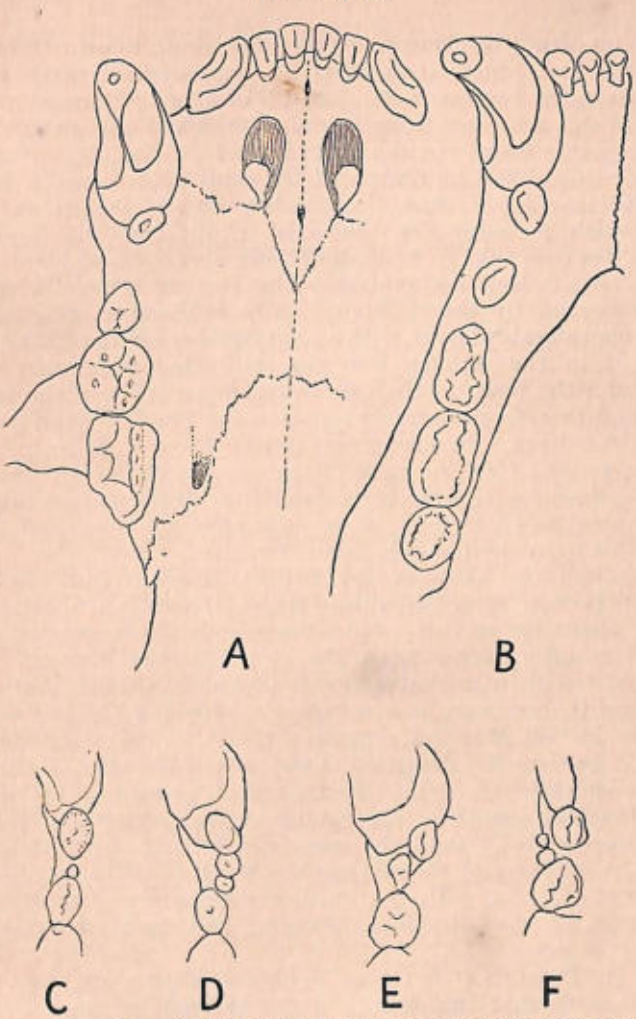


Fig. 49.—Dentition of the Malayan or Sun Bear (*Helarctos malayanus*).

A. Upper teeth of the right side, considerably worn, of the old ♂ from Toungoo.

B. Lower teeth of the left side of the same. The second and third premolars shed in both A and B. B also shows the comparatively short mandibular symphysis as in *Ursus* and *Selanarctos* (fig. 40, B, p. 206), not long as in *Melursus* (fig. 36, B, p. 192).

C. Fore part of lower jaw of right side of adult specimen with small pm^3 (? milk tooth) retained.

D. The same of ad. ♀ from Acheen, Sumatra, with pm_2 and pm_3 retained.

E. The same of ad. ♀ from Sai Yoke, Siam, with pm_2 or pm_3 retained.

F. Fore part of upper jaw of young from Quantri, Annam, with milk canine and pm^2 and pm^3 (? milk-teeth) retained but displaced externally.

in its important dimensions to an adult skull, known to be ♀, from Sai Yoke, Siam (Gairdner). I suggested, however, that the two might represent the ♂ and ♀ of a small Bornean race, *euryspilus*. At that time I had overlooked two papers by Lyon on this bear. In the first (Proc. U.S. Nat. Mus. xxxiii, pp. 561–562, 1907) he compared the skull of an adult ♂, from the Kateman River, Sumatra, which he identified as *H. malayanus*, with an adult, but unsexed, skull from the Landak River, Borneo, said to be undoubtedly also a ♂ and identified as *H. euryspilus*, distinguishing the two, to which he gave specific rank, by the difference in size, the Sumatran skull being considerably larger, with a condylobasal length of 234 mm., whereas in the smaller Bornean skull that dimension was 205 mm., the teeth of the two being approximately the same size, and therefore relatively larger in the Bornean than in the Sumatran form. In his second paper (Proc. U.S. Nat. Mus. xxxiv, p. 660, 1908) he gave the measurements of an adult ♀ of *H. malayanus* from the Kateman River, which had a condylobasal length of 218 mm., thus surpassing the supposed ♂ of *eryspilus* from the Landak River, Borneo.

Although the skull in the British Museum from British North Borneo is considerably larger than Lyon's Bornean skull, about the size of ♀ Sumatran skulls of the species, and has in addition larger teeth, the view that the Bornean bear represents a distinguishable form is probably, I think, correct.* I regard it, however, as a subspecies, of which the two skulls in the British Museum represent the ♂ and ♀ respectively. With regard to the dentition, Lyon stated that the last three upper cheek-teeth of his Bornean skull measured 44½ mm., and that the length of the canine at the base was 22½. In my supposedly ♂ skull the same cheek-teeth are 48½ mm., and the alveolus of the canine, the tooth itself being absent, is about 27 mm. In the smaller supposedly ♀ skull from Sarawak the cheek-teeth are 45 mm., and the alveolus of the canine 21 mm.

E. H. Peacock (' A Game Book for Burma etc.', p. 193, 1933) states that this bear is found throughout Burma, particularly in the heavy forests in the north and south, but does not appear to be so fond of steep, rocky hill-sides as the Himalayan Black Bear. This record of its occurrence throughout the country confirms the information on that head supplied by Anderson to Blanford, who especially mentioned Tenasserim, Arakan, Chittagong, and the Garo Hills as localities where it has been found. No specimens were obtained by the Mammal Survey in any part of Assam. A few were

* Since this paragraph was written Chasen has come to the same conclusion (Bull. Raffles Mus. Singapore, no. 15, p. 89, 1940).

Skull and tooth-measurements (in mm.) of the two admitted races of *Helarctos malayanus*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4, m^1, m^2.	m_1, m_2, m_3.
H. m. malayanus.									
Toungoo, Burma ; ad. ♂	279	—	215	175	73	68	81	12, 17, 22	17, 17, 13
Bukit, Besar, Mal. Peninsula ; old ♂ .	270	246	220	166	68	66	78	12, 16, 21	17, — —
? Tibet (*wardi*, type) ; ad. ♂	254	238	203	171	76	72	74	11, 18, 21	17, 17, 13
Acheen, Sumatra ; ad. ♂	260	237	198	163	65	66	69	11, 16½, 20	17, 17, 12
Kateman R., Sumatra (Lyon) ; ad. ♂.	256	234	208	156	—	69	—	— — —	— — —
Sai Yoke, S.W. Siam ; ad. ♀	237	228	192	154	68	65	69	12, 19, 22	17, 17, 13
Acheen, Sumatra ; ad. ♀	237	223	184	151	68	63	68	10, 17, 21	17, 17, 12
Kateman R., Sumatra (Lyon) ; ad. ♀.	231	218	183	159	—	62	—	— — —	— — —
H. m. euryspilus.									
Brit. N. Borneo ; old ♂	238	220	182	150	58	58	67	12½, 16, 20	— — —
Landak R., Borneo (Lyon) ; ? ad. ♂ .	222	205	176½	134½	—	60	—	— — —	— — —
Sarawak, N. Borneo ; ad. ♀	206	190	156	125	55	51	54	10½, 15, 19	16, 15, 11

obtained or seen in Burma, but unfortunately none reached England. Shortridge, who got it at Kindat and at the Ruby Mines in the North Shan States, said that, like *U. torquatus* (=*S. thibetanus*), it appears to be fairly numerous in suitable localities. Oates found it at Toungoo and Mackenzie collected it on the Pegu–Tharrawaddy border and in the Chin Hills.

The most northern representative of the species I have seen is a young one, with milk-dentition, and the head and body of the dried skin about 20 in. long, which was sent by Ronald Kaulback from Htingnan, 3,000 ft., in Upper Burma (26° 36′ N.; 97° 52′ E.). It was found in a hollow tree on March 1st, and in accordance with the season has the coat thickened with underwool, although short.

Habits.—In their general habits, the food they eat, the sounds they emit, and in their senses they are, according to Peacock, very similar to the Himalayan Black Bear, and, like that species, they are usually shot during chance encounters in the forest. They have much the same temperament as the other species and are said to be equally liable to attack men. Their smaller size renders them less dangerous, but forest villagers are frequently mauled by them. This corroborates Dr. Mason's accounts of attacks by this bear on men, which Blanford suggested might have been perpetrated by the larger Burmese species. From observations on specimens in the Zoological Gardens I can confirm Blanford's statement that they are admirable climbers, surpassing in that respect, in my opinion, the other species of the family. Their general build, indeed, particularly the shape of the fore legs, suggests more perfect adaptation to arboreal life at the expense of general activity on the ground.

Family AILUROPODIDÆ*.

Although the Giant Panda (*Ailuropoda*), the living representative of a special family of Arctoid Carnivores, has not yet been discovered within the precincts of British India, a detailed account of it in this volume is called for by Blanford's reference to it, by the possibility of its turning up in the near future in Upper Burma, by the occurrence of a closely related and quite recently exterminated genus as far south as Mogok, by its being essentially a member of the Burmo-Chinese fauna, and by the great public interest in the animal aroused lately by the first importation to Europe of living specimens collected by Mr. Tangier Smith in Szechwan.

Resembling the Ursidæ in some external features, such as size, general form, the shortness of the tail and hind legs, the so-called plantigrade gait, equality in the length of the fore and hind feet, the wide plantar pads, the approximate alignment of the digital pads, and the large, non-retractile claws; but differing essentially from them in the shortness of the penis and its proximity to the scrotum—a character in which it also differs from the Canidæ, Mustelidæ, and the American family Procyonidæ,—in the presence of a large glandular area round the anus and external genitalia in ♂ and ♀,

* In a paper on the classification of the Procyonidæ (Proc. Zool. Soc. 1921, pp. 419–20) I proposed this family name for the Giant Panda (*Ailuropoda melanoleuca*, Milne-Edwards), of which the systematic position had previously been a subject involving great divergence of opinion. It was included in the Ursidæ by Flower and, following him, by Blanford, although Mivart had in the meantime assigned it, with the common Panda (*Ailurus*), to the Procyonidæ, of which they constituted a special subfamily. It was also placed in the Procyonidæ by Lankester and Lydekker, who do not appear to have been acquainted with Mivart's paper. Following them Bardenfleth attempted to show that Flower was correct in classifying it with the Ursidæ. In my opinion it belongs neither to the Ursidæ nor to the Procyonidæ. In some significant features it resembles *Ailurus*, but in others is so divergent that it seems better to keep the two apart in separate family groups.

In his analytical key to the families of Chinese and Mongolian Carnivores G. M. Allen, who retained the family Ailuropodidæ, distinguished it from the Ursidæ by the shortness of the muzzle, which, measured from the edge of the orbit to the end of the premaxillæ, is less than half the greatest zygomatic width, whereas in the Ursidæ, he states, it is greater. But the character does not hold good in all genera of Ursidæ. Quite commonly, in old skulls of *Tremarctos* and *Helarctos*, the zygomatic width considerably exceeds twice the length of the muzzle; and in some old skulls even of the genus *Selenarctos* it is a little wider.

in the form of the rhinarium, which is relatively much wider as compared with its depth and has a distinct grooved philtrum dividing the upper lip which is adherent to the gum, not free and protrusible.

A peculiar modification of the fore paw distinguishes it from that of all the other genera of Carnivora. The inner end

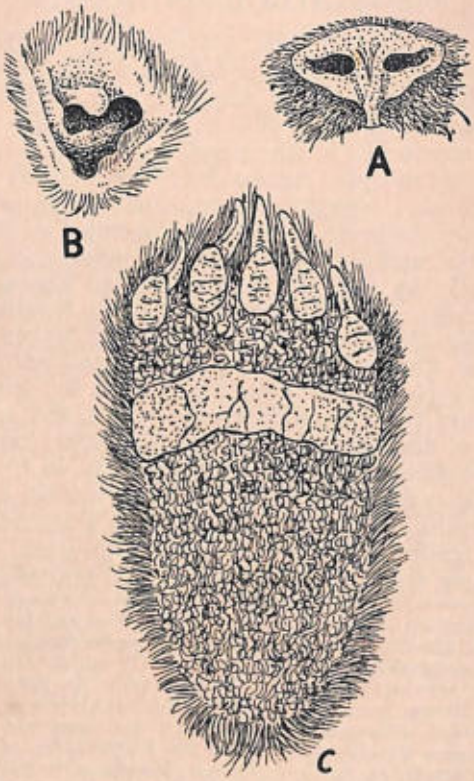


Fig. 50.

A. Front view of the rhinarium of the Giant Panda (*Ailuropoda melanoleuca*).
B. Base of the left ear of the same with the hair cut short.
C. Lower view of right hind foot of the same with the bear-like digits, the wide, short plantar pad and woolly hair covering the rest of the sole.

(A and B drawn from a fresh specimen.)

of the plantar pad is furnished with an accessory lobe which covers the tip of a slightly movable elongated bone developed from the carpus and lying alongside the metacarpus of the first digit, and completely enveloped in the skin of the paw so

as to be entirely invisible without dissection. The digital pad of the first and to a lesser degree of the second digit are capable of being flexed on to the summit of this accessory pad, with its supporting bone, to constiture a prehensile organ by means of which the animal can grasp the bamboo-shoots on which it feeds *.

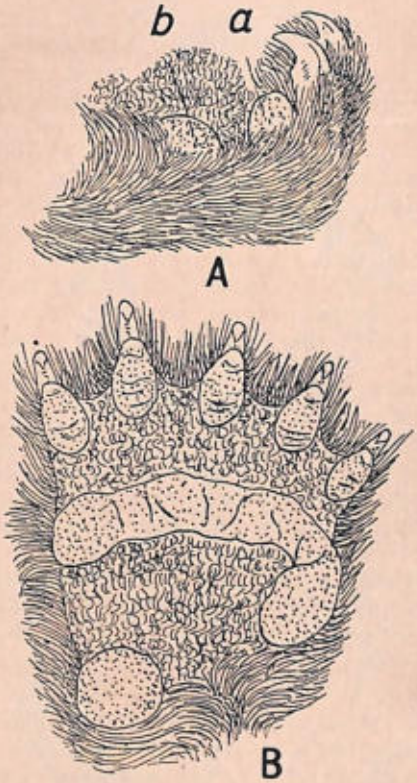


Fig. 51.

A. Inner view of right fore foot of the Giant Panda (*Ailuropoda melanoleuca*), showing the method of folding the pad (*a*) of the first digit on the accessory lobe, (*b*) of the plantar pad to constitute the grasping organ.

B. Lower view of right fore foot of the same, with the long hairs clipped or turned aside and the digits spread to show the webbing; also shown are the accessory lobe on the plantar pad and the carpal pad.

* The muscles by which the bone in question are moved were described by Wood-Jones (Proc. Zool. Soc. 1939, B, p. 113), and the peculiar grasping power of the fore paw was observed in the living animal in the Zoological Gardens, as shown in the plate illustrating his paper.

The skull and teeth are also profoundly modified, but although the affiliation of *Ailuropoda* with the Ursidæ was based largely on the evidence they supply, the differences are too great to admit the belief of close kinship between the

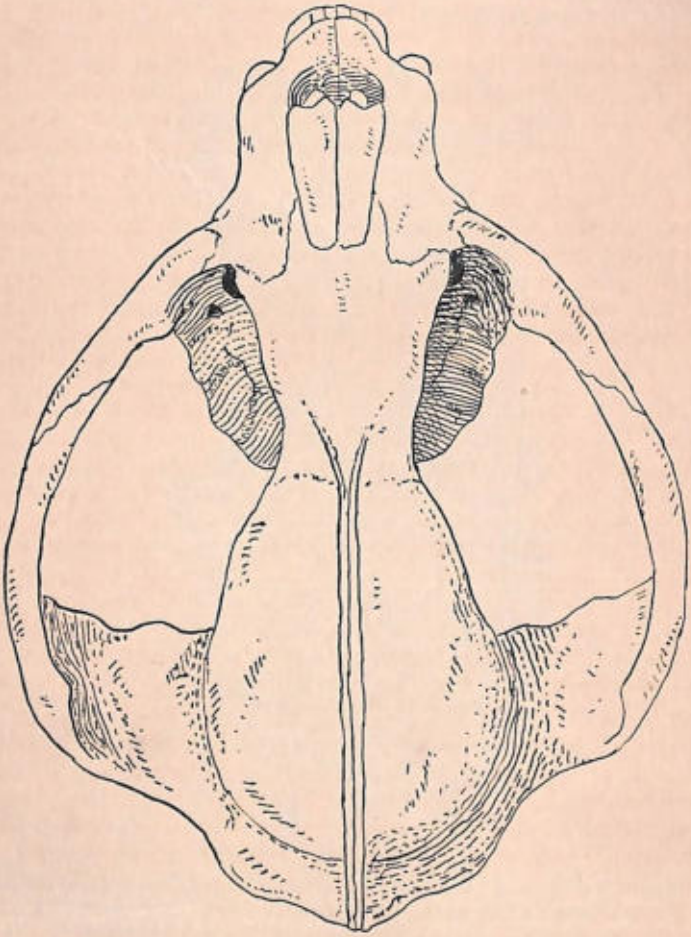


Fig. 52.—Upper view of skull of the Giant Panda (*Ailuropoda melanoleuca*), showing especially the narrow frontals, without postorbital processes, and the long floor to the orbit formed by the backward extension of the cheek-teeth far behind its anterior border. (For comparison with the skull of the Malayan Bear, fig. 47, p. 227).

groups. The cranial portion has the sides flattish, steeply sloped, and gradually blending dorsally with a high, thick sagittal crest, its general shape recalling that of the Hyæna.

The occipital crest is also well developed, and the zygomatic arches exceptionally so, being thick, very wide at the base, strongly arcuate, but nearly horizontal in lateral view, and with a very low anteriorly set postorbital process; and since there are no postorbital processes on the narrowed frontal bones, which gradually expand anteriorly from the narrow postorbital constriction, the orbits are almost imperceptibly defined from the temporal fossæ. This region of the skull is very different from that of the Ursidæ. Still more marked differences occur below in association with the excessively developed cheek-teeth, which extend far back beyond the anterior root of the zygoma, the posterior end of the last upper molar overlapping the anterior end of the mesopterygoid fossa, so that there is no long postdental palatal area such as is seen in the Ursidæ. The backward extension, moreover, of the teeth forms below the orbit a long, wide floor reaching to the postorbital constriction behind and exposed from the dorsal view owing to the narrowness of the frontal area. No such structure is visible in the Ursidæ. Additional differences are the position of the preorbital foramen above the anterior half of the upper carnassial, the absence of the alisphenoid canal, the comparative shortness of the auditory tube so that the orifice is deeply sunk in the fossa between the large mastoid and the glenoid process of the squamosal, and the position of the postpalatine foramen opposite the first, not the second molar. Also in the mandible the angular process is small and inturned, the condyle is very large and wide to fit the immense glenoid area of the zygomatic arch, and the coronoid process is high, narrowed above and strongly hooked, and the edge of the jaw is abruptly curved outwards behind the last molar, the entire formation of the postdental portion of the lower jaw being very different from that of the Ursidæ.

The dental formula is: $i.\ \frac{3}{3}$, $c.\ \frac{1}{1}$, $pm.\ \frac{4-3}{3}$, $m.\ \frac{2}{3}$. The variation in the number of the upper premolars is due to the retention or loss of the first, which, when present, is minute and functionless and generally set on the inner side of the canine. When it is retained the number of upper teeth is the same as in the Canidæ and potentially at all events in the Ursidæ. The presence of the third lower molar is a primitive feature shared by the Ursidæ and typically by the Canidæ, and the lower premolars are one fewer than in those families owing to the invariable loss of the first. Except numerically the teeth show no special likeness to those of the Canidæ, but in the massive development and hypertrophied tuberculation of the upper two and lower three molars they recall those of the Ursidæ, being similarly adapted for crushing and grinding tough vegetable food. The premolars, however, are very different from those of the Ursidæ, in which the first

three are clearly nearly functionless, with the first typically larger and always more persistent than the second and third. In *Ailuropoda*, on the other hand, the first is the least important, being minute in the upper jaw and absent in the

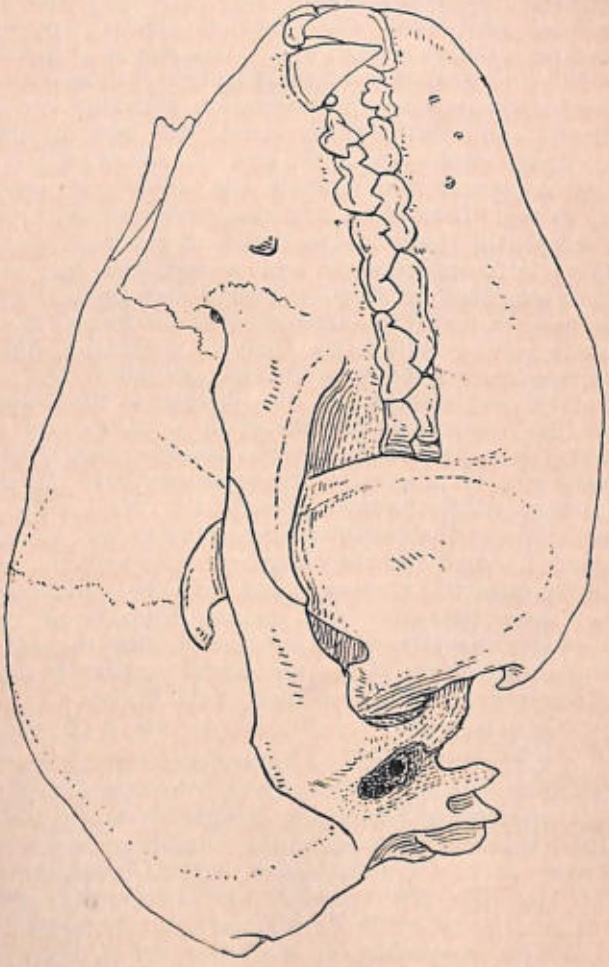


Fig. 53.—Side view of the skull of the Giant Panda (*Ailuropoda melanoleuca*).

lower, whereas the second and third are large, thick, two-rooted, tricuspid teeth *, the third upper having two additional inner cusps, and they are all in contact, not spaced. The

* In the recently extinct Burmese Giant Panda (*Ælureidopus*) the first upper premolar is absent and the second is one-rooted (p. 249).

fourth lower premolar is also a big, tricuspid tooth, quite unlike those of the Bears. The fourth upper premolar (carnassial) is a much more important tooth than in the Bears, being longer than the first molar, three-rooted, and provided with three large outer cusps and two inner cuspidate lobes, the posterior being the rooted protocone. The first upper molar is subquadrate, with rounded angles and a little wider than long, provided with two large outer and two large inner, but lower, cusps, with curved enamel ridges between them, the outer slopes of the inner being crenulate at the base; and there is a large tubercular cingulum on the inner edge of the tooth. The second molar is as wide as the first but a good deal longer; its anterior portion is tolerably similar to that of the first but has more accessory enamel ridges, the posterior portion, however, which is narrowed behind, has a single large outer cusp in front, the rest of it being covered with numerous tubercles and enamel-ridges; the cingulum is similar to that of the first but does not reach the posterior end of the tooth. The three lower molars progressively decrease in length, the inner cusps of the first and second are larger than the outer; the first (carnassial) has the three normal cusps on its anterior portion, one outer, two inner, its posterior portion or "heel" being massive and provided with two main cusps and some accessory ridges; the second molar, which is longer than wide, has four main cusps with accessory enamel folds and tubercles; the third molar is wider than long and has its surface flatter but studded with small cusps and tubercles. No known Bear has such highly developed and structurally complicated molar teeth.

In view of the many deep-seated differences between the Giant Panda and the Bears it seems probable that such resemblances as exist between them have been independently acquired in adaptation to similar needs.

The two admitted genera of this family are distinguished as follows :—

a. The first upper premolar, although minute, typically present, only very occasionally absent; the second a longish tooth, with two roots and a tricuspid crown; the canine teeth comparatively small.....	[p. 240. AILUROPODA, Milne-Edw.,
b. The first upper premolar absent; the second a short tooth, with a single root and probably a unicuspid crown; the upper canine massive and longer.....	[p. 248. ÆLUREIDOPUS, Woodw.,

Genus **AILUROPODA** Milne-Edwards.

Ailuropoda Milne-Edwards, Ann. Sci. Nat., Zool. xiii, art. 10, 1870.
Pandarctos, Gervais, Nouv. Arch. Mus. d'Hist. Nat. Paris, vi, p. 161, 1870.
Ailuropus, Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris, vii, Bull. p. 92, 1871 ; id., Rech. Mamm. p. 321, 1868–74 (altered to *Æluropus* and cited as such by many authors).
Ailuropoda of most recent authors, including Pocock, Proc. Zool. Soc. 1921, pp. 405 & 417 ; id., Proc. Zool. Soc. 1928, p. 975 ; and G. M. Allen, Mamm. China and Mongolia, p. 318, 1938.

Type of the genus and the only known species, *melanoleuca*.
Distribution.—As under the species.

The principal generic features distinguishing this genus from its only known ally are cited in the analytical key. Other characters are contained in the definition of the family, and need no repetition. For the rest it may be added that, although the general form is bear-like, the hind quarters are less robust, falling away in a manner recalling that of the Hyænas, and that the tail, although short, is less abbreviated, more triangular in shape, and broader at the base than in bears, acting as a cover to the large glandular area surrounding the anus. The general weakness of the hind quarters is emphasized by the massiveness of the head, due to the expanded zygomatic arches and the greatly developed masticatory muscles.

67. **Ailuropoda melanoleuca** David. (Pl. VI.)

Ursus melanoleucus, David, Arch. Mus. d'Hist. Nat. Paris, v, Bull. p. 13, 1869.
Ailuropoda melanoleucus, Milne-Edwards, Ann. Sci. Nat., Zool. xiii, art. 10, p. 1, 1870.
Ailuropus melanoleucus, Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris, vii, Bull. p. 92, 1871 ; and of subsequent authors quoted mostly as *Æluropus*.
Ailuropoda melanoleucus, G. M. Allen, Mamm. China and Mongolia, p. 319, 1938 (containing complete bibliography).

Locality of the *type*, Moupin.
Distribution.—Central and Western Szechwan north to the mountains bordering Kansu.

Coat thick, woolly, and about 50 mm. long in winter, with a hairy fringe on the cheek, shorter and less woolly in summer. Colour of the new coat typically black and white or reddish, the black frequently with a brown tinge and the white soiled in the old coat ; the head, the nape back to the shoulder and the sides of the neck white, the white of the head relieved by black ears and by a black patch over the small, bear-like eyes, this patch sometimes extending inferiorly towards the corner of the mouth ; the throat fuscous ; the legs black up to the level of the body, but the black of the fore leg extended



Panda (*Ailurus fulgens*).



Giant Panda (*Ailuropoda melanoleuca*).

upwards as a broad band passing over the junction of the shoulder and back; the area behind this band including the rump usually white but sometimes strongly tinged with red; hairs of the belly white at the tips but dusky below; hairs clothing the soles of the feet brownish-grey and noticeably paler than the tint of upper side of the foot.

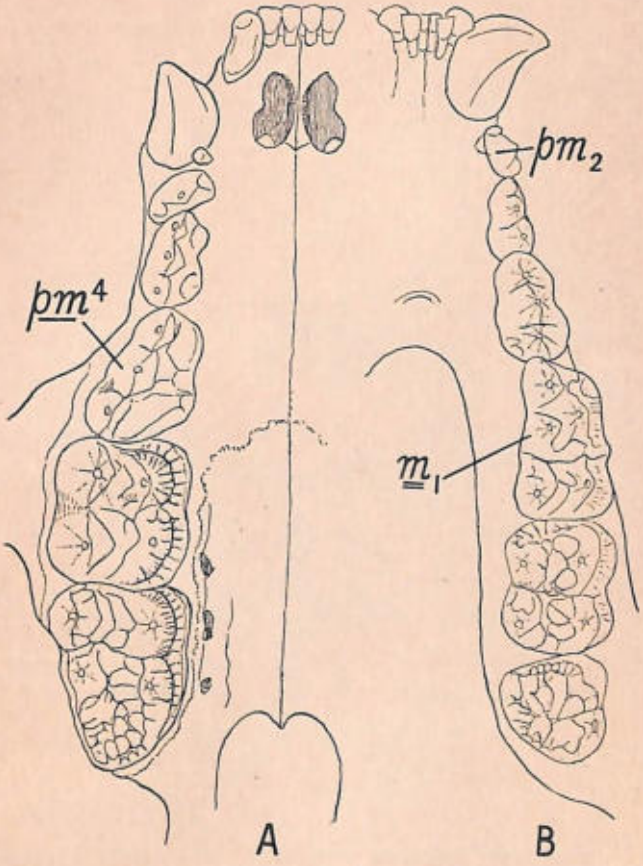


Fig. 54.—Dentition of the Giant Panda (*Ailuropoda melanoleuca*).

A. Teeth of right side of upper jaw, showing also the last molar considerably overlapping the level of the anterior edge of the mesopterygoid fossa.

B. Teeth of right side of lower jaw, showing also the long mandibular symphysis.

pm^4, upper carnassial; m_1, lower carnassial; pm_2, second lower premolar, the first absent.

The facial vibrissæ, as in Bears, mostly short and apparently almost functionless, represented by a few over the eye, of which the longest may be 60 mm., and a few on the upper lip and chin, but the genal and interramal tufts practically obsolete. The ears, as in typical bears, rounded distally, narrowed at the base, and mobile. The tail, as described above, short, broadly triangular. The feet, also as described, short,

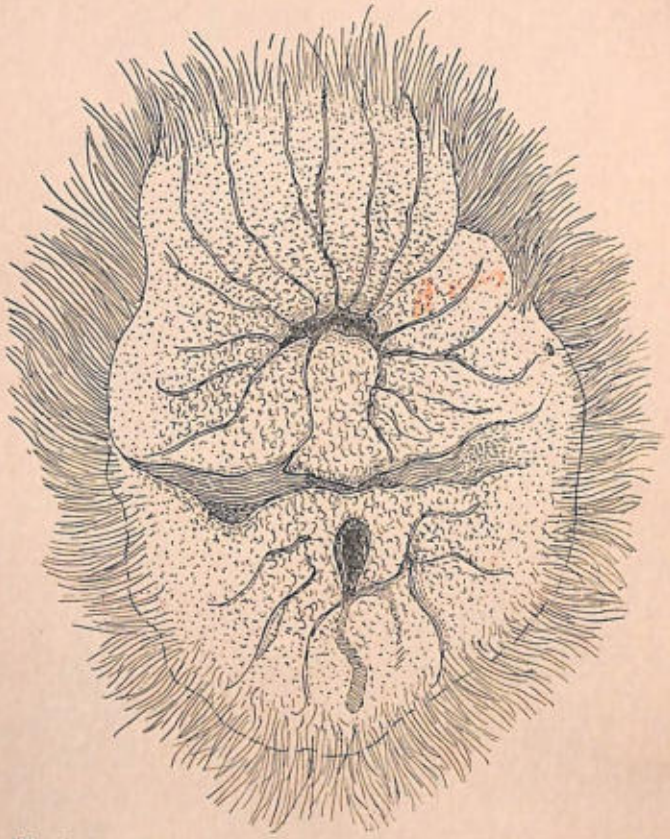


Fig. 55.—Subcaudal glandular area of ♀ Giant Panda (*Ailuropoda melanoleuca*), with the anus in its upper part and the vulva below.

broad, and bear-like, the fore paws a little broader than the hind but the two subequal in length. The fore foot with a tolerably large rounded or ovate external (ulnar) carpal pad, a broad, short plantar pad, with its accessory radial lobe projecting proximally beyond the level of its external margin; the digital pads ovate, narrowed distally, the five forming a lightly curved line, and tied tolerably tightly together by integument reaching beyond their proximal (posterior) ends;

all the pads more or less coriaceous, the areas between them clothed with woolly hair, but in the winter at least all the pads are concealed, being overlapped by the long hairs clothing the entire sole of the foot. The hind foot similar in essentials to the fore foot, but there is no trace of metatarsal pads and no accessory lobe on the plantar pad *.

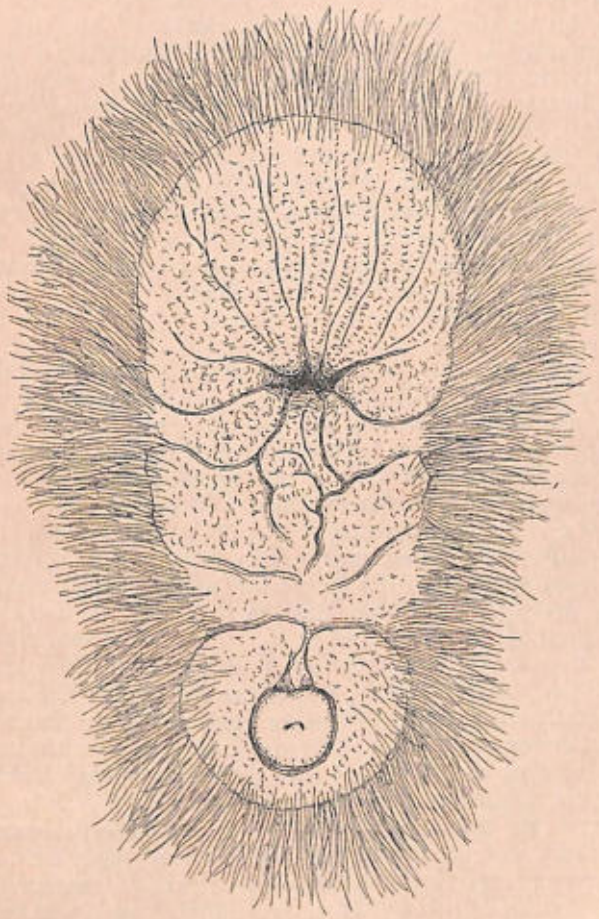


Fig. 56.—Subcaudal glandular area of ♂ Giant Panda (*Ailuropoda melanoleuca*), showing the proximity of the penis to the anus, the absence of the scrotum, etc.

* In the reduction in length of the plantar pads and the clothing of long hairs on the soles the feet of the Giant Panda adaptively more nearly resemble those of the Polar Bear (*Thalarctos maritimus*) than of any other genus of Ursidæ. But the Polar Bear retains a small metatarsal pad on the hind foot, as recorded in my paper in 1914 (Proc. Zool. Soc. 1914, p. 930, fig. 9).

The subcaudal glandular area* in the ♀ is extensive and irregularly ovate. It is divided by a deep, transverse groove into an upper portion surrounding the anus, and a lower surrounding the vulva. It is sparsely hairy laterally, and its surface is thrown into asymmetrical folds by grooves irregularly radiating from the orifices in question towards the margins of each half, those of the upper half above the anus passing on to the base of the lower surface of the tail. Its skin generally is highly glandular ; but the pair of anal glands, normally developed in Carnivora, appears to be aborted as in the Bears. But no bear has a trace of the glandular area described (fig. 55, p. 242). In the ♂ there is a somewhat similar glandular area but differing in a few details. The upper or anal portion is more extensive both above and below the orifice ; and between it and the lower or genital portion there is a longer area of naked, non-glandular skin. The genital area, on the contrary is less extensive than in the ♀ and encircles the prepuce. It is longer above than below and towards the margins laterally and below is more hairy than the anal area.

The perinæal area between the prepuce and the anus is short as compared with that of all the other genera of Arctoid Carnivora, except *Ailurus* ; but it is remarkable for the entire absence of the scrotum. The testes are inguinal in position and there is nothing in the external appearance of the genital area to suggest their descent into a scrotum. The animal looks as if it had been castrated (fig. 56, p. 243).

The only flesh-measurements with which I am acquainted were taken by myself from an old ♀ (Tangier-Smith) that died in the Zoological Gardens, London :—Head and body 4 ft. 9½ in. ; tail 5¾ in. ; hind foot 8⅛ in. The weight was 170 lb.

The flat skin of a supposedly ♀ ad. specimen (Brookes) in the British Museum is 4 ft. 8 in. from the nose to the root of the tail, the rest of the tail being missing. A mounted skin of another supposed ad. ♀ (Berezowski) is 5 ft. over the curves to the root of the imperfect tail. Another mounted skin of a very old ♀ (Stoetzer) has the head and body 5 ft. 4 in. over the curves, the tail being about 5 in. Milne-Edwards's unsexed type, also a mounted skin, had the head and body 5 ft. over the curves ; and two stripped skins, ♂ and ♀, measured by Jacobi and recorded by Allen, were 6 ft. and 5ft. 9 in. respectively. There seems to be very little doubt, as Allen suggested, that these two skins were stretched.

The skull differs considerably in size individually, as illus-

* I am indebted to the Zoological Society for the opportunity to examine and sketch this glandular area in two of Tangier-Smith's specimens, ♂ ♀, that died in the Gardens. The structure had not been previously observed.

Skull-measurements of the Giant Panda (*Ailuropoda melanoleuca*). (The sexes have been guessed by the size on the assumption that the skull of the ♂ is larger than that of the ♀.)

Locality and sex.	Total length.	Cond.-basal length.	Mastoid width.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.
Szechwan (4); ad. ♂	317	275	160	215	39	55	66	230
Szechwan (11); ad. ♂	304	270	166	210	45	51	63	228
Upper Min River (Brookes); ad. ♀	283	253	146	205	43	45	60	205
Szechwan (15); old ♀	280	250	158	211	42	48	59	210
Szechwan (Berezowski); ad. ♀	273	252	153	195	42	51	60	208
Szechwan (18); ad. ♀	263	242	132	190	48	47	56	200
Szechwan (12); ad. ♀	265	235	153	200	47	55	57	195

trated by the dimensions of those in the British Museum entered in the subjoined table and by those recorded by G. M. Allen. In the width of its areas it is subject to the changes with age normal in the Carnivora, especially those in which the masticatory muscles are exceptionally developed. Especially variable in shape is its dorsal profile, due to the size of the sagittal crest and the extent to which the frontal region is inflated with air-cells, the facial profile sometimes forming an evenly inclined slope, although more usually there is a marked concave curve where the nasals meet the frontals. In adults of both sexes the skull is remarkably heavy for its size owing to the compactness of its bony tissue.

In the preceding table of the measurements (in mm.) of the skulls of *Ailuropoda* the sexes have been guessed by size, none of them being so marked by the collectors. Those indicated by numbers were collected by Tangier-Smith, whose notes have gone astray. The collectors' names are entered after the others.

The broken skull of a very old ♀ collected on Stoetzer's Expedition to Szechwan has the mandible 225 mm. long.

G. M. Allen recorded three unsexed skulls with a total length of 290 mm. In one of them the condylobasal length was 260 mm., the difference of 30 mm. being about normal, whereas in the other the condylobasal length was said to be 285 mm. The latter figure is no doubt a misprint for 265.

As might be expected from their hypertrophied development, the teeth differ a good deal in the details of their tuberculation and enamel folds, sometimes on the two sides of the same skull. They also differ profoundly with age owing to wear, the tubercles in very old specimens being practically obliterated and the main cusps greatly reduced in height. The general uselessness of the canine teeth for feeding purposes is shown by an immature skull with a condylobasal length of 219 mm. and no sagittal crest to alter the roundness of the cranium. In this all the premolars and molars are fully erupted, but the points of the canines have not yet cut the gum.

In the following table are entered the measurement (in mm.) of some of the teeth. The upper row includes the five teeth from the pm^2 to m^2; the lower row the six teeth from pm_2 to m_3. In the columns in which two measurements are indicated the first figure represents the median length, the second the greatest width.

Habits *.—So far as is at present known the Giant Panda

* This account of the habits and occurrences is mainly abridged from the volume by G. M. Allen, who collected the records, to about 1937, contained in the memoirs of European and American travellers, of all the specimens of this interesting animal killed or observed or reported by natives.

Measurements of the posterior three teeth of the upper and lower jaws of the skulls entered in the previous table.

Locality and sex.	Upper row.	pm^4.	m^1.	m^2.	Lower row.	m_1.	m_2.	m_3.
Szechwan (4); ad. ♂	114	26	24 by 29	36 by 26	125	30	26 by 21	19 by 20
Szechwan (11); ad. ♂	111	25	23 by 27	32 by 26	118	31	24 by 21	16 by 18
Upper Min River (Brookes); ad. ♀	115	27	25 by 28	36 by 28	127	33	26 by 22	19 by 21
Szechwan (15); old ♀	102	22	21 by 25	30 by 23	111	29	23 by 20	17 by 18
Szechwan (Berezowski); ad. ♀	109	25	23 by 28	33 by 26	118	32	24 by 20	18 by 18
Szechwan (18); ad. ♀	100	23	22 by 25	30 by 23	111	29	23 by 20	17 by 18
Szechwan (12); ad. ♀	111	25	23 by 26	35 by 25	117	29	23 by 20	17 by 18

is restricted to the bamboo-jungles of the mountains of central and western Szechwan at altitudes ranging from about 6,000 to 12,000 ft. It feeds mainly, if not exclusively, upon bamboo-shoots up to half an inch or so in diameter, its droppings being composed solely to all appearance of the finely crushed fibres of this plant, for the mastication of which its powerfully developed jaw-muscles and huge teeth are especially adapted. It may, however, eat fruits or other vegetable substances. At all events, Dr. Vevers tells me that the specimens now living in the London Zoological Gardens throve on a diet of rolled oats and milk on the voyage from China, and are still given a certain amount of those foods in addition to their main diet of bamboo and sugar-cane.

In connection with the feeding reference may again be made to the peculiar method of grasping small branches between the first and second digits and the accessory lobe of the plantar pad of the fore paw, as explained above (p. 235). By the use of this unique prehensile organ the Giant Panda is no doubt enabled to pull down or tear off the leaves of twigs beyond the reach of its mouth when standing on its hind legs.

In the open forests of the silver-fir and other sparsely wooded districts the bamboo, growing to a height of 10 or 15 ft., forms an almost impenetrable jungle, and this is traversed by paths trampled by the pandas, bears, leopards, wild boars, and takin. In winter the summits of the bamboo become compacted with snow, which converts the paths into tunnels from 5 to 15 feet high. Native reports about the hibernation of the Giant Panda are contradictory; but since fresh droppings have been seen in January, and Roosevelt followed up and killed a specimen in the snow, the balance of evidence is against the conclusion that it passes the winter in that state. Hunters usually employ dogs to track the animal through the jungle, and shoot it when brought to bay, but when overtaken it may seek refuge up a tree; and further evidence of its ability to climb is supplied by the record of a sportsman seeing a large white object, supposed to be a Giant Panda, curled up asleep in the fork of a high tree. But it lives mainly on the ground, and the natives who reported its hibernation stated that it lies up in hollow trees under rocks or in caves. It is usually solitary, but a male, female and cub were on one occasion seen together, the presence of the single cub suggesting that, as in the Bears, the litter consists of at most one or two.

In addition to the typical form this family contains another genus and species, *Ælureidopus baconi*, described by A. S. Woodward (Proc. Zool. Soc. 1915, p. 425, with text-fig. and pl.). This Giant Panda is of special interest in connection with the fauna of British India, since, although apparently extinct,

it was named on the evidence of a tolerably complete skull discovered by Mr. A. L. Bacon in a cave at the Ruby Mines, Mogok, Upper Burma ; and the condition of the bone suggests that its extermination in the district was comparatively recent.

Three correlated features in the anterior cheek-teeth of the upper jaw justify the generic status assigned to this species. The canine is much larger than in *Ailuropoda*, and its enlargement is correlated with the total suppression of the first premolar and great reduction in the length of the second, which had only one root instead of two, as shown by the socket, and was probably unicuspid, although this is uncertain owing to the tooth itself being absent. The enamelled portion of the canine has a height of 34 mm. and a basal length of 23 mm., the corresponding dimensions of the tooth in a slightly larger skull of an adult ♂ of *Ailuropoda* being 25 and 18 mm. The remaining upper cheek-teeth are in all essential respects like those of *Ailuropoda*, but they are a few millimetres longer and wider than the largest teeth of *Ailuropoda* examined, pm^4, for example, being 29 by 21 mm. as compared with 25 by 19 mm. in the above quoted ♂ of the existing species ; and the length of the tooth-row from pm^3 to m^2 inclusive is 114 mm. in the former, 103 mm. in the latter.

The palate also has a slightly different shape in *Ælureidopus*, mainly owing to the inner edges of the teeth forming a slightly but definitely curved instead of a very nearly straight line. The least distance, for example, between the two pm^3 is 48 mm. and between the two m^2 35 mm., the corresponding widths in the skull of *Ailuropoda* being 36 and 37 mm. Hence the palate is much wider in front and slightly narrower behind in *Ælureidopus* than in *Ailuropoda*, in which it is approximately parallel-sided. In the latter too it is flat from back to front, whereas in *Ælureidopus* it is a little hollowed between pm^4 and the anterior half of m^1, a variation recalling the more marked undulation of the palate in *Ailurus*.

There is also a good deal of evidence, although not conclusive, that the paroccipital process was not nearly so well developed in *Ælureidopus* as in *Ailuropoda*.

The larger size of the canine teeth, associated with the suppression of the first upper premolar and the reduction in size of the second, suggests that this Giant Panda was partially predatory in habit and preyed upon such mammals, birds and reptiles as it could capture. Possibly it took to the destruction of the more easily accessible domesticated livestock of the Burmese natives, who consequently hunted it down and finally exterminated it as a troublesome pest.

Family AILURIDÆ.

Resembling the Ailuropodidæ, and differing from the Canidæ and Ursidæ in the shortness of the penis, the proximity of the prepuce to the scrotum and the relatively small size of the baculum, in the possession of a glandular sac surrounding the anus and the woolly clothing of the soles of the feet. Further and convincing evidence of kinship between the two families is supplied by general similarity in the colouring (see p. 256). But the differences are well marked and point to wide divergence from a common ancestor. In this family the most noticeable external differences lie in the feet and tail. The tail is long, up to about two-thirds the length of the head and body, and the feet are unlike those of the Ursidæ, the hind being noticeably longer than the fore; the digits form a strongly curved line, are widely separable, furnished with short, curved, sharp semi-retractile claws, the pads are greatly reduced in size, functionless, buried deep beneath the woolly hair covering the whole of the underside of the feet, the plantar pads are much narrower than the feet and curved, and in the fore foot there is no especially developed carpal bone associated with an accessory lobe of the plantar pad to constitute a grasping organ.

There are also many differences in the skull and teeth. The skull has the cranial portion rounded, with an abruptly rising, thin sagittal crest, a small occipital crest, well-developed postorbital processes, highly arched zygomata, a definite posterior prolongation of the palate passing beyond the last molars, an anteriorly narrowed mesopteryoid fossa, the bullæ inflated, with the carotid foramen near the centre of its inner side, instead of flat, with the foramen posterior, as in *Ailuropoda*, a well-developed auditory tube, with the orifice superficial, the paroccipital process is much bigger than the mastoid, instead of *vice versa*, and the alisphenoid canal is present. In the mandible the symphysis, or junction between the rami, is very short, not exceedingly long, the angular process is large and low, and the coronoid has a strongly convex anterior border, the upper end is broad, not narrow and hooked, and the dental edge is not curved outwards behind the last molar.

The dental formula is typically: $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{3}{4}$, $m.\frac{2}{2}$, but the first lower premolar, which is minute, may be early shed, and the first upper is always absent. The greatest numerical difference from the teeth of the Ailuropodidæ is the entire

absence of the third lower molar. The teeth, moreover, have none of the peculiarities distinctive of those of that family. In the upper jaw pm^3 has a wide, long, inner-rooted lobe, and is very similar in shape to pm^4, which has three outer and two or three inner cusps, the latter borne by the large protocone of which the root is anterior, not median as in *Ailuropoda*;

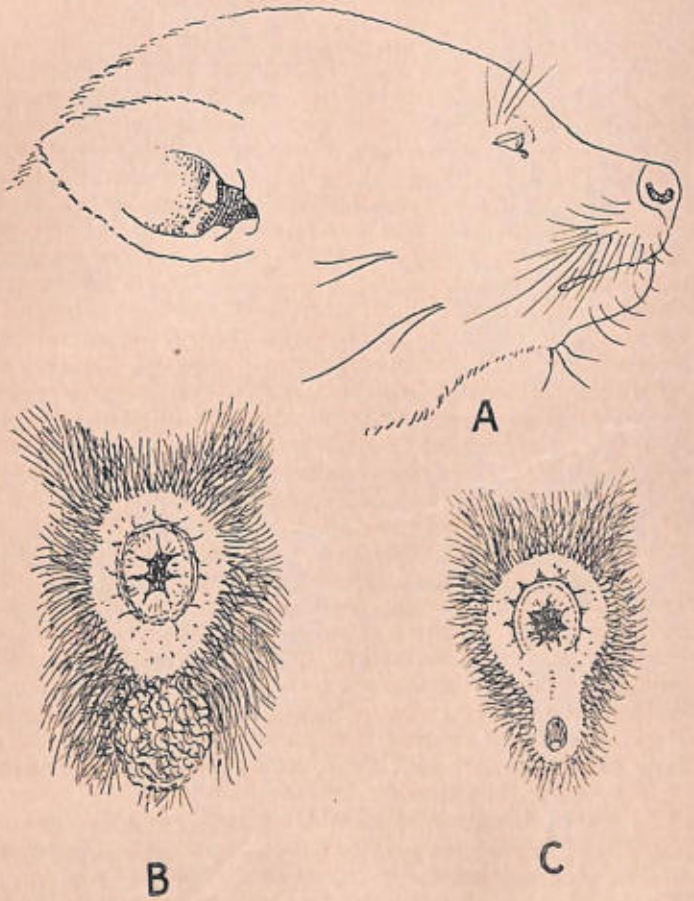


Fig. 57.

A. Side view of head of common Panda (*Ailurus fulgens*) showing the comparatively well developed, normal tufts of facial vibrissæ, etc.,
B. The subcaudal glandular area of the ♂, encircling the anus, with the scrotum below it.
C. The same of the ♀ showing the naked skin extending from the glandular area and encircling the vulva.

(B and C for comparison with the glandular areas of *Ailuropoda* (figs. 52, 53, pp. 242, 243).

m^1 and m^2 are also tolerably like pm^4 and profoundly different from those of *Ailuropoda*, being considerably wider than long and narrowed internally, m^2 showing no trace of the posterior enlargement seen in *Ailuropoda*. In the lower jaw m_1 and m_2 are longitudinally ovate and not very different in size and

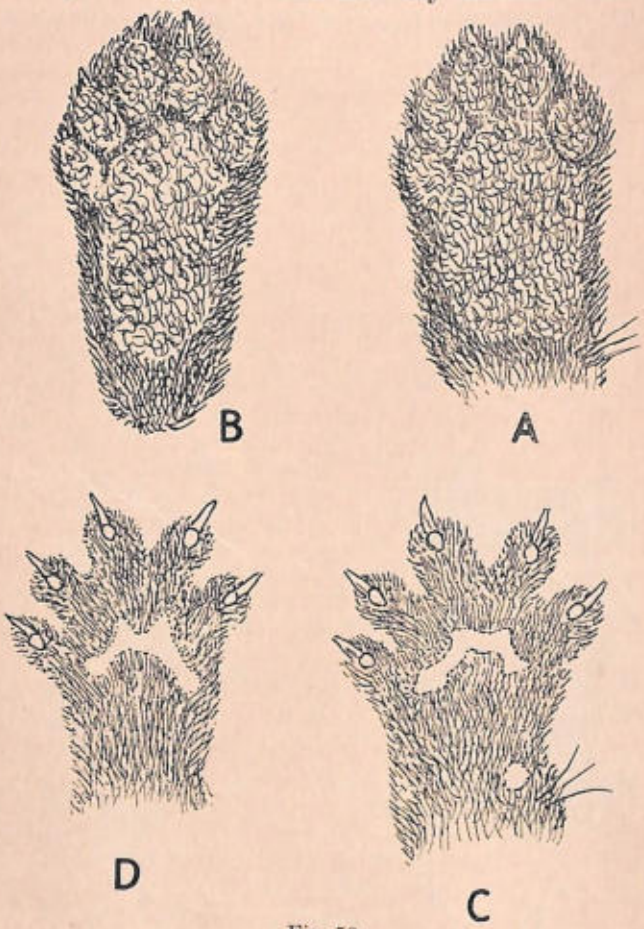


Fig. 58.

A. Lower side of left fore foot of the Panda (*Ailurus fulgens*), showing the curvature of the row of digits and the clothing of woolly hair completely concealing the pads.

B. The same of the left hind foot.

C and D. The same feet with the digits spread and the hairs cut short to show the areas of naked skin representing the digital, plantar and carpal pads.

(For comparison with the feet of *Ailuropoda*, figs. 50, 51, pp. 234, 235.)

shape, whereas in *Ailuropoda* they are very unlike in shape, neither resembling the corresponding tooth in *Ailurus*.

Blanford followed Blyth in placing *Ailurus* in the Procyonidæ, a family containing the Racoons (*Procyon*), the Kinkajou (*Potos*) and other sharply differentiated American genera; but all these genera have a number of characters in common which distinguish them from *Ailurus*. The penis is long, with the baculum to correspond, and the prepuce is abdominal, remote from the scrotum, as in the Canidæ, Ursidæ and Mustelidæ. The feet have the digital and plantar pads normally developed and naked, and the single or double carpal pad is large and close to the plantar pad. There is no glandular sac round the anus. In the teeth pm^2 and pm^3 are comparatively small, pm^3 being unlike pm^4 in shape, having at most one main and three minute cusps. In the skull the alisphenoid canal is absent, the postdental portion of the mandible is differently and more normally shaped, and some of the *foramina* in the base of the skull are differently disposed or shaped, as I pointed out in 1921 (Proc. Zool. Soc. 1921, pp. 420–421).

In this paper I reverted to Flower's original view that the peculiarities of *Ailurus* justify placing it in a special family. But quite recently G. M. Allen (Mamm. of China and Mongolia, pp. 313–314, 1898) followed Blyth and Blanford in classifying it in the Procyonidæ, and quoted Hollister's paper (Proc. U.S. Nat. Mus. xlix, pp. 141–150, 1916) in support of that view. But in this paper Hollister separated *Bassariscus* from the Procyonidæ as the representative of a special family, his action implying closer kinship between *Ailurus* and *Procyon* than between the latter and *Bassariscus*. This view is, in my opinion, untenable, as was stated in the paper quoted above. Undoubtedly *Ailurus* is more nearly related to the Procyonidæ that to the Canidæ, Ursidæ or Mustelidæ; but it is, I think, certainly more nearly akin to *Ailuropoda*, which its relegation to the Procyonidæ obscures.

Genus **AILURUS** F. Cuvier.

Ailurus, F. Cuvier, Hist. Nat. Mamm., text of pl. 203, 1825, and of subsequent authors, formerly commonly cited as *Ælurus*.
Arctælurus, Gloger, Gemein Hand. Nat. i, p. xxviii, 1840.

Type-species of *Ailurus* and *Arctælurus*, *fulgens*.

General form heavy, tail long, head rounded, with moderately large erect, pointed ears, a short muzzle, naked rhinarium and normal facial vibrissæ, although the genal tufts are mostly hidden in the hair of the cheeks; legs short and stout, unlike those of any other tropical mammal in having the soles of the feet covered with a thick mat of wool entirely concealing the

pads, which are greatly reduced in size and functionless ; the digits arranged normally in a strongly curved line, the claws short, curved, pointed and partly retractile ; the anus has a pair of normal anal glands and opens in both sexes in the centre of a naked glandular pouch like that of the Mongooses ; four pairs of mammæ.

The skull is remarkable for the modifications affected by the masticatory muscles manifested chiefly by the sagittal crest, the thick zygomata, strongly arched in a horizontal and vertical plane, and the unusual development of the postdental portion

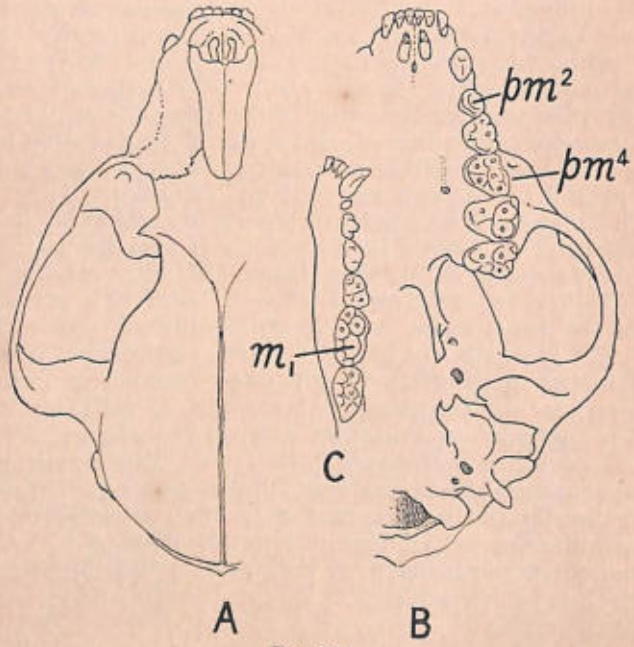


Fig. 59.

A. Left half of upper side of skull of the Panda (*Ailurus fulgens*). Drawn from one of Hodgson's skulls from Sikkim. (Two-thirds nat. size.)

B. The same from below, showing the teeth etc.

C. Teeth of the right side of the lower jaw of the same, showing also the short mandibular symphysis. pm^2, second upper premolar, the first absent ; pm^4, upper carnassial ; m_1, lower carnassial.

(For comparison with the skull and teeth of *Ailuropoda* (fig. 54, p. 241.)

of the mandible, which has a high, sickle-shaped coronoid process, a massive condyle and a prominent angular process ; the dorsal profile of the skull is tolerably strongly convex from the occipital crest to the front of the orbits ; the muzzle

is short and broad, the bulla small, with tubular auditory meatus. The dental formula is $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{3}{4 \text{ or } 3}$, $m.\frac{2}{2}$. The canines are of normal size, with cutting posterior edge; the first premolar is apparently always absent in the upper jaw, and when present in the lower jaw is small and functionless. The essential characters of the rest of the cheek-teeth are referred to above, the third and fourth upper premolars, the two upper and two lower molars having massive, many cusped crowns adapted for crushing tough vegetable fibre.

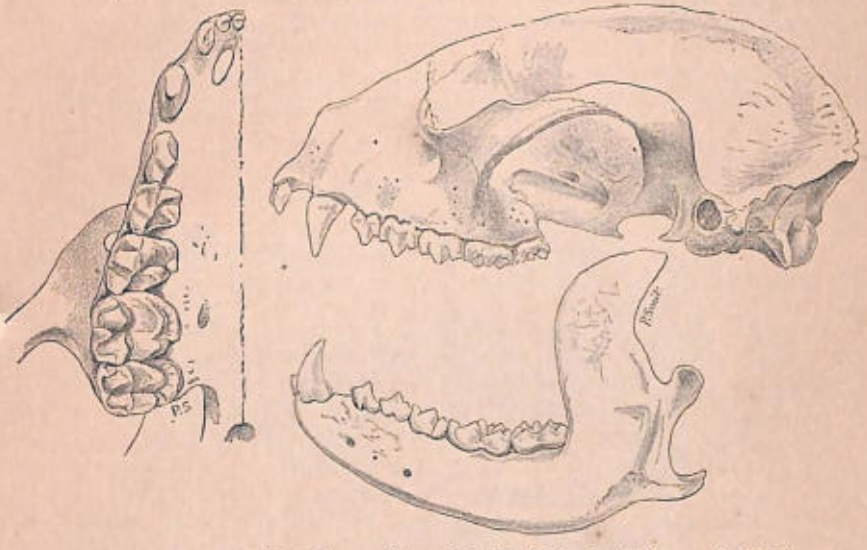


Fig. 60.—Right half of the palate of skull of Panda (*Ailurus fulgens*), from Blanford, showing the teeth, natural size, and side view of the skull of the same with the lower jaw detached, showing the highly arched zygoma, the remarkably developed coronoid process of the mandible etc., two-thirds natural size.

68. **Ailurus fulgens** F. Cuvier. The Cat-Bear or Panda. (Pl. VI.)

(For the chief bibliographical references see under the subspecific headings.)

Coat, in good condition, long and soft, with the contour-hairs concealing the tolerably abundant underwool, short on the face and shorter on the legs than on the body and tail, the tail uniformly bushy throughout. Colour varying to a certain extent in the two subspecies, and in both considerably in accordance with the state of the coat, but typically deep bright chestnut-red or bay over the greater part of the upper side, with the wool black or grey; the tail generally like the body but typically marked with from five to seven darker

stripes, varying from brown to black, and with a corresponding dark tip ; but the dark stripes sometimes evanescent, with the hair-tips of the spaces between them bleached, so that the organ appears to be pale-ringed ; the legs, throat and belly black ; the shoulders and nape often darker than the back owing to the less extensive redness of the contour-hairs ; the ears black behind with a white rim and white in front ; the face in front of the ears paler than the body, sometimes soiled white, but with a clearer white patch above the eye and a dark stripe, red or blackish, extending from the corner of the mouth to the eye and narrowly surrounding it, the muzzle and chin white.

The presence of stripes on the tail but not on the body is a feature in which *Ailurus* is like some of the Procyonidæ, *e. g.*



Fig. 61.—The Panda (*Ailurus fulgens*), from Blanford. This figure, reproduced from Proc. Zool. Soc. 1869, p. 408, was taken from an unknown specimen showing abnormal pattern of the face, especially the median stripe down the nose, which is not present in any skin I have seen.

the Racoon (*Procyon*), the Cacomistle (*Bassariscus*) and the Coatimondi (*Nasua*) ; but the general style of coloration forcibly recalls that of the Giant Panda (*Ailuropoda*). Both have the legs black, and although there is more black on the throat and belly in *Ailurus*, the tips of the hairs of these areas are generally, if not always, infuscate in *Ailuropoda*. The paler tint of the soles of the feet is also a feature in common. The chief differences are the blackness of the front of the ears in *Ailuropoda*, the larger black patch round the eye, its falling short of the corner of the mouth below, and the generally whitish instead of red hue of the rest of the upper side. But red and white are frequently interchangeable

colours in mammals, and some skins of *Ailuropoda* are reddish on the body behind the shoulder. In *Ailurus*, moreover, especially in young specimens, the blackish tint of the shoulders continuous with that of the fore leg recalls the black belt of *Ailuropoda*.

68 *a*. **Ailurus fulgens fulgens** F. Cuvier.

Ailurus fulgens, F. Cuvier, Hist. Nat. Mamm. pl. 203, 1825; and of most subsequent authors, including Blanford, Mamm. Brit. India, p. 190, 1888, at least in part. (Formerly usually rendered as *Ælurus*.)

Ailurus ochraceus, Hodgson, Journ. As. Soc. Beng. xvi, p. 1118, pl. 52, 1847.

Ailurus fulvens, Hodgson, Journ. As. Soc. Beng. xvii, p. 573, 1848 (probably intended for *fulgens*).

Vernacular.—Wah, Ye, Nigálya-ponya (Nepal); *Thokya, Thongwa* (Limbu); *Oakdonga* or *Wakdonka, Woker* (Bhotia); *Sankam* or *Saknam Sunam* (Lepcha).

Locality of the *type* of *fulgens*, "East Indies"; of *ochraceus* and *fulvens*, "sub-Himalayas" from 7,000 to 13,000 ft.

Distribution.—The Himalayas of NEPAL and SIKKIM, its eastward range unknown.

The winter coat (Dec.–Jan.) between 40 and 50 mm. long, typically about 45 mm.; general colour of the back and shoulders in the adult deep red, frequently lightened, at least on the hind back and rump, by the ochraceous hue of the hair-tips, but never showing a tendency to blackness on the back and tail. Skull with the frontal bones not noticeably inflated by air-cells, the dorsal profile of the forehead and muzzle comparatively evenly and gently curved, sloped from the crown, inclination of the muzzle not steep.

Although Cuvier's original specimen was said to be from the "East Indies" there is no doubt that it came from the Himalayas, because Duvaucel, who sent it to Cuvier, is known to have procured for him several species of mammals from North-eastern India while he was in Calcutta. Hodgson's *ochraceus* certainly represents the same race. The descriptions of the two types agree very closely. In the type of *fulgens* the back behind the shoulders was very ochreous, the head largely white, the tail brown with pale bands, and the type of *ochraceus* was deep ochreous-red above, the red tinge of the head diluted with fulvous and the tail banded with fulvous. Both these specimens are paler than the normal, and all Hodgson's skins labelled Nepal in the British Museum are deeper red than his description of *ochraceus* suggests. A series of skins from Sikkim shows considerable individual variation in colour. One from Chumbi, April 3 (T. G. Longstaff), is deep red all over the upper

side, with the crown of the head buffy or ochreous and the tail red with very faint darker brown stripes; but one from Chuntang, 8,000 ft., January 13 (Crump), has the tips of the hairs of the whole of the back behind the shoulders extensively ochreous or buff, the crown of the head much paler, whitish, the tail-stripes red and emphasized by the buffy hair-tips of the intervening spaces. This specimen agrees very closely with the description of the type of *fulgens*. Other specimens from Sikkim, including examples from Lachen, 10,000 ft., and Ringin, 8,000 ft. (Crump), are intermediate between the two extremes above described.

The flesh-measurements (in English inches) of three adults are as follows * :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Chumbi, Sikkim; old ♀	24	16	4⅜
Chuntang, Sikkim; ad. ♂	23½	16	4½
Chuntang, Sikkim; ad. ♂	22⅝	15⅜	4⅜
Chuntang, Sikkim; ad. ♀	22⅜	14⅜	4⅛

The ears are from 2½ to 3 in.

The weights of the larger ♂ and of the ♀ were alike 8½ lb., but 9½ lb. has been recorded. There is evidently no difference in size between the sexes.

68 *b*. **Ailurus fulgens styani** Thomas.

Ailurus refulgens, Milne-Edwards, Rech. Mamm. p. 380, 1868–74†.
Ailurus fulgens, Anderson, Zool. Res. Yunnan, Introduction, p. xx, 1878 (in part).
Ailurus fulgens styani, Thomas, Ann. Mag. Nat. Hist. (7) x, p. 251, 1902.
Ailurus styani, Thomas, Ann. Mag. Nat. (9) x, p. 396, 1922.

Locality of the *type*, Yang-ten-pa, N.W. Szechwan.

Distribution.—Szechwan, Yunnan, and Upper Burma.

Distinguished from typical *fulgens* by its longer winter coat, which in December is up to 70 mm. long, by the average more abundant blackness in the pelage, some skins showing a good deal of black on areas like the shoulders, nape and tail, which are normally red, on the average, by the more distinct stripes, sometimes quite black on the tail and the redder, less

* Col. F. M. Bailey has an unpublished note of a ♂ from Gangtok, Sikkim, measuring :—Head and body 22½, tail 12½, hind foot 4, ear 2⅝. But there is no skull to show whether the specimen was fully adult or not.

† Following G. M. Allen, I do not think this name should be considered as especially applicable to this race, although it was cited by Milne-Edwards in connection with the mammal fauna of Moupin. Its introduction was evidently due to a lapse of memory on the part of Milne-Edwards, who intended it for *fulgens*, not distinguishing the Panda from Szechwan from the typical form from Nepal.

white face. The skull is on the average a little bigger in all its dimensions and has the frontal region definitely inflated with air-cells, making the forehead more strongly curved and the slope of the muzzle steeper. The teeth too are on the average more robust, as is specially manifested by pm^2, which typically has a larger lobe on its inner side. The characters above enumerated vary, however, individually in both races, so that they intergrade and negative Thomas's opinion in 1922 that specific status might be granted to *styani*.

The type of this race from Szechwan agrees with Hodgson's Nepal skins in colour, but another skin, also collected, by Styan in the same district, is much darker, with the forehead red, the rest of the crown, nape and shoulders very dark brown, with very little red, the middle of the back darker red than usual, turning to deep brown on the rump and becoming nearly black on the tail. There are also in the British Museum skins from the Lichiang Range, N.W. Yunnan, 11,000 ft., collected by Forrest in September, October and December. They are on the average a deeper, more intense red than Himalayan skins, one of them being blacker than the others and approaching the dark skin from Szechwan. The coat of the December skin is close on 70 mm. long, noticeably longer than that of Sikkim skins in the same month and January.

The evidence for the occurrence of this race in British Burma rests upon several specimens. One was collected by Col. G. Whittall 150 miles N. of Myitkyina, near the borders of Yunnan. It is undated, but has the coat shaggy, somewhat tufted and long, about 65 mm., almost as in the December skin from Yunnan. The moult is obviously imminent, and although the nape and shoulders are intense red the hairs of the hind back and loins are extensively bleached and buffy at the tip and the tail is conspicuously banded red and whitish. Except in the length of the coat and the more extensive bleaching of the hind body this skin does not differ from those of the Himalayan race. There is no skull. There is also a skin, without skull, secured from a native by Lord Cranbrook at Nam Tamai, 3,500 ft., in Upper Burma. The coat is in poor condition, the tail having moulted all its contour-hairs and being covered with greyish-buff wool marked with very faint stripes. This skin too shows no features distinguishing it from those of typical *fulgens*. But R. Kaulback procured from natives two specimens from Upper Burma, one from the Nam Tamai Valley, 7000 ft. (lat. 27° 50′ N. ; long. 97° 55′ E.), the other from the Taron Valley, 9,000 ft. (lat. 27° 42′ N. ; long. 98° 12′ E.). Both are dullish, dark skins with brown replacing to a varying extent the normal red of the upper side. Fortunately the skull of the

specimen from the Taron Valley was preserved, and this has the inflated forehead and thicker teeth of *styani*, showing conclusively that these Upper Burmese specimens belong to this race.

None of the Burmese skins of *styani* was measured in the flesh ; but three collected by Forrest on the eastern flank of the Lichiang range, 1,000–12,000 ft., in Yunnan (lat. 27° 30′ N.) have the following dimensions (in inches) :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Lichiang Range ; ad. ♂	24½	18⅜	4½
Lichiang Range ; ad. ♀	24⅜	17½	4½
Lichiang Range ; ad. ♀	23½	11⅜	4¼

These measurements are insufficient to justify the conclusion, suggested by the skulls, that *styani* is on the average larger than typical *fulgens*. Probably the tail of the third example on the list was imperfect.

The skulls recorded * in the following table supply no convincing evidence that ♂ skulls are larger than ♀ skulls in either of the races. The data in connection with *styani* are obviously defective, but the two ♀ skulls of *fulgens* from Chuntang and Chumbi respectively are a trifle longer in condylobasal length than the second of the two ♂ skulls from Chuntang. The measurements clearly show the average superiority in size of the skulls of *styani*.

Some tooth-measurements (in mm.) of the two races of *Ailurus fulgens* are given on p. 262 (the first figures in the columns being the lengths, the second the widths of the teeth).

Apart from the greater width of pm^2 there is nothing in the size of the remaining teeth of the specimen from the Taron Valley to distinguish them from those of typical *fulgens* ; but the teeth are very much worn. In the skulls of *fulgens* the only one entered in the table with the teeth equally worn is the one from Chumbi.

Habits.—There is no reason to suppose that the two races of Panda differ in any respect in habits. All that is known about Styan's Panda is that it is a forest dweller at comparatively high altitudes. In this it resembles the Himalayan race

* The skull labelled "Bengal" and presented by General Hardwicke is of great historical interest, since it no doubt belonged to the specimen, the first Panda to be scientifically described and named, of which he sent an account to the Linnean Society of London in 1821. Owing to his absence in India, or for some other trivial reason, the publication of the paper was delayed for six years, and was eventually printed in the Trans. Linn. Soc. xv, p. 161, pl. 2, 1827. The name he gave to the animal was suppressed when he found that owing to the delay Cuvier had anticipated him by two years.

Skull-measurements (in mm.) of the two races of *Ailurus fulgens* *.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygo-matic width.	Post-orbital width.	Inter-robital width.	Maxil-lary width.	Upper cheek-teeth.	Mandi-bular length.
fulgens.								
Chuntang, Sikkim (15.9.1.97); ad. ♂	113	103	77	21	24½	25	43½	80
Chuntang, Sikkim (15.9.1.98); ad. ♂	111	101	78	24	26	25	44	78
" Bengal " (79.11.21.632); ad. ♂	110	—	74	25	24	26	43	78
Chuntang (6012); ad. ♀	110	103	79	22	—	24	45	78
Chumbi, Sikkim (23.1.23.1); ad. ♀.....	109	102	80	24	24	25	43	79
Sikkim (Hodgson, 58.6.24.79); ad. o	112	102	79	22	23	24	45	81
Darjiling (Oldham, 226 *g*); ad. o	111	102	76	22	23	24	45	80
styani.								
Lichiang Range, Yunnan (23.4.1.21); ad. ♂ ..	120	(110±)	84	25	26	27	47	85
Lichiang Range, Yunnan (22.9.1.38); ad. ♀ ..	117	108	(80±)	23	25	25	47	83
Szechwan (3.5.15.2); old o	117	—	84	24	25	25	46	81
Szechwan (type, 2.6.10.41); old o	115	105	(84±)	—	—	29	46	83
Taron Valley, Upper Burma (251); old o	113	—	82	25	26	25	46	—

* Figures set in brackets with ± signs are estimated dimensions, the area of the skull in question being incomplete owing to breakage.

Tooth-measurements of the two races of *Ailurus fulgens*.

Name, locality and sex.	pm^2.	pm^4.	m^1.	pm_2.	m_1.	m_2.
fulgens.						
Chuntang (15.9.1.97); ad. ♂	5½ by 3	8 by 9	9 by 11	5 by 3	12 by 6	12 by 6
"Bengal" (79.11.21.632); ad. ♂	6 by 3	8 by 9	9 by 11	5 by 3	11 by 6	11 by 5
Chumbi (23.1.23.1); old ♀	5 by 4	8 by 9	7 by 11	5 by 3	11 by 6	11 by 6
Darjiling (Oldham, 226 *g*); ad. o	6½ by 4	8 by 9	9 by 11	6 by 3	11 by 6	11 by 5½
styani.						
Lichiang Range (23.4.1.21); ad. ♂	6½ by 4	8½ by 8½	10 by 11	6 by 3	11 by 6½	14 by 6
Lichiang Range (22.9.1.38); ad. ♀	7 by 5½	9 by 10	10 by 12	6 by 3½	13 by 6	13 by 6
Szechwan (3.5.15.2); old o	6 by 5	8 by 10	11 by 12½	6 by 3	13 by 6	13 by 6
Szechwan (type); old o	6 by 5	8 by 10	10 by 11	5 by 3	12 by 6	13 by 6
Taron Valley (251); old o	6 by 5	8 by 9	9 by 11	—	—	—

about which much more information, based on wild and captive animals, is available. These animals are to a great extent, but not wholly, nocturnal; and although slow and deliberate climbers, never attempting to leap from bough to bough, they are by no means strictly arboreal. They spend the greater part of the day sleeping in trees, and Crump records seeing them in Sikkim, where they are still tolerably plentiful, curled up in the topmost branches of pines. But they feed in a great measure on the ground, especially in the morning and evening; and since they are comparatively defenceless, and so inactive that they can be run down and killed by a man on foot, it is probable that climbing trees is merely a means of escape from ground enemies.

No explanation is supplied by their habits of the peculiar wool-clothed soles of the feet, which are unlike those of any arboreal mammal and recall the hair-covered soles of sub-arctic terrestrial carnivores, adapted for progression over ice and snow in winter. But the sharp, curved claws are admirably fitted for a tenacious grip on the bark of trees. When at rest the Panda, as shown by Hodgson's sketches, either lies with its head turned sideways and the tail over it or squats with the head tucked down between the fore legs.

Under natural conditions its diet consists mainly if not entirely of vegetable substances like roots, grass, bamboo-leaves, sweet fruits, and acorns, for the crushing of which its teeth are admirably fitted. The animal may, however, be omnivorous, since it is said to eat eggs. It is not, however, naturally a flesh-eater. Hodgson found that a specimen he had in captivity never ate fowls put into its cage, although it occasionally killed them. According to Jerdon it is insectivorous; but Hodgson's specimens refused insects, and Dr. Simpson declared that those he kept alive would not eat animal food in any form, except milk, especially when sweetened (Proc. Zool. Soc. 1869, p. 507). This liking for sweet food was subsequently confirmed by Bartlett, who saved the life of a newly imported sick Panda by getting it to take sweetened beef-tea and also the meat itself when sweetened. It would in fact take any food offered it if mixed with sugar, and liked unripe apples and rose-leaves, but was most attracted by the fruit of *Pyrus vestita*, the bunches of which it grasped in its paw while eating (Proc. Zool. Soc. 1870, p. 770). This animal, according to the same observer, sucked up fluid like a bear; but according to Hodgson the method of drinking is by lapping. The lips are certainly better adapted for the latter than the former method.

The usual cry was described by Simpson as a series of short whistles, like the chirping of a bird, by Bartlett as a weak, squeaking call-note. When provoked it utters either a sharp,

spitting hiss (Bartlett) or a succession of snorts (Simpson), standing the while defensively on its hind legs, like a bear. Finally Jerdon reports a couple heard making a most unearthly noise at the top of a tree—but whether they were fighting or pairing did not transpire.

Simpson detected that under "excitement"—the nature of it not stated—the Panda emits a strong odour of "musk"*. This no doubt emanates from the glandular anal area, but its function is not known. Its emission under excitement, if "combative," would suggest that it acts as a deterrent, if "sexual" as an attraction. On the other hand, I have seen live Pandas in the Zoological Gardens rubbing the anal area against the walls, bars and branches of the cage, after the manner of mongooses and civets, apparently to make their environment redolent of their own scent, perhaps to enable individuals to find each other.

According to Hodgson the young, usually two in number, are born in the spring, and seem to have a prolonged period of dependence on the mother, remaining during the time in the hollow tree or rock-crevice where they were born, and staying with her or both parents until the succeeding litter is imminent. This was borne out by F. Wall, who reported (Journ. Bomb. Nat. Hist. Soc. xviii, p. 903, 1908) that two cubs born on July 7 opened their eyes on August 6, 30 days after birth. But the duration of the blindness seems to be variable, since Dr. Vevers tells me that in the Zoological Gardens two cubs remained blind for only 21 days. That, however, is an exceptionally long period for a carnivore. I am also indebted to him for the information that the period of gestation was 90 days, about three calendar months. The colouring of the newly born young, according to Wall, is much less vivid than in the adults, and the tail has no rings. There is no record of more than two cubs composing the litter; but the presence of two pairs of mammæ suggests provision for a larger number.

* "Musk" is a conventional term for a great variety of animal scents, of which the only common feature is want of resemblance to the perfume of that name and to the scent of the musk-flower.



ZOOLOGICAL GARDEN CALCUTTA.

Family MUSTELIDÆ.

This family, including the Carnivora commonly known as Weasels, Badgers and Otters, differs essentially from the preceding families of Arctoidea in the absence, as originally pointed out by Leche, of the vertical slit on the outer surface of the crown of the upper carnassial (pm^4) where the two main cusps meet (fig. 83, p. 355); and also by the invariable loss of the second upper molar (m^2). The complete dental formula is typically: $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{4}{4}, m.\frac{1}{2}$; but the number of teeth is often further reduced by the suppression of the first upper premolar (pm^1), and occasionally by the suppression or early shedding of the first lower premolar and of the second lower molar, the formula of the postcanine cheek-teeth in one genus, the Ratel (*Mellivora*), being not infrequently: $pm.\frac{3}{3}, m.\frac{1}{1}$.

The skull has no alisphenoid canal and the feet have five complete digits.

In other respects the genera differ profoundly in characters comparatively constant in the other Arctoid families, in the structure of the teeth and skull, and in external features, all associated with great diversity of habits. Some of these differences are indicated in the analytical keys to the subfamilies.

For the classification of this family into three subfamilies, the Lutrinæ (Otters), the Mustelinæ (Martens, Stoats, and Weasels) and the Melinæ (Ferret-Badgers, Badgers and Ratels), Blanford followed the system proposed by Flower. The Lutrinæ are a perfectly natural, sharply circumscribed group, and the genera of Mustelinæ, as above restricted, are admittedly affiliated; but the association of the Ferret-Badgers and the Ratel with the Badgers obscures certain marked similarities which the first-mentioned two groups show to the Mustelinæ. The Ferret-Badgers, indeed, have as many characters in common with the Mustelinæ as with the Melinæ, and there is very little evidence of kinship between the Ratels and the true Badgers. The classification adopted in the following pages is the one I proposed in 1921 (Proc. Zool. Soc. 1921, pp. 803–837).

Key to the Subfamilies based on External Characters.

a. Adapted to semi-aquatic habits; tail thick and muscular; hind feet wider than fore feet; vibrissæ thick; fur waterproof.... **Lutrinæ**, p. 267.

a'. Adapted to terrestrial life, without the above-mentioned modifications.

b. Feet adapted for running and climbing, the claws short, sharp and partially retractile; no metatarsal pads.

c. Muzzle, limbs and tail longer; ears larger; body less elongated and cylindrical ..... **Martinæ**, p. 317.

c'. Muzzle, limbs and tail shorter; ears smaller; body more elongated and cylindrical ..... **Mustelinæ**, p. 344.

b'. Feet adapted for digging, the claws long, strong and not retractile; metatarsal pads present.

d. Feet narrower, plantar pads strongly arcuate, all the pads striate and ear with bursa ..... **Helictidinæ**, p. 390.

d'. Feet broader, plantigrade, plantar pads not arcuate; all the pads coriaceous or granular; ear without bursa.

e. Snout modified for rooting; carpal and metatarsal pads small, separated from each other and from the plantar pad; ear with pinna well developed; a subcaudal glandular pouch ..... **Melinæ**, p. 418.

e'. Snout not modified for rooting; carpal and metatarsal pads confluent and in contact with plantar pads; pinna reduced to thickened rim; no subcaudal pouch ..... **Mellivorinæ**, p. 452.

Key to the Subfamilies based on Cranial and Dental Characters.

a. Upper molar subquadrate, its area three or four times that of the carnassial and its outer border much longer than that of the carnassial ..... **Melinæ**, p. 418.

a'. Upper molar transversely elongate, wider than long, subequal in area to the carnassial or smaller, and its outer edge shorter.

b. Upper carnassial with inner lobe expanded, almost as long at the base as the outer portion of the tooth; lower carnassial with triangularly tricuspid anterior portion, the metaconid nearly as large as the other cusps.

c. Muzzle long and slender; postpalatine foramina on the palatine suture; cavity of bulla divided ..... **Helictidinæ**, p. 390.

c'. Muzzle short and broad; postpalatine foramina in front of the suture; cavity of bulla undivided ..... **Lutrinæ**, p. 267.

b'. Upper carnassial with inner lobe reduced, its base short and rising from anterior portion of tooth; lower carnassial with no definite triangle of cusps in front, the metaconid, when present, a minute cusp on base of protoconid.

d. Second lower molar absent; cavity of bulla opening into hollow of mastoid ..... **Mellivorinæ**, p. 452.

d'. Second lower molar present; cavity of bulla usually closed.

e. Premolars $\frac{3}{3}$; muzzle short; wall of bulla spongy ..... **Mustelinæ**, p. 344.

e'. Premolars $\frac{4}{4}$; muzzle elongate; wall of bulla thin ..... **Martinæ**, p. 317.

Subfamily LUTRINÆ.

Otters *.

The Otters differ from the rest of the Mustelidæ in a number of external structural modifications connected with semi-aquatic habits. The coat is smooth, depressed and thickened, with abundance of close, short, fine waterproof underfur; the facial vibrissæ are long, thick, comparatively rigid and abundant, with the lower genal tuft exceptionally large; the head is flat; the muzzle short, blunt, swollen at the sides by the muscles which move the mystacial vibrissæ, with the rhinarium small or nearly obliterated, the nostrils valvular and the upper lip beneath it deep and undivided; the ears are small and structurally simplified; the body is long and sinuous; the tail is long, thick and muscular, especially at the base, tapering and sometimes flattened at the end; the limbs are short, the hind paws considerably larger than the fore paws, but the interdigital webs are by no means always better developed than in the Martinæ or Mustelinæ, but usually the digits are longer with the webs more lax and extensive; the pads are comparatively poorly developed and

* The specific nomenclature of the Oriental Otters, including those of British India, has been in a state of almost hopeless confusion, hardly any two authors agreeing on the points at issue. In my attempt to unravel the tangle I have felt compelled to give at some length the reasons for the conclusions reached, so that they may be checked by anyone who has the material, the patience and the literature for the task. Hardly any of the names adopted for the British Indian species are the same as those employed by Jerdon, Anderson and Blanford and the authors who followed them. The sources of the confusion have been mainly the determination of Hodgson's imperfectly labelled skins and skulls and the erroneous guesses made about the identity of the two Otters Raffles described as "Simung" and "Barang."

smooth, and the claws, when present, are short, lightly curved and not retractile. The skull has a long, low, broad crown, short wide jaws, with the postpalatine foramina in front of the palatine suture as in the Mustelinæ; the bullæ, however, have thin walls as in the Martinæ, but are much lower and smaller than in those subfamilies and remote from the mastoid and typically from the paroccipital processes. The dentition is characteristic. The postcanine teeth are usually five above and below, the formula being: $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{4}{3}, m.\frac{1}{2}$. Occasionally pm^1 is absent; when present it is small and lodged on the inner side of the upper canine; pm^2 and pm^3 and pm_1, pm_2, pm_3 are comparatively stout, subconical and provided with one large

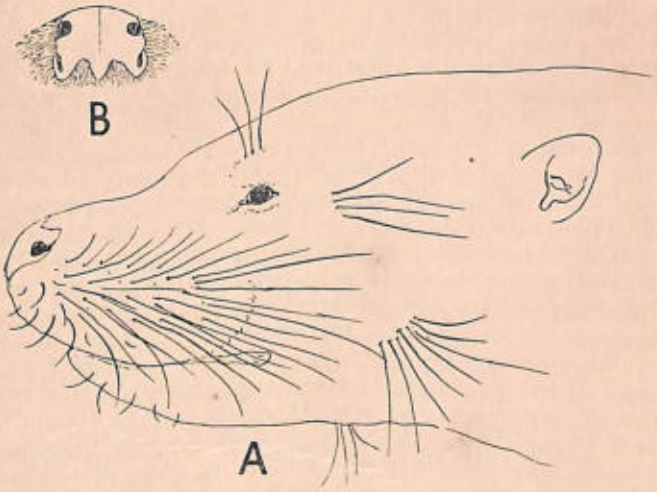


Fig. 62.

A.—Side view of head of common English Otter (*Lutra lutra lutra*) showing the copious, stiff facial vibrissæ, the small eye and ear and the subdorsally placed rhinarium, all adaptations to semi-aquatic habits.

B. Upper view of rhinarium of specimens of *Lutra lutra monticola* from Kangra, showing the shape of the posterior edge characteristic of *Lutra lutra*. (Drawn on a larger scale than A from a skin in which the rhinarium is exceptionally well preserved).

cusp. The upper carnassial (pm^4) is massive, its outer portion carrying a small anterior cusp, a large median pointed cusp and a posterior blade-like cusp; its inner lobe is long and wide, as long, or nearly, as the outer portion externally, rounded and thick-rimmed internally, but at most with a weak anterior cusp; the upper molar (m^1) is nearly or quite as large, has two

outer cusps and two inner cusps on its thick-rimmed inner portion. The lower carnassial has a very large heel and the triangular tricuspid anterior portion has the inner cusp (metaconid) subequal to the others; the second lower molar is small and subcircular.

General Habits.—The whole organization of the Otters suggests that they are the descendants, modified for swimming and fish-catching, of some active, cursorial, predatory stock of Mustelidæ akin to the Martinæ and Mustelinæ, especially the latter. Although comparatively inactive on land they sometimes travel long distances across country. Usually, however, they are found near water, hunting in rivers, lakes, or even in the sea, and are swift swimmers—when moving slowly through the water they frequently paddle with their four paws only, but when going at speed they progress by means of a succession of serpentine curves of the body and tail, aided sometimes by vigorous strokes of the hind legs acting in unison. The thickness and rigidity of the facial vibrissæ are adaptations enabling these feelers to remain erect and functional in the water, probably for exploring submerged rock-crannies for lurking fish; and the crushing crowns of the back teeth are for breaking up the bones of fishes and rendering them harmless to swallow. Their diet, however, consists by no means entirely of fishes. They will eat frogs and water-rats and birds as large as poultry if they can catch them. In captivity at least they will sometimes take vegetable food like cooked carrots or bread. They breed in a burrow or some sheltered spot close to fresh water, the lying-up place being known in England as the "holt." The young, usually two or three to the litter, are born blind and helpless, but covered with short sleek hair; and the female has usually two, sometimes three, pairs of functional postabdominal teats, the number varying within specific limits. The period of gestation in the English Otter is about 60 days according to A. H. Cocks.

Otters are found practically all over the world except the Australian Region, Madagascar, the oceanic islands, the Antarctic and northern Arctic Regions. In the Oriental Region they extend to Borneo and the Philippines.

The three genera that occur in British India may be distinguished as follows:—

a. Paws comparatively large, the digits extensively webbed and with well-developed claws; the skull "long-waisted."

b. The skull depressed, the orbit smaller, the cheek higher, the muzzle longer, with the anterior nares opening obliquely upwards and forwards; the teeth smaller, more trenchant, less crushing in function ..... LUTRA, p. 270.

b'. The skull higher, orbit larger, cheek lower, muzzle shorter, with the plane of the anterior nares more vertical; the teeth larger, with more crushing crowns ..... LUTROGALE, p. 292.

a'. Paws comparatively small, with less extensive webs and minute claws; the skull "short-waisted" ..... AMBLONYX, p. 303.

In the course of this work a point of special interest has come to light in connection with the distribution of these three genera of Otters in India. The large Smooth-coated Otter (*Lutrogale*) is found throughout the country from the Himalayas southwards, but the so-called "Common" Otter (*Lutra*) and the Clawless Otter (*Amblonyx*) are found only in the Himalayas and to the north of the Ganges and in Southern India, although *Lutra* reaches Ceylon. They are absent over the whole of Central India, where the group is represented solely by *Lutrogale*. Thus their distribution is discontinuous. As instances of similar discontinuity may be cited the well-known cases of the Yellow-throated Marten (*Charronia*) (p. 330) and of the Thars (*Hemitragus*).

Genus **LUTRA** Brisson.

Lutra, Brisson, Règn. Anim. Class. ix (ed. 2), p. 13, 1762; Miller, Cat. Mamm. West. Europe, p. 354, 1912 *.
Barangia, Gray, Proc. Zool. Soc. 1865, p. 123.
Lutronectes, Gray, Proc. Zool. Soc. 1867, p. 180.

Typical species of *Lutra*, *lutra* Linn.; of *Barangia*, *sumatrana* Gray (=*barang* Cuv.); of *Lutronectes*, *whiteleyi* Gray from Japan.

Distribution in the Old World.—Europe, North Africa, and all over Asia in suitable localities as far east as Borneo and the Philippines.

Rhinarium not vertical but sloped obliquely upwards and backwards, very variable in the extent to which it is overgrown with hair; ear with distinct intertragal notch and well-developed, lobate supratragal ridge; tail normally tapering, not compressed; feet with extensive webs, reaching about to the middle of the digital pads, the under side of the webs and the pads naked; the digits moderately long, including the first, so that the inner side of the foot when the digits

* Miller used this name in a comprehensive sense to include most of the described species of freshwater Otters, several of which had received generic names, notably from Gray. Those given to American species are outside the scope of the present volume. Two given to Asiatic species, namely *Barangia* and *Lutronectes*, I follow Miller in regarding as synonyms of *Lutra*; but a third, *Lutrogale*, also given to an Asiatic species, may provisionally at all events be accepted as representing a valid genus, as was claimed in my paper dealing with the genera of Otters of the Old World (Proc. Zool. Soc. 1921, p. 535).

are spread for swimming offers a greater surface to the water than the outer ; fore foot with the plantar pad composed of three large comparatively well-defined lobes ; a single large rounded carpal pad close behind it ; hairs reaching the carpal pad and sometimes surrounding it ; hind foot hairy down to the plantar pad, which is greatly elongated, its proximal portion probably representing the remnants of the metatarsal pads fused with it *. Mammæ, according to Miller,

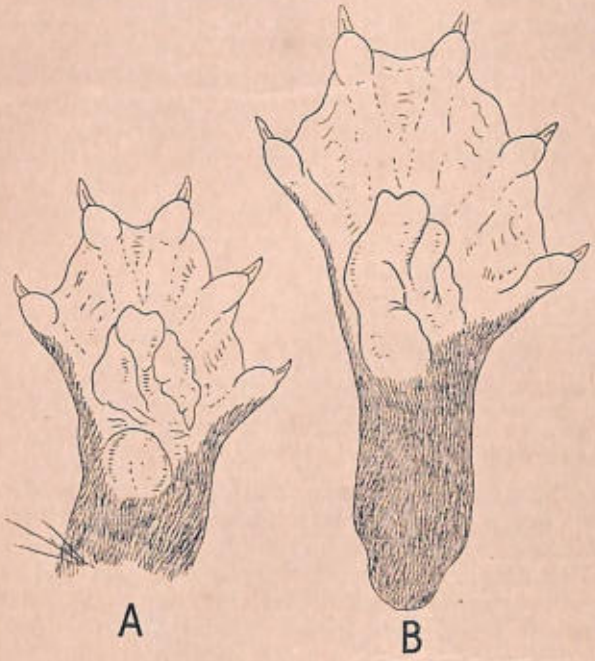


Fig. 63.

A. Lower side of right fore foot of Common English Otter with the digits spread, showing the extensive naked interdigital webs, the obscurely three-lobed plantar pad and the single rounded carpal pad. (Two-thirds natural size.)

B. Lower side of right hind foot of the same, showing the irregularly shaped plantar pad, the hairy metatarsal area and the well-developed webbing, especially on the inner side of the foot. (Two-thirds natural size.)

* This description of the external features of *Lutra lutra*, and the description of those of *Amblonyx cinerea*, the Indian Clawless Otter, given on p. 306, are taken from the descriptions of British specimens of the former and of an Indian specimen of the latter contained in my paper "On the External Characters of some Species of Lutrinæ" (Proc. Zool. Soc. 1921, pp. 535–46). Some variations in details will no doubt be found when other examples, especially those representing distinct subspecies, are examined in a fresh condition.

quoting Southwell, 6 in an English otter ; but only 2 pairs on the hinder abdomen in several skins of two British Indian races, *L. l. nair* and *L. l. monticola*.

The skull is long, low and depressed, broad behind, its mastoid width exceeding, but not to a great extent, half the condylobasal length ; the occipital crest expanded laterally but only a little posteriorly, so that the total length never greatly surpasses the condylobasal ; the sagittal crest at most

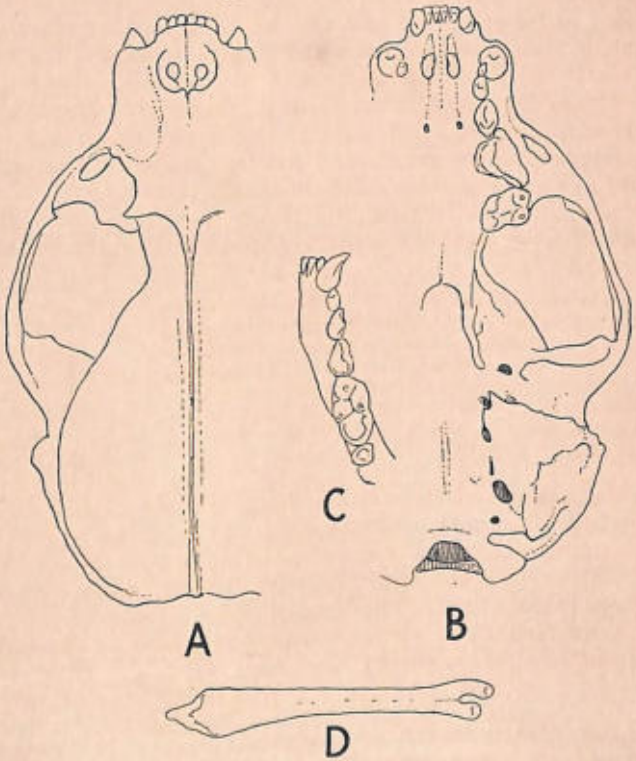


Fig. 64.

A. Left side of upper surface of skull of adult ♂ *Lutra lutra monticola* from the Himalayas (Hodgson).
B. Left side of lower surface of the same.
C. Right lower teeth of the same.
D. Upper view of baculum of Common English Otter (*Lutra lutra lutra*).
(All figures two-thirds natural size.)

forming a low ridge ; the postorbital area, especially in the adult ♂, is deeply constricted a short distance behind the abbreviated postorbital processes, and at this point is typically a good deal narrower than the interorbital area, which is itself

narrower than the muzzle across the canines, where it is slightly expanded; the plane of the anterior nares from the nasals to the premaxillæ is sloped at an angle of about 45° to that of the basicranial axis, the muzzle being lengthened below and the dental series holding a more forward position than in the other Oriental Otters, so that the floor of the orbit is comparatively short; the anterior edge of the orbit is approximately vertically above the anterior portion of pm^4 and behind the anterior portion of the preorbital foramen, which is largely exposed in lateral view, and the orbit itself is comparatively small and the cheek below it correspondingly high. The teeth, at least in the British Indian races, are relatively smaller and rather more trenchant than in the other otters belonging to the fauna, and the inner lobe of the upper carnassial (pm^4) is less expanded internally and shorter, rising from a smaller area of the outer portion of the tooth.

In the Oriental Region this genus is represented by two species, distinguished as follows by the hairiness of the rhinarium or nose-pad :—

a. Rhinarium naked, with its posterior upper margin forming a sinuous or zigzag line owing to the encroachment of the hairs of the muzzle on each side, leaving an angular backwardly projecting prominence in the middle line .... [p. 273. *lutra*, Linn.,

a'. Rhinarium mostly covered with short hairs, except for a narrow naked rim round the nostrils ..... [p. 288. *sumatrana* (Gray),

In well-preserved skins these characters are clearly defined, but in old museum specimens they are liable to be obscured by frictional removal of the hairs. In the case of *sumatrana*, up to the present not known within British Indian precincts, although it may turn up in Tenasserim, evidence of the hairiness of the rhinarium when rubbed is supplied by the follicles detectable with a hand-lens.

69. **Lutra lutra** (Linnæus).

Mustela lutra, Linnæus, Syst. Nat. ed. 10, i, p. 45, 1758.
Lutra vulgaris, Erxleben, Syst. Règn. Anim. i, p. 448, 1777; and of former writers on the Indian fauna, including Blyth, Jerdon, Scully, Anderson, Blanford and Thomas.

69 *a*. **Lutra lutra lutra** (Linnæus).

Mustela lutra, Linnæus, Syst. Nat. ed. 10, i, p. 45, 1758.
Lutra lutra, Miller, Cat. Mamm. Western Europe, p. 355, 1912.

Locality of the *type*, Upsala, Sweden.

Distribution.—Europe and northern Africa, eastward range not known.

It is needless to describe this race, since it does not come into the fauna of British India, and the characters distinctive of the local races of British India are mentioned under their appropriate headings.

69 *b*. Lutra lutra nair F. Cuvier.

Lutra nair, F. Cuvier, Dict. Sci. Nat. Paris, xxvii, p. 247, 1823; and of many subsequent authors, at least in part.
Lutra vulgaris, Blanford, Fauna Brit. Ind., Mamm. p. 182, 1888; and of other authors, in part (not *L. vulgaris* Erxl. 1777, which = *Lutra lutra lutra*).
Lutra indica Gray, Charlesw. Mag. Nat. Hist. i, p. 580, 1837.
Lutra lutra nair, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 69, 1920 (in part); Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 415 (in part).
Lutra lutra ceylonica, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 72, 1920; Phillips, Ceylon Journ. Sci. xiii, p. 177, 1924, and Man. Mamm. Ceylon, p. 199, 1935 *.

Vernacular.—*Lad*, *Pán-maujar*, *Jal-maujar*, *Jal-manus* (Mahr.); *Dalwai-bek* (Wadári); *Niru-kuka* (Tel.); *Nirnai* (Can. and Mal.); *Nirunai* (Tamil); in Ceylon, according to Phillips, *Neer-nai* (Tamil) and *Diya-balla* (Sinhalese).

Locality of the *types*, *nair*, Pondicherry; *indica*, Madras; *ceylonica* Nuwara Eliya, Ceylon.

Distribution.—Southern India, northward range unknown †; Ceylon.

Distinguished from typical *Lutra lutra* of Europe at least by its average smaller size, the largest known ♂ having the

* Cuvier's description of *nair* agrees closely with the fresh southern Indian and Ceylonese skins here described; and the identity of the Otter was put beyond doubt by Anderson's figures of the skull which was extracted from the mounted specimen for his examination. The type of *indica*, procured by Elliot possibly not precisely at Madras, is much paler, but it was exhibited for some time in the public gallery and is probably considerably faded. Pohle distinguished *ceylonica* by the extension of a brown band between the rhinarium and the edge of the upper lip; but this is a variable feature which may or may not be present both in Indian and Ceylonese skins.

† The range of this Otter is still uncertain. It has been recorded as occurring throughout India from the Himalayas to Cape Comorin, but Himalayan specimens probably belong to the next race, *monticola*, the two being not always easy to distinguish. It is significant that the collectors for the Mammal Survey secured no examples of *Lutra* from any locality in India between the Ganges and the districts recorded for *nair*; and it is quite certain that the larger Otters dubiously identified as *nair* and mentioned by Jerdon as plentiful on the Malabar coast and in Lower Bengal were representatives of the Smooth-coated Otter (*Lutrogale*) with which Jerdon was not acquainted. The same is no doubt true of those seen by McMaster in Lake Chilka and by Anderson in the Sanderbans which were described as *nair*. Thomas, indeed, identified as *nair* an immature specimen from the Mekong Valley, Szechwan. It is admittedly very like *nair*, but is no doubt referable to the closely related race *chinensis*.

head and body 25 in., the tail 16½, and the hind foot 4⅛, the corresponding dimensions of the largest ♂ of *Lutra lutra lutra*, recorded by Miller, being 28½, 19⅝, and 5⅝. Similarly the condylobasal length of the skull of the largest known example of *nair* is 110 mm., that of the largest example of the European race, recorded by Miller, being 124 mm.

Coat loose and more or less upstanding, about 15–20 mm. long. Colour of upper side very dark lustrous brown, the wool sooty-brown at the ends, the contour-hairs a little paler, more rufous-brown, but seldom with pallid tips; legs, paws and tail dark brown; contour-hairs of the cheeks, throat and lower side white-tipped, but usually not sufficiently to obscure the brown of the underlying fur, these areas consequently being brownish with a white or grey cast, with the cheeks and throat not very sharply marked off from the

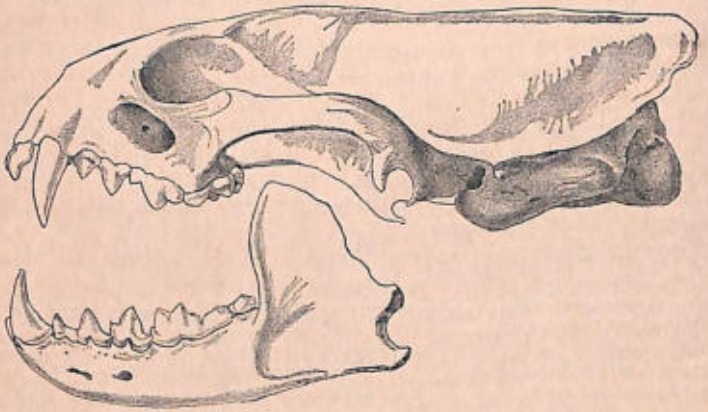


Fig. 65.—Side view of the skull of the type of *Lutra lutra nair* adapted from Anderson's figure, Zool. Res. Yunnan, 1879, pl. xi, fig. 1. About three-fourths natural size (from Blanford).

summit of the head and neck; sometimes, however, the hairs of the belly are more extensively whitened, so that the brown of the fur is mostly concealed. There is commonly an albino patch of wholly white hairs on the chin and fore throat, sometimes on the chest as well.

This description is taken from a number of specimens, all alike except for minor details, from the following localities:— Haleri in North Coorg, 3,355 ft. (J. C. Graham), February 13–19; Virajpet, 2,600–3,000 ft., January 25, February 24, and Srimangala, 2,780 ft., in S. Coorg, February 6 (G. C. Shortridge); Ootacamund in the Nilgiri Hills, July (P. Gosse and Phythian Adams); Pember River, Kodaikanal, in the Palni Hills, 7,000 ft. (C. McCann), May 17. Also three from Ceylon, one

without further locality (Whyte), a second from St. George, Matugama Kulutara (W. W. A. Phillips), May 6; a third from Nuwara Eliya, C.P. (E. W. Mayor), March 8. These specimens exhibit no marked seasonal differences in colour or coat of the upper side, except that the Ootacamund skin collected in July has the coat shorter, about 15 mm. instead of about 18 in the others, the longest coated skin being the one from Matugama, in which the hair is about 20 mm. But the lower surface is more variable. In a ♂ from S. Coorg the abdomen is extensively whitish, with some ochreous on the preputial area. Two suckling ♀♀, with less white, have bright ochreous fur on the mammary area. But the ♀ from Nuwara Eliya in Ceylon has the abdomen almost wholly brown owing to the moult of most of the pale contour-hairs. Every gradation, however, is traceable between this example and the ♂ from S. Coorg, these exhibiting the two extremes in the coloration of the abdomen.

The recorded flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
South Coorge ; ad. ♂	25	16½	4½	11
North Coorg ; yg. ad. ♀	24	14	4	9
Kodaikanal ; ad. ♀	21⅝	13½	4	—
"Ceylon" (Phillips's largest); ad. ♂	24⅜	16	4⅛	11¾
" Ceylon " (Phillips's average of four) ; ad. ♂	23½	14½	4+	10¾
Nuwara Eliya, Ceylon ; ad. ♀.	25	14½	4⅛	9
" Ceylon " (Phillips's largest) ; ad. ♀	23⅜	15½	4⅛	8½
" Ceylon " (Phillips's average of four) ; ad. ♀	21⅛	13⅛	4—	7½

These particulars show that, although males are a little heavier than females, there is no appreciable difference between the sexes in length. Clearly also there is no difference between Indian and Ceylonese specimens.

Only three of the specimens collected for the Survey had fully adult skulls. Of these the ♂ from Virajpet agrees closely in dimensions with the skull of the type of *indica* as shown in the table of measurements (p. 284). Of the Ceylonese skulls the first three on the list from Gammaduwa in Matugama and the Kandy District were received from Mr. W. W. A. Phillips. They vary instructively in dimensions. All are smaller than the ♀ skull from Nuwara Eliya, which I feel compelled to believe was correctly sexed. This is as large as the ♂ skull from Virajpet ; and the ♀ skull from " Ceylon " (Whyte) is as long as Phillips's ♂ from Gammaduwa. The skulls from Ceylon bear out the conclusion derived from the flesh-measurements that the two sexes of this race do not differ in length.

Habits.—The following account is abridged from Phillips's volume on the mammals of Ceylon. No doubt it applies to Indian representatives of the race, and in a general way probably to all the British Indian Otters.

It is mainly nocturnal, especially in populated districts, and is consequently not often seen; but its presence may be detected by the characteristic "spoor" in the sand or mud by the rivers, streams, lagoons or lakes it habitually frequents and by the beaten tracks and regular landing places it uses on their banks. But it frequently wanders across country from one river to another, often turning up in quite unexpected places. It feeds on fish, frogs and freshwater crabs, and will take waterfowl and other birds and rodents as well when it gets the chance. Isolated pools, containing fish, left by the subsidence of the floods from the paddy-fields, are at certain seasons favourite feeding spots. Two or more, when there is a family party, not uncommonly hunt in concert, combining in such a way as to drive the fish into the shallows, where they are more easily caught. Like most predatory Carnivora they are unable to resist the temptation to kill, and will often destroy at a time far more fish than they can eat.

For lying up at ordinary times patches of scrub, fern or reed-beds are generally used; but for the birth of the cubs, usually two or three to the litter and produced at any time of the year, a burrow beneath a rock or the big root of a tree on the bank of a stream is more commonly chosen. To this there are as a rule two entrances, one below the level of the water, the other for necessary ventilation opening to the air. The period of gestation is believed to be about 61 days, and the cubs are blind and deaf at birth. Phillips records that a very young cub, with its eyes still closed, that was found in a fern-clump in a paddy-field was silvery-white above, but soon became brown *.

A note by E. W. Mayor states that this Otter seems to occur in most of the rivers in Ceylon, also in the lake at Kandy, but is most plentiful in the trout streams at Newera Eliya. The only observation made about it by Shortridge in South Coorg is that it is very plentiful, more so than the Clawless Otter (*Amblonyx*, p. 303), which inhabits the same waters, but that it hunts in smaller packs. In two of the ♀ skins Graham secured at Haleri, N. Coorg, on February 13 and 19 respectively the enlargement of the teats shows that they were suckling cubs. The interest of this lies in the immaturity of the skulls, which have the basioccipital suture quite unfused, showing that the ♀ may breed before attaining full size. They weighed 6 and 7 lb. respectively.

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* Newly born cubs of English Otters that I have seen were the same colour as their parents.

69 c. **Lutra lutra monticola** Hodgson.

Lutra monticolus, Hodgson, Journ. As. Soc. Beng. viii, p. 320, 1839. (Not *Lutra monticola*, Anderson, Zool. Res. Yunnan, p. 207, 1868; Blanford, Fauna Brit. Ind. Mamm. p. 185, 1888; Thomas, Proc. Zool. Soc. 1889, p. 192.)

Lutra vulgaris, Anderson, Blanford and Thomas, *op. cit.* (in part; not *L. vulgaris* Erxl.).

Lutra lutra nair, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 69, 1920 (in part); Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 415, 1923 (in part) *.

Locality of *type*, Nepal.

Distribution.—Kangra, Kumaun, Nepal, Sikkim, Assam and ? Burma.

Distinguished on the average from the typical European race *Lutra lutra lutra* by its shorter, thinner winter coat, with the contour-hairs of the belly more extensively whitened, never all brown, and those of the throat and cheeks whiter, the fur of the throat being sometimes white throughout; and from the southern Indian race *L. l. nair* on the average by its larger size and paler colour, the upper side being seldom so dark brown, the white of the cheeks and sides of the neck more sharply contrasted with the crown and nape, and the paws greyer. There is also a marked seasonal difference in colour and coat, the coat in winter being longer, thicker and noticeably greyer than in summer; but the two are not always easy to distinguish.

The general colour of the fresh, lustrous coat varies from brighter, more rufous, to deeper, duller chocolate-brown above,

* About the identity of Hodgson's *monticola* there has been a great deal of confusion, which was started by Anderson's acceptance of the name *monticola* affixed to a skull of the Smooth-haired Otter (*Lutrogale perspicillata*) sent apparently by Hodgson to the museum of the Royal College of Surgeons. Skins and skulls of Hodgson's Otters arrived in England without names and without indication as to the association between the skins and skulls. Their determination, consequently, was left to the museum curators into whose hands they fell. Added to this it is almost certain that Hodgson himself assigned the skulls of the species he named *monticola* to the skins of his *tarayensis* (=*perspicillata*) and *vice versa*. Probably they were mixed by the natives from whom he secured his material. Anderson's error was propagated by Blanford and Thomas. But Hodgson's description of the skins of *monticola* as provided with "longer, rough and considerably porrect fur" contrasted with the "short, smooth fur" of *tarayensis*, leaves no doubt as to the identity of these two otters; and Pohle's determination, adopted by Hinton and Fry, was correct, except for the comparatively unimportant view that *monticola* was inseparable from *nair* (Journ. Bomb. Nat. Hist. Soc. xxix, p. 415, 1923).

Although I have referred the Himalayan representatives of *Lutra lutra* to three races the available material is inadequate for the final settlement of their status and distribution, and their classification is merely provisional. There is still less material from Burma, and the subspecific determination of the few specimens examined from that country is at present beyond me.

the contour-hairs being paler, drabbier brown than the fur, which is silvery at the base; the contour-hairs of the underside are white and the fur richer or paler buff at the summit. But in the old, longer coat, when the moult is imminent or in progress, the contour-hairs of the upper side fade to more or less drabby-grey, with silvery reflections.

The seasonal variations in colour and coat, and also probably colour variations independent of season, are attested by the skins assigned to this race in the British Museum, of which hardly any two are quite alike. Two of Hodgson's Nepalese specimens, for example, although undated, were certainly killed at different times of the year. One adult ♀, with small teats, has the coat about 11 mm. long and the colour dark lustrous chocolate, with no grizzling. Another ♀, with long teats, evidently suckling, is in moult, and the old contour-hairs that are retained are about 22 mm. long and have a grizzled sheen in reflected light., A series obtained by Crump for the Mammal Survey in Sikkim, namely at Dikchu, 2,000 ft., Darjeeling, 3,500 ft., Pedong, 4,700 ft., and Chungtong, 5,350 ft., appear to be of native origin and of untrustworthy dates. They differ considerably in colour, the one from Dikchu resembling skins of the Kashmir race in the drabby-grey tint of the dorsal surface; the one from Pedong, with the normal white parts showing various shades of yellow, is apparently artificially stained; but the other two resemble tolerably closely Hodgson's skin in the short coat. Two skins from Assam, one from Rajapara, S. Kamrup (Wells), 600 ft., and one from Shangpang in the Jaintia Hills, also differ only in minor details from Hodgson's skins, and one from Dhamtal in Kangra, 2,000 ft., has the head and fore-quarters speckled with drabby-grey like the Dikchu skin, but the rest of the back is dark brown. In this case the winter bleaching seems to have set in on the fore-quarters, but would no doubt have extended over the whole dorsal surface.

The only available measurements (in English inches) and weights (in lb.) appear to be the following :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
Nepal (Hodgson); ? ♂	32	20	—	24
Nepal (Hodgson); ? ♂	30	20	—	20
Kangra; ♀	25½	14	3⅛	—

The ♀ from Kangra has no skull to show whether she was adult or not. Hodgson's measurements were possibly taken "over the curves," and the length of the tail may have included the hair at the tip. They were, nevertheless, obviously large otters, judging from the weights, but not much larger than the largest ♂ of the typical race measured by Miller, an

example from Rugby, which had the head and body 28½, tail 19⅛, foot 5⅝, its skull having a condylobasal length of 124 mm., about the same as in the largest skull of *monticola* sent to the Museum by Hodgson. A ♀ from Hungary measured by Miller had the corresponding measurements 25, 15½, and 4⅜, about the size of the Kangra specimen.

There are three complete adult skulls (see table of measurements, p. 284) assigned to this race and received from Hodgson. All no doubt came from Nepal, although two are labelled merely " Himalayas " and cannot with certainty be associated with skins. The larger of these is identified as ♂ from its size ; the smaller, identified as ♀ for the same reason, may belong to either of the adult ♀ skins referred to above. The third skull was extracted from a skin which is obviously ♀. The ♂ skull is considerably larger than any of the skulls of *nair*. The ♀ skulls are also a little longer in condylobasal length than adult skulls of either sex of the South Indian race. There is also a fragmentary skull from Naini Tal in Kumaun which, as indicated by its broader waist, is younger than Hodgson's skulls, but the measurements of its skull and teeth agree very closely with them. The jaws only of a ♂ skull from Dikchu, Sikkim, closely resemble those of the two ♀ skulls. Probably it is not full-sized. A ♂ " Calcutta " skull mentioned by Blanford, with the condylobasal length about 116 mm. and the zygomatic breadth 68 mm., no doubt belonged to this race.

69 *d*. **Lutra lutra kutab** Schinz.

" Kutab," Wagner, in Hügel's Reise Kaschmir, p. 571, 1842.
Lutra kutab, Schinz, Syn. Mamm. p. 354, 1844 ; Pohle, Arch. Naturg. lxxxv, pt. 9, p. 175, 1920 (unidentified).
Lutra vulgaris, Scully, Proc. Zool. Soc. 1881, p. 203.

Locality of the *type*, Kashmir.
Distribution.—Kashmir, ? Kangra and Tibet.

Distinguished from *monticola*, which it rivals in size, by the darker, duller colour of the upper side, owing to the sooty-brown hue of the summit of the fur, which has no rufous tint in it, and very noticeably by the entire absence of the buffy tint in the fur of the underside, which is grey. The contour-hairs of the back are drabby, greyish-brown, giving a grey cast of that tint to the dorsal surface ; the paws are grey.

Since there is no evidence that Schinz had a specimen of this otter, the type is the flat skin collected by Hügel which Wagner described. According to him the colour was dark brown, stippled with white above and white below, including the lower side of the tail.

The British Museum has the unmeasured skins, with skulls,

of two examples, one being an adult ♂, the other young, from Kashmir (Mrs. Entwistle). Except that they can only be described as "stippled with white" under reflected light, they agree very closely apparently with Hügel's specimen. The occurrence of this race in Tibet is attested by the skin of a ♂ procured by Capt. Evanson at Kangma, 25 miles from Gyantse, 13,500 ft., in November. It agrees with the Kashmir skins except that the contour-hairs of the back are a little browner.

Some recorded flesh-measurements (in English inches) and weights (in lb.) are as follows :—

	Head and body.	Tail.	Hind foot.	Weight.
Kashmir (Hügel's type)...	28	18	—	—
Kashmir (A. E. Ward) ; ♂.	24 to 30	15	—	16 to 17
Kangma, near Gyantse (Evanson) ; ♂	35 (? 25)	17½	4⅞	15½

If Capt. Evanson's specimen measured 35 in. from the snout to the root of the tail it must have been a huge otter ; but neither the weight nor the size of the skull, supports that opinion. Possibly the dimension was taken "over the curves"; but it may be suspected that 35 was an error for 25.

The skull of the adult ♂ from Kashmir closely resembles in size the smaller of the two skulls collected by Hodgson labelled "Himalayas" and assigned to *monticola*. The Tibetan skull is a trifle smaller and only a little longer than skulls of *nair*. This bears out the suggestion that the head and body are not likely to have been about 10 in. longer. There is also in the British Museum a skull, without skin, from Gilgit (J. Scully) which is very nearly as large as the largest of the skulls assigned to *monticola*, and decidedly larger than the skulls from Kashmir and Tibet. This skull is provisionally assigned to *kutab* *. It may represent *monticola*.

Habits.—The otter in Kashmir which Col. A. E. Ward identified as *Lutra lutra nair* (Journ. Bomb. Nat. Hist. Soc. xxxiii, p. 68, 1929) no doubt belonged to this race. In the summer it migrates to the streams at high altitudes, often travelling a good deal by land. He saw it playing in the snow at that season by Marsar, at the head of Dachgam, 12,000 ft. Year by year it returns in winter to its favourite quarters, usually making its home or "holt" near deep pools where fish congregate, the entrance to the "holt" being usually under water. He trapped some specimens of a party which had taken up its quarters under a fallen tree

* Blanford seems to have overlooked the record of this otter, and Pohle described it as "*species incertæ sedis.*"

lying across a piece of marshy land, whereupon the rest abandoned the spot and lay up under a rock overhanging water where no trap could be set. He reported that the natives when preparing the skin for use pull out all the long brown-tipped contour-hairs, leaving only the soft underwool.

69 *e*. **Lutra lutra aurobrunnea** Hodgson.

Lutra aurobrunneus, Hodgson, Journ. As. Soc. Beng. viii, p. 320, 1839 ; Anderson, Zool. Res. Yunnan, p. 212, 1868 ; Blanford, Mamm. Brit. India, p. 186, 1888 (*aureobrunnea*).

Barangia ? *nepalensis*, Gray, Proc. Zool. Soc. 1865, p. 190 ; id., Cat. Carn. etc., p. 101, 1869 ; also Anderson and Blanford, *op. cit.* (under *Lutra*).

Lutra vulgaris, Thomas, Proc. Zool. Soc. 1889, p. 190 ; Blanford, Mamm. Brit. Ind. (Appendix) p. 601, 1889.

Lutra lutra lutra, Wroughton and Thomas, Journ. Bomb. Nat. Hist. Soc. xxvi, p. 348, 1919.

(Not *Lutrogale barang aurobrunnea*, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 112, 1920 ; Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 416, 1923 *.)

Locality of the *types* of *aurobrunnea* and *nepalensis*, Nepal.

Distribution.—NEPAL, at high altitudes according to Hodgson, but apparently occurring in GARHWAL at lower levels.

Distinguished from *nair*, which it resembles in size, by its brighter colour, and from *monticola* and *kutab* by being smaller and also by its colour.

Hodgson, who had at least two specimens, since he gave their dimensions and weights, described this otter as having longish and rough fur, thus attesting its affiliation with *Lutra*, as detected by Anderson and Thomas, and not with the Smooth-coated Otter (*Lutrogale*) as claimed by Pohle. Its colour was rich chestnut-brown above, golden-red below and on the limbs. Since Hodgson evidently had freshly killed carcases for examination, their colour cannot be ascribed to artificial staining.

There are no skins in the British Museum which agree with Hodgson's description. He sent, however, a badly preserved

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* Anderson and, following him, Blanford at first, accepted *aurobrunnea* as a valid species, with *nepalensis* as a synonym ; but while Blanford's volume was in the press Thomas revised the species of otters, and came to the conclusion that both names had been given to abnormal examples of the Himalayan Otter, for which he adopted the name *Lutra vulgaris*. The skin of *aurobrunnea* with which he was acquainted he dismissed as artificially stained, overlooking the derivation of Hodgson's description from fresh specimens, and the peculiarities of the skull he ascribed to *nepalensis* was similarly disposed of as a menagerie specimen altered by the conditions of captivity. Blanford, in his Appendix, accepted these opinions and expunged *aurobrunnea* from the British Indian Fauna. Wroughton, with Thomas's concurrence, adopted the same conclusion in 1919 ; but Pohle restored the name to use for a local race of a totally distinct species of otter.

skin, unjustifiably selected by Thomas as the type of *aurobrunnea*, which no doubt belongs to this race, as Anderson and, following him, Blanford supposed. It is apparently in full moult, most of the contour-hairs being shed; the colour above and on the paws is dark, slightly rufous-brown, with scarcely a trace of grey speckling, the fur being reddish at the summit, pale golden at the base, instead of the normal greyish-white; the whole of the under side, including the throat, chin, cheeks and vibrissæ, is brown, with the fur of the belly, chest and throat golden. Blanford suggested that the colour was due to artificial staining, an opinion endorsed by Thomas. This is supported by the brown hue of the usually whitish areas of the head and inferior vibrissæ; but it is doubtful if the golden hue of the base of the fur can be thus explained away.

The measurements and weight (in lb.) of two specimens recorded by Hodgson are as follows :—

	Head and body.	Tail.	Weight.
Nepal; ? age and sex	22	13	11
Nepal; ? age and sex	20	12	9

Although there is no proof that these specimens were full-sized, an adult skull sent by Hodgson from Nepal and one secured by B. B. Osmaston in Garhwal, both referred to below, attest the occurrence in the Himalayas of an otter closely resembling *nair* in size, and decidedly smaller than typical *monticola*, and found, according to Hodgson, at higher altitudes than the latter. The skull sent by Hodgson belongs very likely to one of the specimens of which he gave the measurements. Hence it may be inferred that his measured and weighed specimens were probably adult and not immature, as might otherwise have been supposed.

The skull in question is the type of *Barangia nepalensis* Gray. It is marked ♀, but not in Hodgson's handwriting, and since there is no certainly known skin to be associated with it the sex is uncertain; but, as Anderson and, following him, Thomas claimed, it possibly is the skull of the skin above identified as *aurobrunnea*, which is ♀. Thomas dismissed this skull as referable to a specimen of *Lutra vulgaris* (=*L. l. monticola*), dwarfed and otherwise modified by captivity. Captivity, however, does not dwarf skulls; and the skull itself shows no special peculiarity except a dent on the frontal bones, probably a healed fracture, associated with suppression of the characteristic muscular ridges and blunting of the postorbital processes. Both the ridges and the processes are normally developed in the skull of an adult ♂, received without the skin from B. B. Osmaston and collected at Haldigaddi,

Skull-measurements (in mm.) of the Indian races of *Lutra lutra*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
L. l. monticola.								
Himalayas (Hodgson); ad. ? ♂	129	123	77	15	22½	30	12	14
Himalayas (Hodgson); ad. ? ♀	114	113	72	13	19	27	12	14
Nepal (Hodgson); yg. ad. ? ♀	110	112	64	14—	21	24	11	13
Naini Tal, Kumaun; ad. ? ♀	—	—	68	15	19	27	12	14
L. l. kutab.								
Gilgit; ad. ♂	124	121	75	11	20	30	12	13½
Kashmir; ad. ♂	115	114	72	13	19	30	12	13½
L. l. aurobrunnea.								
Garhwal; ad. ♂	109	107	62	11	17	23	10	12
Nepal (*nepalensis* type); ad. ? ♀	—	—	61	—	17	23	10	12
L. l. nair.								
Madras (*indica*, type); ad. ♂	110	110	65	—	19	25	12	13½
Virajpet, S. Coorg; ad. ♂	111	—	67	12	—	21	11	13
Srimangala, S. Coorg; ad. ♂	109	106	66	14	20	24	11	13
Haleri, N. Coorg; ad. ♀	102	102	—	14	16	21½	11	13
Gammaduwa, Ceylon; ad. ♂	107	104	67	13	18	23½	11	13
Kandy District; ad. ♂	103	101	63	14	18½	23	10½	12½
Kandy District; ad. ♂	100	97	61	16	17½	23	11	12
Nuwara Eliya; ad. ♀	111	109	61	14	17	23	11	13
" Ceylon "; ad. ♀	107	—	65	15	18	24	11	13

Garhwal, 1,500 ft., which is much smaller than the skulls assigned to *monticola* and agrees very closely with the skull of *nepalensis* in such measurements of the latter as are available, and in both the teeth are smaller than in *monticola*. They are also a little smaller than in *nair*, although the dimensions of the skulls are the same as in that race; but the colouring of the two skins described by Hodgson forbids their identification as *nair*, and the available data regarding them are opposed to the view, repeated by Wroughton and Thomas (Journ. Bomb. Nat. Hist. Soc. xxvi, p. 348, 1919), that they belong to the same form as the larger Himalayan specimens here named *monticola*.

In his account of the otter of Kashmir, above referred to under *L. l. kutab*, Col. A. E. Ward mentioned a smaller, more reddish-brown otter which he saw in the Ladak River and in eastern Kumaun. He said, "Anyone who sees it will be struck by its small size and, if the otter is dry, by the chestnut-brown of the head and body." Its weight was said to be from 9 to 11 lb. It is possible that these otters were examples of *aurobrunnea*, especially those seen in the Ladak River; but the description applies nearly equally well to at least some skins of the Himalayan Clawless Otter (p. 303), which is found in Kumaun. So far as is known, however, it does not occur west of that state.

69 *f*. **Lutra lutra** subsp. ?

In Burma *Lutra lutra* is apparently very rare, its place being mainly taken by the Smooth-coated Otter (*Lutrogale*) and the Clawless Otter (*Amblonyx*). The first evidence of its occurrence in Upper Burma was supplied by H. C. Smith, who secured the skin and skull of a young ♀, weighing 4½ lb., in the Taung-byo Reserve, Maymyo, 3,600 ft. The colour is darkish brown above, brownish-grey below and on the cheeks and sides of the neck, where the contrast with the tint of the crown and nape is not very sharply defined; but from the chin backwards the fore throat is clean white, although the wool on the hind throat is pale brown at the summit, like that of the chest and belly. The condylobasal length of the skull, which has the occipital suture open, is 100 mm., and pm^4 and m_1, both unworn, are 11 and 12 mm. respectively. This may be a young example of *monticola*, but the teeth are rather small, resembling those of *chinensis* (see p. 287). The colour, however, is darker than in *chinensis* and there is less contrast between the upper surface of the head and neck and the sides.

Recently R. Kaulback has sent two ♂ skins, without skulls, from farther north, in the "Triangle," Upper Burma; one

from Gam Majaw (26° 43′ N., 97° 58′ E.), 3,000 ft. is, unfortunately, artificially discoloured, apparently by smoke which blackened the throat. The other, from Sumprabum (26° 33′ N., 97° 54′ E.), 1,500 ft., is in good condition. It is darker brown above than the Maymyo skin and is buffier grey below, but there is a much sharper contrast between the crown and nape above and the side of the neck and cheek below, owing to the wool of these latter areas being mainly whitish throughout, like the whole of the throat. In this respect the skin agrees closely with those of *chinensis*, but its upper surface is decidedly darker than in any skins of that race I have seen.

The following two very similar and intergrading Oriental races of *Lutra lutra* may be briefly referred to on the chance of their future discovery within British Indian precincts.

69 *g*. **Lutra lutra barang** F. Cuvier.

" Simung," Raffles, Tr. Linn. Soc. xiii, p. 254, 1822.
Lutra barang, F. Cuvier, Dict. Sci. Nat. xxvii, p. 246, 1823
Lutra vulgaris barang, Robinson and Kloss, Journ. Fed. Mal. St. Mus. viii, p. 13, 1918; and *Lutra lutra barang*, id., *op. cit.* vii (nos. of these vols. apparently transposed), pp. 306–7, 1919. (Not *Lutra barang*, Thomas, Proc. Zool. Soc. 1889, p. 195; nor *Lutrogale barang*, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 108, 1920 (see p. 294).)
Lutra intermedia, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 62, 1920 *.

Locality of the *type* of *barang*, Java according to Cuvier, but corrected to Sumatra by Lesson; of *intermedia*, Sumatra.

Distribution.—Sumatra; Siam, according to Gyldenstolpe (Journ. Nat. Hist. Soc. Siam, iii, p. 145, 1919), and Annam.

Judging from the comparatively few specimens available for examination this otter differs from *nair* in its average smaller skull and teeth (see table of measurements, p. 291)—

* Cuvier's description of *barang* shows it to be an otter closely related to *Lutra lutra*, and Scully, who, according to Blanford, examined the type, said it resembled that species. My examination of the skin in the British Museum sent by Raffles as representing his " Simung " from Sumatra bears out Anderson's verdict that it belongs to the same species. Its rhinarium and coat are like those of *L. lutra*. Anderson compared it to *nair*. This is opposed to Thomas's identification of it as the smooth-coated otter he called *tarayensis* (see p. 294). The confusion regarding the status of *barang* was cleared up by Robinson and Kloss; but Pohle, not knowing their papers, accepted Thomas's opinion, and, having disposed of *barang* in that way, gave the name *Lutra intermedia* to two young Sumatran otters. There is nothing in the description to justify the admission of *intermedia* as distinct. The tail, it is true, was less than half the length of the head and body, the dimensions being given as 12⅜ and 25¾ in. respectively; but the tail is relatively shorter in young otters, and the skin of the head and body was probably stretched. Moreover, the essential cranial characters Pohle relied on are those of immature skulls.

it is, indeed, the smallest known race of *Lutra lutra*, apart perhaps from *aurobrunnea*—and in its colour, the dorsal surface being on the average paler brown, the ventral surface whiter owing to the more extensively pallid tips of the contour-hairs, and the wool, especially of the throat, whiter at the summit, also by the sharper contrast between the white of the throat and cheeks and the brown of the nape and crown.

Extremes in colour are exhibited by a flat skin labelled "G. Dempoo, Sumatra (W. Blok)," which is about as dark chocolate-brown above as *nair*, and an adult ♂ from Kata Tjane, Atcheh, Sumatra, 200 ft. (W. J. C. Frost), July, which is much paler brown with an ochreous cast. A third Sumatran specimen, an adult ♂ from Siolak, Daras, Korinchi, 3,100 ft. (Robinson and Kloss), March, is a good deal darker than Frost's specimen, the difference being perhaps seasonal, but not so dark as the first.

There are also two skins from the Quangtri River, Annam (Delacour and Lowe) which I cannot distinguish from Sumatran skins. An adult ♂, December, is a little paler than the Korinchi skin, and an ad. ♀, February, is very like it in colour above, except that the wool at the base is buffy; but the pale inferior areas are buffy, with the fur of the belly reddish. The specimens from Annam Osgood recorded as *chinensis* are no doubt the same (Field Mus. Nat. Hist. Zool. xviii, p. 262, 1932).

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

Locality and sex.	Head and body.	Tail.	Hind foot.
Atcheh, Sumatra; ad. ♂	28½	16	—
Korinchi, Sumatra; ad. ♂	23⅜	14⅜	4½
Fort de Kock, Sumatra (Jacob); ad. ♂.	22⅜	18½	4⅜
Quangtri River, Annam; ad. ♂	24	15½	—
Quangtri River, Annam; ad. ♀	22½	14⅜	—

69 *h*. **Lutra lutra chinensis** Gray.

Lutra chinensis, Gray, Mag. Nat. Hist. (2) i, p. 280, 1837; id., Proc. Zool. Soc. 1865, p. 126; Swinhoe, Proc. Zool. Soc. 1870, p. 624.

Lutra lutra chinensis, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 73, 1920; G. M. Allen, Amer. Mus. Novit. no. 358, p. 12, 1929; id., Mamm. China Mongol. p. 410, 1938.

Lutra hanensis, Matschie in Filchner's Zool. Bot. Exp. China, p. 150, 1907 (according to Pohle).

Locality of *type* of *chinensis*, probably Canton; of *hanensis*, Hsinganfu in Shensi.

Distribution.—Southern China, Formosa and Hainan.

This otter so closely resembles the preceding that it can only provisionally be admitted as distinct pending the collection

of further material of both. Most of the skins I have seen are indistinguishable in colour from those of *barang*. The coat is on the average perhaps a little longer, and there is some evidence that the skull is a little larger, the average condylo-basal length in the three skulls marked ♂ in my table being 109 mm., as nearly as may be, as opposed to 101 mm. in the three ♂ skulls of *barang*, the same dimension in three ♀ skulls of *chinensis* being 101 mm. as opposed to 100 mm. in *barang*. But the evidence is clearly inconclusive in view of the great individual intrasubspecific variation in size of skulls in other otters.

In addition to the faded type probably from Canton (Reeves) the British Museum has skins from Amoy (Swinhoe), Shanghai (Styan), Ichang on the Yangste, two from Formosa, one from Panglearn (Swinhoe), the other from Tappocha (Owston). It is needless to describe their individual variations; they seem to agree closely in colour with the specimens recorded by G. M. Allen from Yenping in Fokien, from Szechwan, and from Hainan. There is also the skin of an immature specimen from the Mekong Valley, Szechwan (Forrest), which is a little darker than the others, and was identified by Thomas as *nair*, and is indistinguishable from skins of the Indian race. Equally indistinguishable is a young skin from Chapa in Tongking, 5,000 ft. (Delacour and Lowe); but another young skin secured by the same collectors at Hué in Annam is not quite so dark, being greyer, especially on the cheeks, sides of the neck and belly. These skins were provisionally identified by Osgood as *chinensis*. They probably represent intergradational forms between *chinensis* and *barang*, if, indeed, these two are distinct.

The following otter, usually regarded as specifically distinct from *Lutra lutra*, may be discovered in Lower Burma.

70. **Lutra sumatrana** (Gray).

"Barang," Raffles, Tr. Linn. Soc. xiii, p. 254, 1822.
Lutra barang, Cantor, Journ. As. Soc. Beng. xv, p. 195, 1846. (Not *Lutra barang*, F. Cuvier.)
Barangia sumatrana, Gray, Proc. Zool. Soc. 1865, p. 183; id., Cat. Carn. etc., p. 101, 1869; and of many subsequent authors (under *Lutra*).
Lutra lovii, Gunther, Proc. Zool. Soc. 1876, p. 736; Lyon, Proc. U.S. Nat. Mus. xxxiii, p. 560, 1907.
Lutra sumatrana lovii, Pohle, Arch. Naturg. lxxxv, p. 44, 1920.
Lutra sumatrana brunnea, id., *op. cit.* p. 43.

Locality of the *type* of *sumatrana*, Sumatra; of *lovii*, Mengalong River opposite Labuan, Borneo; of *brunnea*, Pontianak, Borneo.

Distribution.—The Malay Peninsula; Peninsular Siam (Gyldenstolpe); Sumatra; Cochin China and Annam; Borneo.

Distinguished from *Lutra lutra* by having the nose-pad, or rhinarium, covered with short hairs *, apart from its lower edge and the extreme margins of the nostrils, and by the colour of the under side, the belly, chest, hind throat, sides of neck and cheek brown, at most a little paler than the upper parts, never strongly contrasted with them, only the upper lip, chin and fore throat, the last irregularly and to a varying extent, whitish and strongly contrasted.

On the evidence supplied by skins and skulls in the British Museum I am unable to agree with Pohle that there are three subspecies of this otter, two of them being restricted to Borneo.

He distinguished *lovii* from *sumatrana* by the whitish instead of yellowish tint of the lips, chin and fore throat, by the palate projecting only 5 mm., instead of 10 mm., beyond the molars, and by the frontals projecting as a point between the parietals. But in my Malayan and Sumatran skins the areas above mentioned may be whitish or yellowish; in a skull from Sandakan, N. Borneo, the country of *lovii*, the palate projects 11 mm. behind the molars, and thus agrees with four skulls of the typical form from the Malay Peninsula in which the projection varies from 10 to 13 mm.; a young skull from Sumatra (Raffles) and another from Malacca resemble the young skull of the type of *lovii* in the frontals projecting between the parietals.

Pohle distinguished *brunnea* from typical *sumatrana* and from *lovii* by the tail being more instead of less than half the length of the head and body, and by the anterior narial orifice in the skull being about as wide as high instead of narrower than high. But the adult ♂ of *sumatrana*, recorded by Cantor, has the tail much more than half the length of the head and body, as in *brunnea*, and the shortness of the tail in the type of *lovii*, on which Günther relied, is due to the immaturity of the animal and probably partly to stretching of the made-up skin of the head and body. The tail is always relatively short in young otters, as in most long-tailed carnivores. The shape of the narial aperture is also an age character. In adult Malayan skulls of *sumatrana* the orifice is as wide as high, 12 by 12 or 11 by 11 mm., as in Pohle's diagnosis of *brunnea*, and it is 11 by 11 in the skull from Sandakan; but in two young skulls of the typical form from Sumatra the orifice

* In dried skins at least more or fewer of these hairs are liable to be rubbed off; but their former presence may be detected with a hand-lens by their follicles, which give a finely pitted surface, different from the coriaceous surface of the rest of the Oriental otters, which have the nose-pad naked.

is respectively 9 by 11 and 8 by 10½ mm. The characters relied on by Pohle have clearly no systematic value.

The British Museum has the following skins referable to this species :—

Malacca, 2 ad. ♂ (Cantor, nos. 79.11.21.265–266), 1 yg. ♀ (Cantor no. 50.10.5.7), and 1 ad ♀ from Singapore are lustrous chocolate-brown above, a little paler brown below, noticeably paler brown on the hind throat, the side of the neck and the cheek, with the upper lip, chin and fore throat whitish. A young ♀ skin from the Straits Settlements has the general coloration rather darker brown, with the lips and chin yellowish.

The type from Sumatra (Sir S. Raffles, 84.6.3.4), a young adult ♀, is rather redder, more earthy brown than the Malaccan specimens. A still younger specimen (no. 84.6.3.2), the original " Barang " of Raffles, is still redder brown than the type. The redder tint of these two examples, which were for many years in the Museum of the East India Co. before being incorporated in the British Museum, is probably due to fading.

The type of *lovii* Günther, a young ♂ from the Mengalong River, opposite Labuan, N. Borneo (Low, no. 76.9.20.4), and a young ♀ from Sandakan, N. Borneo (W. B. Pryer, 80.4.15.1), match the darker skin from the Straits Settlements, the pale areas being whitish as in the other Malayan skins.

The skin of a ♂ from Long Xuyen, Cochin China (Lataste, no. 19.7.7.2537), appears to represent the same race as the Bornean, Sumatran and Malaccan skins.

The skin of a youngish individual from Hué, Annam (Delacour and Lowe), May 18, apparently in new coat, is darker than the foregoing, less rufous and more chocolate-brown above and below, with the crown of the head nearly black and the cheeks, sides of the neck and hind throat rather darker brown, less strongly contrasted with the nape and crown and more strongly contrasted with the cream-buff of the upper lip, chin and fore throat.

The following are the recorded flesh-measurements (in English inches) :—

	Head and body.	Tail.
Malacca (Cantor) ; ad. ♂	32½	20
Borneo, Pontianak (*brunnea* type) ; ad.	31½	18½
Borneo, Pontianak (Lyon) ; ad. ♀	24⅜	15⅞
Borneo, Pulo Saporo (Lyon) ; ad. ♀ ...	23	15

Pohle recorded the head and body and the tail of a young dry skin from Sumatra as 28 and 14 in., and the type of *lovii*, the made-up skin of a young ♂, with the head and body apparently stretched, was stated by Günther to measure 23 and 11 in. ; but measurements of dried skins are never to be trusted.

Skull-measurements (in mm.) of *L. lutra barang*, *L. l. chinensis* and *L. sumatrana*, which may prove to be members of the British Indian Fauna.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
Lutra lutra barang.								
Atcheh, Sumatra; ad. ♂	111	106	66	13	21	25	10	12
Fort de Kock, Sumatra (Jacob); ad. ♂	104	106	60½	14	19	—	10½	—
Korinchi, Sumatra; ad. ♂	103	102	63	13	16	22	11	12
Quangtri River, Annam; ad. ♂	101	97	59	15	17	21	10	12
Quangtri River, Annam; ad. ♀	100	97	60	13	17—	21	11	12½
Hoi Xuen, Annam (Osgood); ad. ♀	—	100	68·8	—	—	—	—	—
L. l. chinensis.								
Amoy; ad. ♂	112+	112	68	13½	19	25	11	12
Foochow; ad. ♂ ?	105	108	61	13	17	24	10½	12
Fokien (G. M. Allen); ad. ♂	—	108	63	15	—	—	—	—
Tappocha, Formosa; ad. ♀	110	107	69	13	19	24	11	13
Hainan (G. M. Allen); ad. ♀	—	109	57	14	—	—	—	—
Szechwan (G. M. Allen); ad. ♀	—	96½	54½	16	—	—	—	—
Lutra sumatrana.								
Malacca; ad. ♂	—	(119±)	73	12	18	26	13	12½
Malacca; ad. ♂	—	(115±)	70	12	17	27	13	14
Singapore; ad. ♀	—	(110±)	63	10½	16	25	12	13
Sumatra (type); yg. ♀	100	100	55	15	15	21	12	12
Sandakan, Borneo; yg. ♀	—	—	62	13	16	24	11	12
Mengalong River, Borneo (*lovii* type); yg. ♂	—	—	60	19	18	24	12	—

Genus **LUTROGALE** Gray.

Lutrogale, Gray, Proc. Zool. Soc. 1865, p. 127; id., Cat. Carn. Brit. Mus. p. 105, 1869; Pohle, Arch. Naturg. lxxxv, pt. 9, p. 108, 1920; Pocock, Proc. Zool. Soc. 1921, p. 543; Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 416, 1923.

Type of the genus, the species identified by Gray as *monticola* Hodgson, which is *perspicillata* Geoffroy, not *monticola* Hodgson.

Distribution.—Peninsular India (not Ceylon), Himalayas, Assam, Burma, Indo-China, Malay Peninsula, Sumatra and Borneo (according to Pohle).

Distinguished principally from *Lutra* (sensu stricto) by the structure of the skull, which is less depressed, has the orbit larger and set so far forwards that its anterior rim is vertically above pm^3, thus reducing the length of the muzzle, lengthening the floor of the orbit, and bringing the frontal postorbital processes over the middle of the upper carnassial (pm^4); the elongated postorbital area or "waist" is also noticeably inflated, nearly parallel-sided, with an abrupt constriction where it passes into the cranium proper; the plane of the anterior nares more nearly approaches the vertical and the cheek below the eye is lower, the infraorbital foramen being largely concealed in profile view by its upper bar; the teeth too are larger than in all the typical Oriental forms of *Lutra*, the inner lobe of pm^4, for instance, occupying nearly the whole length of the tooth *.

In its external characters this otter differs from British Indian representatives of *Lutra* by its very smooth, sleek coat, as was originally stated by Hodgson when he described it as *tarayensis*, and contrasted it in that respect with *monticola*, which has a rough coat †. Also, according to Hodgson, the only author apparently who examined fresh specimens, the tail is more flattened, a character manifest in most made-up skins, which have a ridge of stiff integument on each side of the end of the tail (fig. 69, C, D, p. 304). Hodgson gave figures of the feet, reproduced in fig. 66, p. 293, but these are not sufficient to justify the conclusion that there is any difference between the two genera in these extremities, although the recorded flesh-measurements suggest that the hind feet may be on the average a little longer. A character observed on dried skins, and often referred to, is the straightness of the hair-line defining the posterior edge of the rhinarium, or nose-pad,

* The Japanese Otter (*Lutra whiteleyi*), however, has teeth almost as in *Lutrogale*.

† If Hodgson's original description of these otters had been consulted by Gray, Anderson, Blanford and Thomas there need never have been the former confusion about the allocation of their names to his specimens.

above, whereas in *Lutra lutra* and its subspecies the line is irregularly zigzag. From the shape of the skull two differences may be inferred: the first is that the rhinarium, with its nostrils, faces more directly forwards, and the second that the eyes are set lower on the side of the face. If this inference be correct a larger area of the top of the head is exposed in *Lutrogale* on rising to the surface with the eyes and nostrils above the water than in *Lutra* *.

71. **Lutrogale perspicillata** (Is. Geoffroy). The Smooth-coated Indian Otter.

Lutra perspicillata, Is. Geoffroy, Dict. Class. d'Hist. Nat. ix, p. 519, 1826. (Not *Amblonyx cinerea perspicillata*, Pohle, Arch. Nat. lxxxv, pt. 9, p. 130, 1920.)

Lutra simung, Lesson, Man. Mamm. p. 156, 1827; Robinson and

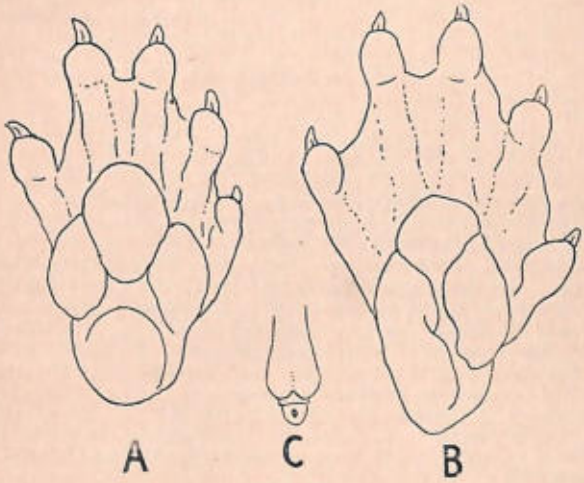


Fig. 66.

A and B. Lower side of right fore and hind feet of *Lutrogale perspicillata*, showing general similarity to those of *Lutra lutra*.

C. Upper side of tip of penis of the same, showing the apparently symmetrically bilobed end of the baculum, with the orifice of the uretha below it.

(These figures traced from Hodgson's unpublished drawings of *Lutra tarayensis*.)

* Although the structural characters in which this otter differs from *Lutra* have not been considered as of generic or even subgeneric importance by authors who have quoted it since the name *Lutrogale* was independently restored to use by Pohle, myself and Hinton, it is submitted that they are at least as well pronounced as those which distinguish some other genera of mammals, e. g., *Thalarctos*, the Polar Bear, and *Ursus*, the Brown Bear.

Kloss, Journ. Fed. Mal. St. Mus. viii, p. 14, 1918. (Not *L. simung*, Horsfield, Cat. Mamm. E.I. Co. p. 116, 1851, which is *L. l. barang*, Cuv.).

Lutra tarayensis, Hodgson, Journ. As. Soc. Beng. viii, p. 319, 1839; and of many recent authors, including Thomas and Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, p. 348, 1919.

Lutra macrodus, Gray, Proc. Zool. Soc. 1865, p. 128; Blanford, Mamm. Brit. Ind., Appendix, p. 602, 1891.

Lutra ellioti, Anderson, Zool. Res. Yunnan, p. 212, 1878; Blanford, Mamm. Brit. Ind. p. 185, 1888.

Lutra barang, Thomas, Proc. Zool. Soc. 1889, p. 190. (Not *L. barang*, Cuv., see p. 286.)

Lutrogale barang, Pohle, Arch. Naturg. lxxxv, pt. 9, p. 108, 1820; Pocock, Proc. Zool. Soc. 1921, p. 542; Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 416, 1923. (Not *Lutra barang*, Cuv.)

Lutrogale perspicillata, Pocock, Journ. Bomb. Nat. Hist. Soc. xli, p. 515, 1940.

Vernacular.—Ludra (Sindhi); *Ud*, *Puni-Kutta*, *Jal-manus* (Central India according to Dunbar Brander); *Niru-Kuka* (Tamil); *Dilwai Bek* (Mal.); *Phey* (Talain); *Hpyan* or *Pyan* (Burmese); *Bung* (Karen); *Mohn* or *Mun*, *Wun* (Shan St.); *Shăram* (Kachin).

Locality of *types*, *perspicillata* and *simung*, Sumatra; *taray ensis*, Nepal Tarai; *macrodus* and *ellioti*, Madras *.

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* Owing to an unintelligible mistake by Gray, equally unintelligibly perpetuated by his successors hitherto, the pair of otters Gray described as *Lutra* (*Lutrogale*) *macrodus* were stated to have come from "Brazil" and to have been purchased from Parzudaki. That history is still on their labels. But the ♂, marked lectotype by Thomas, bears the number 46.11.9.11, and according to the entry in the register it was collected by Jerdon in Madras. The ♀ is numbered 46.6.13.31; but there is no such entry in the register. No doubt they were both secured in the Madras Presidency by Jerdon, who was personally acquainted with a large otter common on the Carnatic coast.

The adoption of the name *perspicillata* for this big, smooth-coated, large-toothed Oriental otter, and its transference from the Small-clawed Otter to which it has been assigned, notably by Pohle in 1920, needs explanation.

Cuvier's diagnosis of *L. barang*, discussed above (p. 286), was followed by the description of the skull and skin of a young otter, also sent by Diard, for which no locality was mentioned. This Cuvier thought was probably a young specimen of the "Simung," the larger of the two Sumatran otters referred to by Raffles (Tr. Linn. Soc. xiii, p. 254, 1822). From its softer, smoother and shorter coat, and the differences in colour, Cuvier was sure it was not the young of his *L. barang*. The skull, although "very young," was sufficiently large to make Cuvier believe that when adult the animal would equal "notre loutre" (the European *Lutra lutra*) in size. He gave no name to this otter. But Is. Geoffroy reproduced Cuvier's description of it and called the animal *Lutra perspicillata*. To the same specimen, also with a repetition of Cuvier's description, Lesson gave the name *Lutra simung*, which is therefore a synonym of *perspicillata*, as Pohle detected. But Pohle assigned *perspicillata* to the synonymy of *Amblonyx cinerea*, the Clawless Otter, apparently on account of what Anderson said about Cuvier's specimens which he saw in Paris. But Anderson misunderstood Cuvier's text,

Distribution.—INDIA from the HIMALAYAS and SIND to the MADRAS PRESIDENCY (not CEYLON), BURMA, Indo-China, Malay Peninsula, Sumatra, Borneo.

A large otter, the size and proportions being about the same as in the larger races of *Lutra*, the tail considerably more than half the length of the head and body and more than three times the length of the hind foot. The colour of the upper side varies from deep, nearly blackish-brown to lighter brown, with a rufous tinge, and to much paler, tawny- or sandy-brown; the paws paler than the back; the belly always lighter than the back and flanks, brown or grey, its contour-hairs sometimes extensively grey; the upper lip to the edge of the rhinarium, the cheek to the eye and ear, the sides of the neck, the chin and throat white or whitish, the pale hue

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and published a most confused rendering of it (Zool. Res. Yunnan, pp. 204–5, 1878). After referring to *Lutra barang* he added that Cuvier judged from the large size of its immature cranium that the adult attained the size of the "Simung" and that it, *i.e.*, the type of *barang*, was probably the young of "Simung" and not of *nair*. Cuvier said nothing of the kind. But the principal error made by Anderson was thinking that the skull of Cuvier's second specimen was the skull of *barang*. This skull he said he could not find; he did in reality find it, but failed to identify it, apparently because it was entered in the Catalogue by its correct name *perspicillata*. He also found the skin of the type of *perspicillata* without associating it with the skull bearing the same name. Thus he saw all Cuvier's specimens, the skin of *barang* said to be from Java and the skin and skull of the second specimen which Geoffroy named *perspicillata*. He thought the skin of *perspicillata* might be referable to *Amblonyx cinerea*, although he admitted that the claws were longer than is usual in the young of the Clawless Otter. Pohle accepted that guess, which Anderson probably would never have made if he had associated the skull with the skin; and Pohle justified his view by saying that the claws of young *Aonyx* are longer than in the adult.

My reasons for dissenting from Pohle's decision are as follows:—(1) From Cuvier's statement about the size of the "very young" skull of *perspicillata* it may be inferred that it was about as large as the adult skull of *Amblonyx*. A very young skull of *Amblonyx*, the smallest of all the Oriental otters, could hardly justify the opinion that the adult would equal *Lutra lutra* in dimensions. (2) My examination of the feet of young examples of *Amblonyx*, ranging from cubhood to maturity, shows that while they are still entirely dependent on the mother the claws are normal in length and curvature, but that as soon as the young are large enough, when about a third grown, to be wholly or to a great extent independent of her and able to hunt for themselves the claws, at least of the fore feet, which are used for feeding, become stunted and like those of the adult, although the change is delayed longer in the hind feet. Hence an *Amblonyx* of the size suggested by Cuvier's remarks would have had very small claws on the feet, and not claws of the kind that evoked Anderson's comment.

All the evidence therefore seems to point to the conclusion that the type of *perspicillata* was a young example of the large, smooth-coated, big-toothed otter, for which the oldest name, except *perspicillata*, is *simung* of Lesson, and under this name it was described by Robinson and Kloss (Journ. Fed. Mal. St. Mus. viii, p. 14, 1918).

of the throat traceable posteriorly between the fore legs, where it gradually diminishes in distinctness.

There are two or three pairs of teats detectable on dried skins when they are enlarged, indicating the suckling of cubs.

In the synonymy quoted above possibly two British Indian subspecies are represented—*perspicillata* (=*simung*) occurring in Burma and Assam, and *tarayensis* (=*macrodus* and *ellioti*) inhabiting India from the Himalayas southwards, but excluding Sind. There is not, however, sufficient evidence at present for the admission of *tarayensis*. But a considerable number of skins from the lower Indus suggest that Sind specimens, although intergrading with those of the rest of Hindostan, differ on the average in their paler, more sandy colour. These I provisionally regard as representing a distinguishable local race.

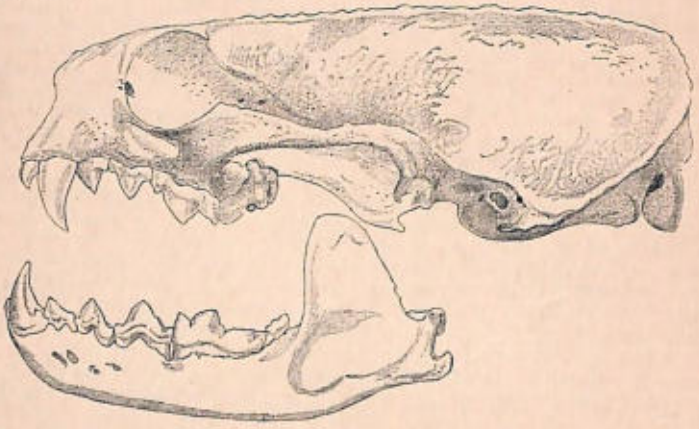


Fig. 67.—Side view of skull of *Lutrogale perspicillata* about three-fourths natural size, copied from a figure by Anderson (Zool. Res. Yunnan, 1879, pl. 12, fig. 1) of a skull sent by Hodgson to the Royal College of Surgeons and wrongly identified as *Lutra monticola*. (From Blanford.)

71 *a*. **Lutrogale perspicillata perspicillata** Geoffroy.

(Synonymy and distribution, excluding Sind, as under the species.)

Colour typically dark from blackish to rufous chocolate-brown, sometimes paler, sandy- or tawny-brown.

In Burmese skins the colour varies considerably. In two, immature, from Pegu (E. W. Oates), March, the upper side is pale tawny or sandy-brown. Three adult males from 20 and 40 miles W. of Toungoo, also in Lower Burma, 500 to 600 ft. (Mackenzie), December 19 and January 26, are a little darker brown, but still rather pale. But two from six miles

west of Kindat, in Upper Burma, 600 ft. (Mackenzie), February 18 and 21, are dark chocolate-brown, although a third, a flat undated, probably native, skin, and possibly a little faded, is rather paler, more like the Toungoo skins. Similarly dark coloured, almost blackish-brown, are a skin from Sagaing, near Mandalay (Owens) and two from the "Triangle," Upper Burma (R. Kaulback), one from Mashaw Tingra (26° 48′ N., 98° E.), 3,000 ft., April 6, the other from Sumprabum (26° 33′ N.,

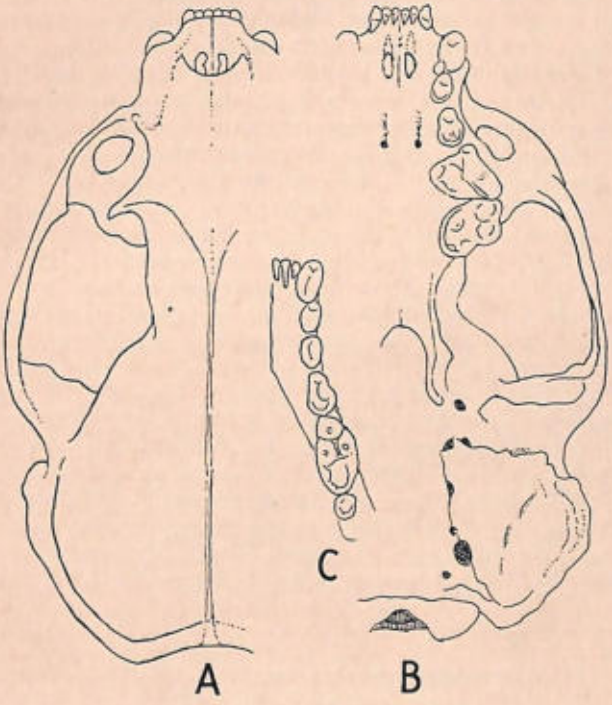


Fig. 68.

A. Left side of upper surface of skull of adult ♂ *Lutrogale perspicillata* from the Ankulam Lagoon, Travancore.
B. Left side of lower surface of the same.
C. Lower teeth of the right side of the same.

(These figures two-thirds natural size.)

97° 34′ E.), 1,500 ft., May 20. The dates of these skins do not support the view that the differences in tint are due to seasonal change. Nor is there sufficient evidence for the conclusion that Lower Burmese are paler than Upper Burmese specimens. Similar variations occur in Assam. A ♂ skin from Sadyia, 500 ft. (Wells), December 1, is of the paler tawnier-brown

tint approaching those from Toungoo, whereas two ♀♀ from the Naga Hills (Mills), one from the Chibi River, 1,500 ft., August, another from the Dikhu River, December 17, and a ♀ skin from Kaziranga, Jorhat, 250 ft. (Wells), January 24, are dark, falling into the same category as the Kindat skins.

The above-described skins are not as a whole distinguishable from three skins from the Malay Peninsula, one from Padang Tembeling in Pahang, (Robinson and Kloss), March, another from Larut in Perak (Robinson and Kloss), July 28, and a third from Salanga Island, which differ slightly individually but are more earthy-brown than the Toungoo skins A skin from Lawas District (A Everett) * is as dark as the darkest Upper Burmese skins; and a ♀ skin from Annam (Vassall) is a slightly darker, greyer brown than the Toungoo skins.

The following Indian skins from scattered localities ranging from the Himalayas to the Madras Presidency are all dark tinted and, although varying individually, are on the average more rufous or earthy-brown than those from Assam and Burma :—Three of Hodgson's, including an adult ♂ from Nepal, selected by Thomas as the type of *tarayensis*, and two immature specimens, one labelled " Nepal," the other the " Himalayas " ; a young ♀ from Mt. Abu, Rajputana (L. Impey) ; a young ♂ from Damoh, 1,200 ft. (Crump), May 12 ; an adult ♀ from Ghazipur, near Benares (S. S. Flower), January 13—this is duller tinted than the rest ; the co-types, ♂♀, of *macrodus* from the Madras Presidency (Jerdon), the reddest of all ; an immature specimen from Trivandrum (Ferguson) and an adult ♂ from the Ankulam Lagoon, Travancore (Pillay), August 12. This last is very dark lustrous brown above, pale brown below, with less noticeable grey cast than usual. It tolerably closely matches the dark Burmese skins, being merely a trifle more rufous †.

71 *b*. **Lutrogale perspicillata sindica** Poc.

Lutrogale perspicillata sindica, Pocock, Journ. Bomb. Nat. Hist. Soc. xli, p. 517, 1940.

Locality of the *type*, Chak in the Sukkur district of Sind.

Distribution.—The Indus Valley at least from Bahawalpur southwards to Sind.

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* This skin was purchased with those particulars. In the register Thomas entered it as from Lawas, Borneo. The only Lawas I can find is the well-known district of that name in Sumatra. Everett may have collected the specimen there on his way to Borneo. If so, it is of special interest as coming from the island whence the type of the species came. It is an adult ♂, but the skull is small, with a condylo-basal length of only 115 mm., the same as in the type of *tarayensis*.

† I have seen no specimens from Dharwar, where the species was collected by Jacob.

Distinguished on the average from representatives of *L. perspicillata* inhabiting the rest of Hindostan by its noticeably paler colour, the general hue above being drabby, tawny or sandy-brown, in accordance it may be supposed with its desert environment.

I have seen in all seven skins of this otter from the lower Indus. One labelled "Sind" and another "Sukkur, Sind," were sent to the British Museum many years ago by the Karachi Museum. Two were secured by S. H. Prater for the Mammal Survey at Sukkur, March 24, and three at eastern Nara, Khairpur, April 7 and 12. None of the specimens is fully adult, as the skulls indicate. The Khairpur skins are a trifle darker than those from Sukkur, thus approaching those from other parts of Peninsular India; and a young specimen, about a third grown, from Bahawalpur (J. Scully) is also darker, not very different from the type of *tarayensis*, with the belly brownish and the throat soiled buff. It is quite likely that the young of *sindica* are darker than the adults.

Both Hume and Blanford, who saw at least one example of this otter in Sind, thought it differed from the normal Indian form by its smaller size. This is not borne out either by the flesh-measurements Prater recorded or by the skulls he secured.

Admittedly the skins of this Sind otter are practically indistinguishable in colour from some Burmese skins assigned to the typical race, *e. g.*, those from Pegu and Toungoo; but I have considered the Sind specimens worth naming on account of their difference from ordinary Indian specimens and their geographical isolation from the Burmese skins.

Flesh-measurements (in English inches) and weights (in lb.) of British Indian representatives of *Lutrogale perspicillata*:—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
L. p. perspicillata.				
West of Kindat, Burma; ad. ♂	29⅜	17	5⅜	24
West of Kindat, Burma; ad. ♂	28½	18½	5⅜	21
Toungoo, Burma; ad. ♂	26½	17⅜	5⅜	—
Toungoo, Burma; ad. ♂	26	17⅜	5⅜	—
Sadiya, Assam; ad. ♂	28⅜	16½	5⅜	—
Nepal Tarai (Hodgson); ad. ? ♂ and ♀	28 and 26	16	—	20 to 16
Ghazipur, Benares; ad. ♀	(34 ?)	18	—	—
L. p. sindica.				
Chak, Sukkur, Sind (type); yg. ad. ♀	25½	17⅛	5⅜	16
Eastern Nara, Khairpur; yg. ad. ♀	25½	16½	5½	—

The individual variations in size are not exceptional for otters, apart from the example from Ghazipur, in which the head and body were recorded by S. S. Flower as 850 mm. Since this unusual length is not borne out by the size of the skull, it may be suspected that 850 was unwittingly written for 650, giving a length of 26 in., which would be about right. General agreement in size between British Indian specimens and those found in the Malay Peninsula is shown by the measurements, taken by Robinson and Kloss, of two adult ♂♂ from Pahang and Perak, in which the head and body are respectively 27⅔ and 26½ in. respectively.

The two specimens of *sindica* selected for measurement are the largest of the series; neither is quite full-sized judging from their skulls, but the data they supply do not suggest that there is any marked difference between the sexes in this species of otter.

Dunbar Brander recorded the weight of a large ♂ from Central India as 22 lb.

Skulls.—Most of the skulls entered in the following table belong to the skins above referred to from the same localities. Three have no skins, namely the one from Bengal, which has no further history, the one from Nerbudda, C.P., and the one from Goona in Gwalior which were received from Dr. J. Scully. The preponderance of ♂ skulls is striking. They vary individually in all their dimensions, the skull of the type of *tarayensis* being 10 mm. shorter in condylobasal length than the skull from Travancore; but precisely the same difference exists between the skull from Bengal and the one from Nerbudda. The average condylobasal length of ten ♂ skulls is just about 121 mm. It is almost the same, *i. e.*, 120 mm., in the first four ♀ skulls entered; but the ♀ skull from Goona is much smaller, bringing the average of the five to less than 118 mm. But since the only other adult ♀ skull I have seen, that of the specimen from Annam (Vassall), is 119 mm. in its condylobasal length, and the young adult ♀♀ of the Sind race are respectively 119 and 116 mm., the two sexes clearly differ very little in the size of the skulls. The Goona skull may provisionally be regarded as a "dwarf."

Habits.—So far as is known the habits of this otter are to all intents and purposes the same as those of *Lutra*. There is no doubt that when Jerdon (Mamm. India, p. 87, 1867) described the otter that is found in numbers along the Malabar coast and in Lower Bengal as being, in his opinion, larger, more reddish or yellowish-brown, with the upper and under sides more sharply defined than in the southern Indian otter which he correctly identified as *L. nair*, he was referring to the smooth-coated otter (*Lutrogale*) with which he was un-

Skull-measurements (in mm.) of British Indian representatives of *Lutrogale perspicillata*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
L. p. perspicillata.								
Kindat, Upper Burma ; ad. ♂	128	125	80	22	22+	29−	15	—
Kindat, Upper Burma ; ad. ♂	126	—	75	18½	21	26	15½	16
Toungoo, Lower Burma ; ad. ♂	122	122	72	19	22	25	14	15
Toungoo, Lower Burma ; ad. ♂	120	117	78	23	22	26½	15	16½
Toungoo, Lower Burma ; ad. ♂	121	117	72	22	22	25	14	15
Sadyia, Assam ; ad. ♂	123	120	76	18	22	27	14	15
Himalayas (Hodgson) ; ad. ♂	126	122	74	18	23	27	15	16½
Nepal (*tarayensis* type) ; ad. ♂	120	115	71	18	19	26	14	14
Bengal ; ad. ? ♂	128	128	80	20	27	28	13	15
Nerbudda, C.P. ; ad. ♂	122	118	74	18	21	26	13½	15
Ankulam Lagoon, Travancore ; ad. ♂	130	125	82	20	25	27	14	13
Dikhu River, Naga Hills, Assam ; ad. ♀	127	123	76	17	22	27	15	16
Chibi River, Naga Hills, Assam ; ad. ♀	126	122	81	20	22	29	15	16
Ghazipur, Benares ; ad. ♀	122	118	75	18	22	26	15	14−
Ghazipur, Benares (Hodgson) ; ad. ♀	118	116	72	17	20½	25	13	15
Goona, Gwalior ; ad. ♀	111	107	62	18	18	26	13	—
L. p. sindica.								
Eastern Khairpur, Sind ; yg. ad. ♀	123	119	73	25	22	26+	14½	16
Sukkur, Sind ; yg. ad. ♀	122	116	71	21	22	27	14	15
Eastern Khairpur, Sind ; yg. ad. ♂	121	115	68	21	21	27	15	16

acquainted. He reported seeing them hunting in parties on the Malabar coast and in the sea. McMaster ('Notes on Jerdon,' p. 18, 1870), who followed Jerdon in discussing this otter under *L. nair*, gave an account of his watching a party of at least six hunting in concert in Lake Chilka. They worked in a huge semicircle, with a distance of about 50 yards between each otter, driving a shoal of mullet before them and going well out into the open sea. Later Annandale (Mem. Ind. Mus. v, p. 165, 1915) secured a specimen of this otter in Lake Chilka and identified it as *Lutra macrodus* (=*Lutrogale perspicillata*). He reported it as common in all parts of the lake where rocks occur, adding that it might be seen swimming at some distance from the shore in Balugaon Bay, but was more commonly observed among the rocks at Barkul Point. This otter was probably also the species mentioned, under *L. nair*, by Anderson (Zool. Res. Yunnan, p. 209, 1879) as "largely employed by the fishermen of the Jessore district and the Sunderbands to drive fish into their nets"; and Hume's account ('Stray Feathers,' i, p.110), quoted by Blanford, of the tame otters kept by the Mohánas of Sind and employed by them in fishing and capturing porpoises was shown by Prater to refer to this species when he wrote (Journ. Bomb. Nat. Hist. Soc. xxiv. p. 755, 1916) :—"Otters are not uncommon in the Indus and Eastern Nara. They are kept by the Muhanas (fishermen), who employ them as decoys for capturing dolphins (*Platanista gangetica*) and fish. Two or three tame otters are let into the river and food in the shape of fish or prawns is thrown to them, whereupon there ensues a great mewing and splashing, and the commotion attracts the fish, which blunder into the nets prepared for them."

The occurrence of this otter in Travancore, as attested by skins sent by Ferguson and Pillay, suggests that it was this species Shortridge referred to as the "estuary otter of the west coast" in his note on *Lutra lutra nair*.

The otter Dunbar Brander ('Wild Animals of Central India,' p. 277) mentioned as the only species found in the Central Provinces was obviously this species, although he identified it as *Lutra vulgaris*, adding that it is exactly like the European otter but somewhat less heavily coated. It is found locally in all the main rivers and larger jungle-streams. From two to five are often seen together, but occasionally regular schools are met with. He once counted twenty-two in one pool. When fishing in co-operation they work in a semicircle, driving the fish on to a shoal. Their food, however, is by no means restricted to fish. When the pools shrink in the hot weather they sometimes take to jungle hunting, like other carnivores, and lie up in earths on the hillside. They are by

no means helpless on land, and a tame specimen used to accompany the "bobbery" pack after jackals. The only cry they were heard to utter was a shrill yap.

In Burma Mackenzie recorded having seen parties of six and having heard of parties of eight, nine or ten fishing together in the Chindwin River; and according to Osgood this is the dominant otter of the Mekong River.

The presence of three pairs of functional teats, with the skin around them naked, in a skin from Kaziranga, Golaghat, Assam (Wells), dated January 24, shows that cubs may be born in that month; but a skin from the Chibi River, Naga Hills. (J. P. Mills), dated August, with two pairs of enlarged teats, suggests breeding at a much later date. Possibly there are two broods in the year *.

Genus **AMBLONYX** Rafinesque.

The Oriental Clawless Otter.

Amblonyx, Rafinesque, Atlantic Journal, i, p. 62, 1832 (subgenus of *Lutra*); Pohle, Archiv Naturg. lxxxv, p. 124, 1920; Pocock, Proc. Zool. Soc. 1921, pp. 535–44; and of most recent authors.

Leptonyx Lesson, Nouv. Tabl. Regn. Anim., Mamm. i, p. 72, 1842 (*nom preocc.*).

Aonyx of Gray and of many later authors, at least in part, until 1920 (not of Lesson, Man. Mamm. p. 157, based on the African Clawless Otter).

Micraonyx, J. A. Allen, Journ. Mamm. i, p. 24, 1920; G. M. Allen, Mamm. China Mongol. p. 415, 1938.

Type of the genus *Amblonyx, concolor*; of *Leptonyx, leptonyx* (=*cinerea*); of *Micraonyx, cinerea*.

Distribution.—S. Peninsular India; absent from Central India, the north-western desert area, and from Ceylon; Himalayas, at least eastwards from Nepal and Kumaun, Assam, Burma, Southern China, thence southwards through Indo-China, Malaya and the Sunda Islands to Borneo and Palawan.

Principally distinguished from *Lutra* and *Lutrogale* in external characters † by the structure of the feet, which are considerably narrower, with the digits tied closer together by shallower, narrower, more emarginate webs, which do not extend along the digital pads and are sparsely covered below

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* On the back of the label of one of Mackenzie's ♂ skins, from six miles W. of Kindat, there is a note referring to the possible presence of a gland just above the tip of the tail. On the spot indicated there is a patch of scabby skin. Although I have failed to find a similar patch on other skins of this otter, Mackenzie's suggestion is worth bearing in mind for future verification.

† See my paper on "The External Characters of some Species of *Lutrinæ* (Otters)" (Proc. Zool. Soc. 1921, pp. 535–46).

with short hairs ; also the claws, except in small cubs, are at most minute, erect spikes, not projecting beyond the end of the digital pads ; the plantar pads are better developed, more normal in shape, subsymmetrical and four-lobed, the inner main lobe being prolonged backwards by the pollical and hallucal elements ; the rhinarium, or nose-pad, is as in *Lutrogale*, its anterior surface being directed forwards and its upper posterior margin straight. The tail is as in *Lutra*.

The skull is shorter and broader, the width of the cranium being over half the total length, and its dorsal profile is not so

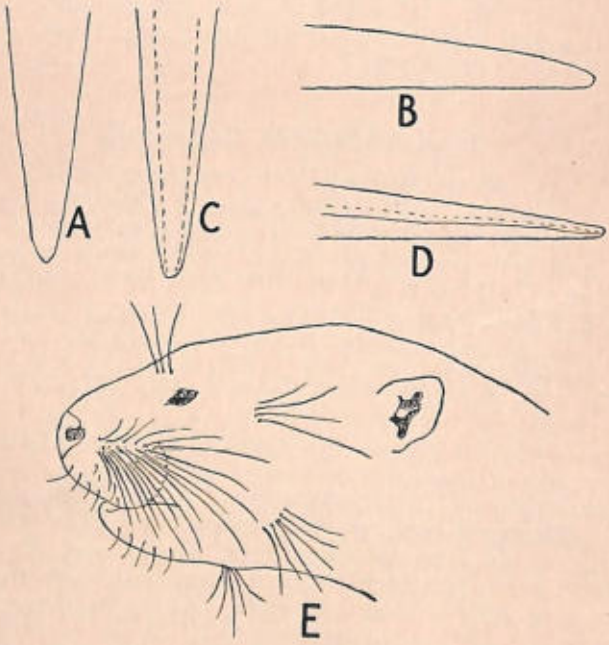


Fig. 69.

A and B. Upper and side views of the end of the tail of a specimen of *Lutra lutra nair*, from Coorg, showing the gradually tapering cylindrical shape of the organ in *Lutra* and *Amblonyx*.

C and D. The same of a specimen of *Lutrogale persipicillata* from Sind, showing the lateral integumentary keels and the more depressed shape of the end of the tail.

(These four figures drawn from dried skins.)

E. Side view of head of *Amblonyx cinerea*, showing especially the anterior position of the rhinarium in this otter, and also in *Lutrogale perspicillata*, for comparison with that of *Lutra lutra* (fig. 62, A, p. 268). (Drawn from a fresh specimen and copied from Proc. Zool. Soc. 1921, p. 536, fig. 19.)

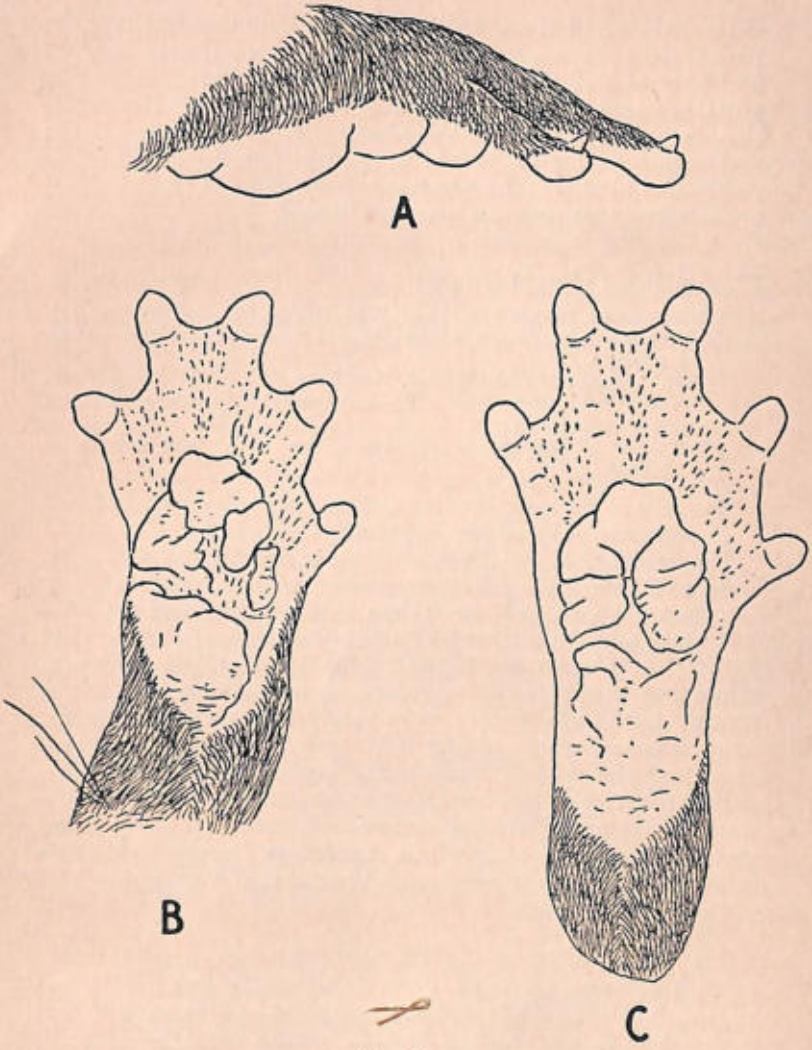


Fig. 70.

A. Outer side of right fore foot of Indian specimen of *Amblonyx cinerea*, showing the small erect claws.

B. Lower side of the same, showing the irregularly-shaped plantar and carpal pads and the comparatively small, sparsely hairy interdigital webs.

C. Lower side of right hind foot of the same, showing the same features of the interdigital webs and plantar pad as B, with the largely naked metatarsal area with its reduced pads. (All figures natural size, drawn from a fresh specimen and reproduced from the paper already quoted.)

depressed ; the bulla is better developed, almost reaching the paroccipital process behind, and the postorbital area is short and only in well-developed skulls has an abrupt constriction a little distance behind the postorbital processes. The dentition is characterized by the absence in most skulls of the first upper premolar, there being only four instead of five postcanine teeth above ; the last two upper teeth (pm^4 and m^1) are relatively larger even than in *Lutrogale*.

72. **Amblonyx cinerea** (Illiger).

Lutra cinerea, Illiger, Abh. Akad. Wiss. Berlin, 1815, p. 90 ; Thomas, Proc. Zool. Soc. 1889, p. 190 ; and of most recent authors under *Amblonyx*.

Lutra leptonyx, Horsfield, Zool. Res. Java, pl., 1824 ; and of most subsequent authors, including Anderson and Blanford, till 1889, under *Lutra* or *Aonyx*.

(For other bibliographical references see under the subspecific headings.)

Locality of the *type* of *cinerea*, Batavia ; of *leptonyx*, Java.

Distribution.—As under the genus.

The smallest of the Oriental Otters, apart from the little-known Himalayan *Lutra lutra aurobrunnea*, the head and body less than 2 ft., the tail more than half the length of the head and body and from three to four times the length of the hind foot. The colour above in fresh skins is typically dark brown, sometimes with a tawny or rufous tinge when the tips of the contour-hairs are paler; very rarely apparently are these hairs bleached white, giving the "grey" or ashy tint which suggested the specific name ; the under side is generally a paler brown than the upper, often showing a grey cast ; the edge of the upper lip, the chin, cheek, side of the neck and throat are grey or nearly white, sometimes sharply, sometimes comparatively weakly contrasted with the dark upper tint of the head and neck.

The distribution of the Clawless Otter in British India, as in the case of *Lutra lutra*, is discontinuous. Blanford stated that it inhabits the Himalayas at low elevations and is found in Lower Bengal, being common near Calcutta, in Assam and in Burma, but that beyond or southwards of Lower Bengal it has not been recorded from the peninsula of India except at considerable elevations on the Nilgiri Hills and some other ranges in the Madras Presidency. This was confirmed by the results of the Mammal Survey of British India, of which the collectors secured no examples from districts between the Ganges in the north and Coorg and the Palni and Nilgiri Hills in the south, its place over this vast area being taken apparently, as also observed in the case of

Lutra lutra, by the large Smooth-coated Otter, *Lutrogale perspicillata*. It is not, therefore, surprising that differences are detectable between skins from the northern and southern parts of Hindostan, indicating the existence of two local races in the British Indian fauna. These are distinguished collectively, principally by certain cranial characters, from the typical representative of the genus recorded originally from Java; but the material at my disposal supports the opinion that the differences are questions of averages and that the genus is represented by a single species, *cinerea*, as most authors have supposed. This conclusion differs from that of Pohle, who admitted two forms of full specific rank, adopting *indigitata* for the Indian and *cinerea* for the south-eastern species; but he had only two skulls, which he identified as *indigitata*, one labelled "India," the other "Further India," obviously inadequate material. The skulls at my disposal show that the characters on which he relied to a great extent are individual variations due to muscular moulding with age. According to his definitions some of my Indian skulls are *cinerea* and some of my south-eastern skulls *indigitata*.

It is needless to describe in detail the characters of the typical race *A. cinerea cinerea*, since they are referred to under the description of the British Indian race *A. c. concolor*, and also in the discussion of Pohle's classification of the so-called races occurring in the Malay Peninsula, Sumatra, Java and Borneo (p. 315).

72 *a*. **Amblonyx cinerea concolor** Rafinesque.

Amblonyx concolor, Rafinesque, Atlantic Journ. i, p. 62, 1832.
Lutra indigitatus, Hodgson, Journ. As. Soc. Beng. viii, p. 320, 1839.
Aonyx indigitata, Horsfield, Cat. Mamm. E. I. Co. p. 117, 1851.
Amblonyx indigitata and *concolor*, Pohle, Arch. Naturg. lxxxv, pt. 9, pp. 134–6, 1920.
Aonyx sikimensis, Horsfield, Ann. Mag. Nat. Hist. xvi, p. 109, 1855; id., Proc. Zool. Soc. 1856, p. 399.
? *Lutra swinhoei*, Gray, Proc. Zool. Soc. 1867, p. 182; Swinhoe, Proc. Zool. Soc. 1870, p. 624; Pohle, *op. cit.* p. 134, 1920.
? *Amblonyx cinerea fulvus*, Pohle, *op. cit.* p. 133, 1920 *.
Amblonyx cinerea concolor, Pocock, Journ. Bomb. Nat. Hist. Soc., lxi, p. 514, 1940.

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* Only two of the names entered in the synonymy need discussion. The otter named *Lutra* (*Lutrogale*) *swinhoei* by Gray, represented in the British Museum by the type, the jaws of a young specimen sent by Swinhoe from Gawkang Island, near Amoy, not from Formosa as Gray thought, was correctly determined by Anderson as a Clawless Otter (Zool. Res. Yunnan, p. 202, 1879). Swinhoe (Proc. Zool. Soc. 1870, p. 624) described the skin as rich, dark brown above, yellowish-brown below, with the lips, cheeks, throat and fore neck white. There is no evidence that this otter differs in any way from the examples collected

Vernacular.—*Chusan* (Bhot.); *Suriam* (Lepcha); *Pyan* (Burmese); *S'haam* (Chin); *Shăram* (Kachin).

Locality of *type* of *concolor*, Garo Hills, Assam; of *indigitata*, Nepal; of *sikimensis*, Sikkim; of *swinhoei*, Gawkang Island, nr. Amoy; of *fulvus*, Lao Key, Tong-king.

Distribution.—HIMALAYAS, from Kulu eastwards; ASSAM; UPPER BURMA; ? S. China; ? Tong-king and Annam.

Distinguished at all events on the average from typical *cinerea* from Java in colour by the sharper contrast between the whitish hue of the cheeks and sides of the neck and the darker hue of the crown and nape, and by the further extension posteriorly of the whitish of the side of the neck which reaches the shoulder and fore leg. The colour of the upper side is drabby, greyish, earthy or rufous-brown in fresh skins, never very deep chocolate or almost blackish-brown as in the

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by Kaulback far north in Upper Burma, which I have identified as *concolor*.

The Indo-Chinese form named *A. cinerea fulvus* by Pohle (*op. cit.* p. 133) is of doubtful status. It was diagnosed as being pronounced ash-brown in colour above, paler and yellower than his specimens of typical *cinerea* from Java, with the head and face darker than the body; much clearer, nearly yellow, with brownish sheen, below; the lips, chin, throat and breast white and sharply defined from the tint of the upper side, the white extending back to the fore legs, which, like the hind legs, are yellowish-brown. The type is a skin, without a skull, from Lao Key, Tong-king, in the Berlin Museum. But Pohle included in this race the otters from Tong-king and Annam identified as *Lutra* or *Aonyx cinerea* by Boutan (Mamm. Déc. Zool., Miss. Sci. Expl. Indo-Chine, v, pl., 1906). These otters were not *Amblonyx*. Boutan's plate shows they were *Lutra* or *Lutrogale*, the paws being broad and provided with strong claws. Boutan admitted that the illustration was poor, but stated that the example he described had a claw 6 mm. long on the third digit of the fore foot and 8 mm. long on the corresponding digit of the hind foot. Pohle explained this feature by suggesting that the animal was young; but since no *Amblonyx* has claws on any of its digits at any stage of its existence approaching the size of those on Boutan's specimen, there is no doubt that this specimen was a *Lutra* or *Lutrogale* in which the claw-sheaths of the other digits were either greatly shortened by wear or absent, giving the feet in that respect a superficial resemblance to those of *Amblonyx*. The claws are often naturally comparatively short in *Lutra* and *Lutrogale*, and in prepared skins the claw-sheaths are not infrequently absent. This may easily be a source of error to those unacquainted with the other characteristics of the feet of *Amblonyx*. For further information about the claws of *Amblonyx* see under *Lutrogale*. The above-stated facts clearly throw doubt on the correctness of the determination of the type of *fulvus* as a representative of *Amblonyx*. If it belongs to that genus there are several points in its description suggesting that it differs but little from the drabby, greyer brown skins from Upper Burma and Assam, which, for the reasons stated, are assigned to *concolor*. Since Pohle had no skull of *fulvus* it is not clear why he associated that alleged race with the southern "species" *cinerea* rather than with the more northern British Indian "species" *indigitata*. If it is an *Amblonyx* the skull will no doubt resemble that of Assamese, not of Javan specimens.

South Indian race. The skull differs from that of typical *cinerea* in being on the average shorter in its condylobasal length and less noticeably moulded by the action of the masticatory muscles.

The type of *concolor* was either a young or shrivelled skin. It was described as " entirely of a uniform bay throughout," including presumably the normally greyish-white areas of the head and neck. Also it had no whiskers, a clear proof of its being a " native " skin. No doubt it was artificially stained, possibly by being smoked *.

Hodgson described *indigitata* as dusky bistre-brown above, paler and ruddier below. Horsfield, who saw Hodgson's skins as well as one from Bhutan (Pemberton) and one cited as from Afghanistan (Griffiths) in the Museum of the East India Co., described them as " pure chestnut-brown." Later he adopted the MS. name *sikimensis* given to a skin from Sikkim by Hodgson, who described it, presumably when it was freshly killed, as " medial earthy brown." The dimensions he gave of this specimen show that it was adult.

Hodgson's skins of *indigitata* seem to have altered in colour in the dozen years between his description and Horsfield's inspection of them. Four of them, including the type, are now light rufous-brown, but not all quite alike. The type of *sikimensis* is not available ; but Pemberton's Bhutan skin and Griffiths' skin, which, according to Blanford, probably came from Assam, where Griffiths is known to have collected, are much duller rufous-brown than Horsfield's description suggests.

Fortunately the collectors for the Mammal Survey secured a number of fresh specimens. Of particular interest is one from Tura in the Garo Hills, 1,400 ft. (Wells), which is a topotype of *concolor*. It is dark drabby lustrous brown above, tawnier brown below, with the cheeks, throat and sides of the neck whitish back to the fore legs. There are also Assamese skins from the following localities :—Dikhu River in the Naga Hills, 2,000 ft. (J. P. Mills) ; Hot Springs, 2,400 ft., and Jowai, 4,500 ft., in the Jaintia Hills (Wells) ; Dabadubhi River, Golaghat, 250 ft. (Wells) ; and one from Sadyia (Cockburn). The last is an older, more faded skin belonging to Blanford. It is rather more rufous than the rest, which, varying individually, may be described as greyish earthy or drabby brown,

* An imperfect skin of a young otter from the Jaintia Hills, Assam (Wells), is very similarly discoloured, no doubt by the same process, whatever it was ; and one of this same species from Gam Majaw, Upper Burma (26° 43′ N., 97° 58′ E.), secured by R. Kaulback from a native, although not uniformly coloured throughout, being paler below than above, has the whole of the lower side reddish-brown from the chin backwards, including the cheeks and neck.

pale chocolate, or rufous-brown above, paler brown, often noticeably greyish, below. Six skins collected by R. Kaulback in the "Triangle," Upper Burma, at Sumprabum, 26° 33′ N., 97° 34′ E., 1,500 ft.; Htingnan, 26° 36′ N., 97° 52′ E., 2,500 ft.; Nchangyang, 25° 50′ N., 97° 48′ E., 1,500 ft.; and at Nauhkang, 26° 33′ N., 97° 55′ E., 1,500 ft., are dark greyish-brown; and one from Pwepi in the Chin Hills (Shortridge), 5,000 ft., is drabby brown. This skin very closely matches the old skin from Bhutan collected by Pemberton. Two skins from Naini Tal in Kumaun (Crump) differ profoundly: one is dark greyish-brown with fine grey speckling above, very like most of Kaulback's Upper Burmese skins; the other is much paler, more rufous-brown, recalling Hodgson's skins. The skin from Sadyia, above referred to, is nearly intermediate in tint between these two Kumaun skins.

Flesh-measurements (in English inches) and weights (in lb.) of British Indian representatives of *A. cinerea* :—

Name, locality, and sex.	Head and body.	Tail.	Hind foot.	Weight.
A. cinerea concolor.				
Golaghat, Assam; ad. ♂ ..	22⅜	13½	3¾	—
Golaghat, Assam; ad. ♀ ..	21½	13⅜	3⅜	—
Jaintia Hills, Assam; ad. ♀.	20⅝	11⅜	3	—
Nepal (*indigitata*, Hodgson); ? ♂ and ♀	24 & 22	13½ & 10	—	13 & 11
Sikkim (*sikimensis* type, Hodgson); ? ad. ♂.....	24	13	3½	—
A. c. nirnai.				
Virajpet, S. Coorg (type); ad. ♂	23½	13¾	4	9½
Palni Hills; ? ad. ♀	18⅜	10⅝	3⅝	6

72 *b*. **Amblonyx cinerea nirnai** Pocock.

Lutra leptonyx and *L. cinerea*, Blanford, Mamm. Brit. India, p. 187, 1888, and p. 602, 1891 (in part).
Amblonyx cinerea nirnai, Pocock, Journ. Bomb. Nat. Hist. Soc., lxi, p. 515, 1940.

Vernacular.—Probably the same as for southern Indian representatives of *L. lutra nair*.

Locality of the *type*, Virajpet in South Coorg, 3,000 ft.

Distribution.—The hill-ranges of Southern India.

Distinguished from the northern Indian race, *concolor*, by the noticeably darker colour of fresh skins, the upper side being very deep chocolate, almost blackish-brown, without the paler rufous-drabby or greyish-brown hue of the previous race.

Before the Mammal Survey was started this otter was represented in the British Museum by a couple of unsexed skins and skulls presented by F. Day and merely labelled

"Madras," meaning somewhere in the Presidency. They were received in 1867 *, and are now somewhat faded, showing a decided reddish tinge which is absent from the fresh skins on which the subspecies is based. For the Survey the type from Virajpet in South Coorg, 3,000 ft., was collected by Shortridge; another, which I have not seen, came from Haleri, North Coorg (J. Graham), 3,555 ft.; a third was from the Palni Hills (McCann), 5,800 ft., and a couple of young "native" skins a little paler than the type were secured by Gosse at Ootacamund in the Nilgiri Hills, 7,000–8,000 ft. Later Major Phythian Adams sent me from the Nilgiris four adult skins which in their deep, nearly blackish-brown hue closely resemble the type and the skin from the Palni Hills. This skin is exceptional amongst Indian skins and resembles Javan skins of typical *cinerea* in having the pale hue of the cheeks and sides of the neck less sharply defined from the dark tint of the crown and nape and less extensive towards the fore leg.

Skulls.—Only six out of the ten available adult skulls of the two Indian races are sexed. The average condylobasal length of the 3 ♂ skulls is just about 84½ mm., of the 3 ♀ skulls 82, and of the 10 skulls 83½. In 4 ♂ skulls of typical *cinerea* from Java, namely, from Surabaya 99 mm., Panganderan 91, Batavia 94, and Java, co-type of *leptonyx*, 88 mm., the average is 93 mm., the skull from Surabaya being exceptionally large; but in 3 ♂ skulls from Ban Saikan, 87 mm., and Kuala Lumpur, 82 mm., both in the Malay Peninsula, and from Bintang Island, 92 mm., the average is only 87 mm. In an adult ♀ from Panganderan, Java, the condylobasal length is 86 mm., in one from Sumatra and one from the Poch Mountain, Sarawak, it is 88. These dimensions clearly establish the smaller size of the skulls of the British Indian races. In these races also pm^4 varies in length from 9 to 11 mm., in the south-eastern race, *cinerea*, from 10 to 12 mm. A further difference between them lies in the greater frequency of the formation of a definite sagittal crest by the fusion of the temporal ridges in typical *cinerea*. In *concolor* and *nirnai* these ridges are almost always separated, forming a lyrate area; in only one skull from Madras do they meet as a low ridge, hardly definable as a crest. The extent of the encroachment of the temporal muscles over the crown is associated with a narrower or broader post-orbital area or waist; and, as a rule, although not always as Pohle claimed, the postorbital area is wider than the

* This was the date of the publication of Jerdon's volume; but curiously enough, although a surgeon in the Madras army, he was not aware of the existence of this otter in southern India. He reproduced Hodgson's and Horsfield's accounts of it.

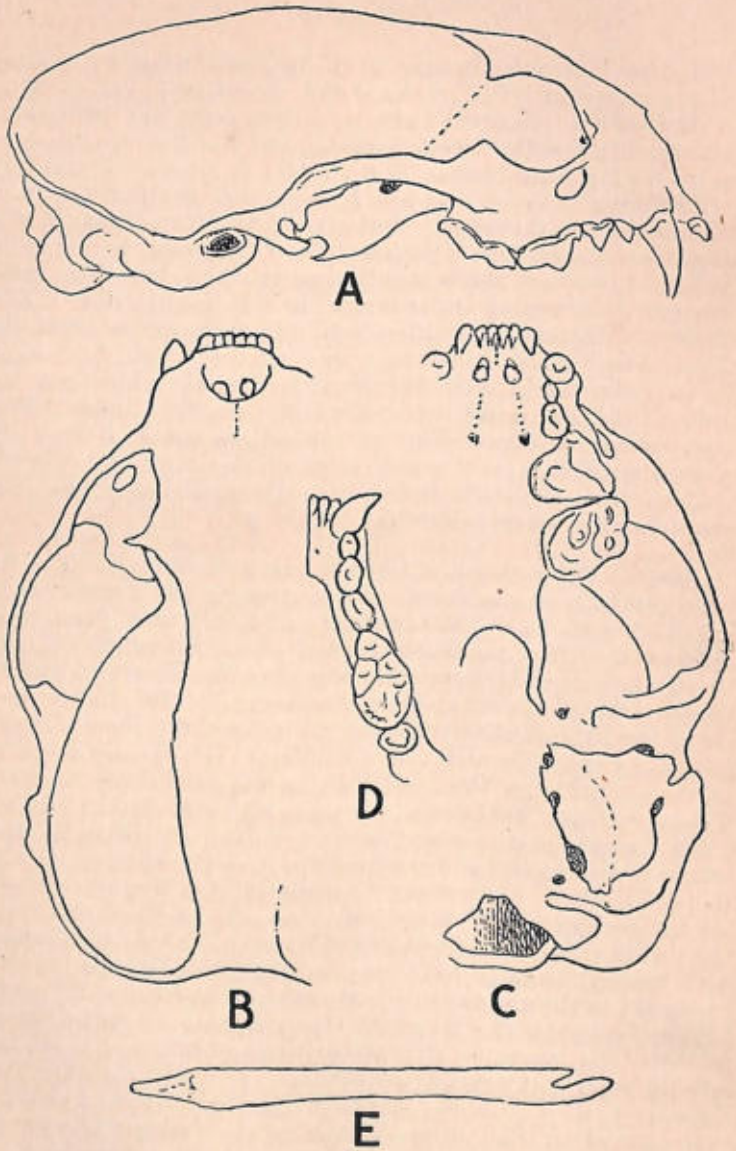


Fig. 71.

A. Side view of skull of adult ♂ *Amblonyx cinerea concolor* from Golaghat, Assam.
B. Left side of upper surface of the same.
C. Left side of lower surface of the same.
D. Lower teeth of the right side of the same.
E. Upper side of baculum of the same, showing inequality of the two terminal prongs.

(All figures natural size.)

interorbital area in Indian skulls and narrower in typical *cinerea* from south-eastern Asia. There are exceptions to this in both districts. In Indian skulls, for example, the two areas are equal in the skull from Golaghat in Assam, and the postorbital is noticeably narrower than the interorbital in the skull from Madras. The Indian skulls also disprove Pohle's further claim that the distance between the tips of the postorbital processes exceeds the interorbital width by over 9 mm. In most of my Indian skulls the difference is as nearly as may be 9 mm., in the skull from Golaghat it is 10 mm., but in the ♀ Garhwal skull and the skull from Naini Tal the excess is 7 mm., and in the ♀ from Htingnan, Upper Burma, it is only 6 mm. In four ♂ skulls of the south-eastern form, typical *cinerea* from Java, the excess varies from 6 mm. to 11 mm. The manifest overlap shows that the difference is merely a question of average.

The skulls of the Indian races, several of which have no skins, exhibit great individual variation in the points Pohle regarded as constant. In all cases the sutures are closed, but the postorbital area in some has been profoundly affected by the subsequent encroachment of the temporal muscles as age advanced. The least developed is a ♀ skull from the Dabadubhi River, Golaghat, Assam, which has the "waist" very short and merely crescentically emarginate on each side; the temporal ridges are 15 mm. apart at the waist and on the crown, and the distance between the points of the postorbital processes is only 26 mm. The Kumaun skull is very similar. In the ♂ skulls from Golaghat and the Naga Hills the "waist" is narrower and longer, the ridges being respectively 12 and 8 mm. apart at the waist, and the distance between the points of the postorbital processes 24 and 29 mm. In the ♂ skull of the type of *nirnai* from Virajpet, S. Coorg, the crests are only 3 mm. apart at the waist, and the distance between the points is 27 mm., whereas in an old ♂ skull from Madras, with the teeth worn, the ridges are confluent from the waist backwards and the distance between the points is 27½ mm. In only two out of the six skulls does the distance between the points of the postorbital processes exceed the width of the interorbital area by more than 9 mm.

Habits.—Referring to the South Indian race of this otter (*nirnai*) as observed in Coorg Shortridge stated that it frequents the same waters as *Lutra lutra nair*, but in fewer numbers, although hunting in larger packs. Otters, however, he added, are gregarious wherever they are plentiful. In his experience *A. cinerea* is a hill-otter in southern India, but in Java and other parts of the East Indies where he observed the species it is equally abundant in estuaries and

Skull-measurements (in mm.) of the two British Indian races of *Amblonyx cinerea*.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
A. cinerea concolor.								
Htingnan, Upper Burma ; ad. ♀	86	80	54	18	14	18	9	11
Dikhu River, Naga Hills, Assam ; ad. ♂	88	(82)	56	17–	15+	19	10	13–
Golaghat, Assam ; ad. ♂	88	82	58	18	18	20	10	12
Dabadubhi River, Golaghat, Assam ; ad.♀	84	80	56	21	17–	19	10	12
Augion, Garhwal ; ad. ♀	92	87	57	15	16–	19	11	12
Garhwal ; ad. o	88	85	58	19	17	20	10	11
Garhwal ; ad. o	89	84	58	18–	16½	19	11–	11
Naini Tal, Kumaun ; ad. o	86	82	55	18	15–	19–	9½	12
A. c. nirnai.								
Virajpet, S. Coorg (type) ; ad. ♂	94	90	60	21	18	21	10	13
" Madras " ; ad. o	87	82	57	15	17	19	9+	—
" Madras " ; yg. ad. o	84	79	54–	21	16	19–	10	11

on the sea-coast. In Java he found it breeding in the banks of paddy-fields.

Jerdon saw a specimen of the northern race (*concolor*) captured by the side of a salt-lake near Calcutta ; and it may be suspected that the parties of five or six of a " very small hill-otter " McMaster observed near the Karenni Hills in Pegu were representatives of this race, although he referred to them as *Lutra aurobrunnea*, being under the impression, which Blanford seems to have been inclined to share, that they were a distinct kind from the Clawless Otter, which, as *Lutra leptonyx*, he described as a small white-throated otter seen in a creek just north of Toungoo. They lived in colonies in burrows under trees lying partly in the water.

From observations on living examples of *A. cinerea*, exhibited in the Zoological Gardens, I wrote in 1921 :—" The abbreviation of the claws of the front foot is accompanied in this otter by extreme delicacy of the sense of touch in this extremity. I have seen one of these animals manipulating and playing with a marble in a manner recalling that of a conjuror juggling with a cricket-ball." There is little doubt, I think, that the paws are used for handling captured prey and for feeling for fishes and other aquatic animals it feeds on when they are buried in the mud or lurking concealed under stones in the water.

In this connection it is interesting to record that Howell, who observed this otter at Kulu, stated in his report on trout-fishing in the head-waters of the Beas River that in his opinion it does little damage to fish. This suggests that it may feed to a larger extent than *Lutra lutra monticola* upon freshwater " shell-fish," including mussels, snails and crabs, for the crushing of which its massive teeth seem admirably adapted.

Note on Javan and other south-eastern representatives of this Otter.

As already stated, Pohle, in his monograph of the Otters, gave specific rank to the eastern and south-eastern Clawless Otters as *Amblonyx cinerea*. This he divided into four races—two northern forms from China and Tong-king respectively, which were considered above (p. 308, note), and two southern forms, one from Java (typical *cinerea*) and one from Malaya, Sumatra and Borneo (*perspicillata*). The Javan otter, from Batavia, to which Illiger gave the name *cinerea*, was originally described by Wurmb as the " Gryze Otter," and was said to be dark grey in colour above (Batav. Genootsch. Verhand. ii, 1780 ; ed. 3, p. 285, 1826). It has always been taken for granted, and I think correctly, that the same otter was named *Lutra leptonyx* by Horsfield, who described it as brown, with a tawny lustre above and dusky yellowish on the pale areas of the head

and neck. Pohle accepted the current view that *leptonyx* is a synonym of *cinerea*, but his diagnosis of the race *cinerea* recorded from Preanger as "ashy brown" above clearly does not apply to Horsfield's specimens. Later Sody described some skins from western Java of supposedly typical *cinerea* as "dark smoky brown" (Ann. Mag. Nat. Hist. (10) xii, p. 441, 1933); this description agrees neither with Horsfield's nor Pohle's specimens. The truth is that Javan skins vary greatly in colour, probably seasonally. There are several in the British Museum, and by no stretch of the imagination can one of them be described as "grey." One, undated, from Batavia (Shortridge), a topotype of *cinerea*, is brown above with the tips of the contour-hairs a trifle paler than the base, giving a slightly rufous cast to the pelage. This seems to agree with Horsfield's description of *leptonyx*; but Horsfield's specimens, which were exhibited for some years in the gallery, are now rich chestnut, almost coppery red, above and below. A younger skin from Batavia, July 24, is very like the first; but three young skins of various ages from Buitenzorg (Shortridge) suggest that the cub is tawny and becomes progressively darker with age. An adult pair from Panganderan, Dirk de Vries Bay (Shortridge), March 10 and 20, are very dark lustrous chocolate-brown above, the colour being unaffected by a few sparsely scattered whitish hairs; and a skin from Surabaya in eastern Java (Frost) is also deep lustrous chocolate-brown. From these data it is clear that in western Java this otter varies in tint from deep brown to ashy-brown, an intermediate stage being tawny-brown, when the tips of the contour-hairs are beginning to fade, the final stage in the bleaching producing the "grey" or ashy hue. The evidence is entirely opposed to the validity of the race named *wurmbi* by Sody, based on a single ♀ specimen from the Watanga Mts., near Poeger, Besoeki, in eastern Java, which was distinguished by being clearer brown than his smoky-brown skins of *cinerea* from western Java. Sody also claimed that in *wurmbi* the length of the upper cheek-teeth, 31½ mm., exceeds that of *cinerea*, in which they range from 27 to just over 30 mm. In two of my western Javan skulls, one from Batavia and one from Panganderan, the teeth measure 32 mm. In my opinion *wurmbi* is a synonym of *cinerea*.

Misled by his erroneous opinion that typical Javan *cinerea* is distinguished by its ashy-brown hue, Pohle regarded skins from the Malay Peninsula, Sumatra, Borneo and Palawan as representing a second race characterized by its dark chestnut-brown tint. This he called *perspicillata*, adopting Anderson's opinion, which was accepted as final without further examination by Thomas in 1889, that that name had probably been given to an immature example of *Amblonyx*. I have already

given fully my reasons, which need not be repeated, that the name *perspicillata* belongs to the previous genus, *Lutrogale*. It is therefore inadmissible for this alleged race of *Amblonyx*. I am unable to find evidence for the admission of that race. Skins in the British Museum from the Malay Peninsula, Sumatra and Borneo closely match the Javan skins. A ♀ from Singapore is practically the same as Horsfield's specimens of *leptonyx*; a ♂ from Malacca (Cantor) is intermediate between Horsfield's skins and one from Batavia. A ♂ from Ban Sin Kan in the Malay Peninsula (Robinson and Seimund) and one from Bintang Island are hardly distinguishable from the skin from Batavia; and one from Taiping, Perak (Robinson and Kloss), is a little paler and redder, owing to incipient fading of the hair-tips. A young ♂ from Sanderam Agong in Korinchi, Sumatra, 2,450 ft. (Robinson and Kloss), May, and one from the Poch River, Sarawak (Everett), Aug., closely match the skin from Batavia; but another from Sarawak (Lewis) and one from Baram (Hose) are rather redder owing to the tips of the contour-hairs being paler. None of the above described skins is so dark as the deep chocolate-brown Javan skins from Pangandéran and Surabaya, but considering the known variation of Javan skins from deep brown to ashy-brown, it does not seem reasonable to attach systematic importance to the difference.

Subfamily MARTINÆ.

Adapted for active predatory life on the ground and in trees. The head has the muzzle pointed, a normal naked rhinarium, with non-valvular nostrils; the facial vibrissæ are also normal in length, delicacy and the number of tufts; and the ears are moderately large, with a well-developed bursa, the upper edge of which arises behind the margin of the pinna; the tail is always long, over half the length of the head and body and at least three times the length of the hind foot; the feet are digitigrade, supplied with short, curved, sharp claws and striated pads; the plantar pads are distinctly four-lobed * and the carpal pad is double, with the outer portion larger than the inner; the metatarsal pads are sometimes represented by areas of naked skin, but usually the hind foot is covered with hair from the heel to the plantar pad; usually the area round the plantar and carpal pads is

* At least in British Indian forms. Perhaps in the northern species, like the Sable, with thickly haired soles, the pollical and hallucal elements of the plantar pads and the inner lobe of the carpal pad may be concealed or obliterated in winter.

also covered with hair, but occasionally it is largely naked; the hind feet are not larger than the fore feet. There are no scent-glands or pouches associated with the anus, apart from the two normal anal glands, which, at least in one species, have a nauseous secretion.

The skull has the muzzle strong and comparatively long, the prepalatine foramina set back on the palatine suture; the bullæ inflated, thin-walled, the cavity undivided, closed behind and not opening into the mastoid. The dental formula is: $i.\frac{3}{3}$, $c.\frac{1}{1}$, $pm.\frac{4}{4}$, $m.\frac{1}{2}$, $pm.^1$ being retained above and below, although small; teeth mostly trenchant; second and third upper and second, third, and fourth lower premolars with a high, compressed pointed cusp; upper carnassial (pm^4) with trenchant outer portion and small anterior inner lobe; upper molar large, with crushing surface, about the area of pm^4, much wider than long, mesially constricted, its outer lobe with two cusps and its larger rounded inner lobe with a single cusp and a thickened rim; lower carnassial (m_1) with tolerably large heel, its anterior portion with small inner cusp or metaconid.

General Habits etc.—The distribution of the Martens is as stated below under the headings of the two British Indian genera. All the species seem to have very similar habits. They live in forests and open rocky places, and are extremely active both on the ground and in trees, their sharp claws and striated pads giving them a sure foothold when chasing prey, and in trees they can leap from branch to branch, using their long tails for balance, with such speed and precision as to be able to overtake squirrels, whose only chance of escape is dodging round a vertical tree-trunk, a feat which is beyond the Marten's power. They are essentially predatory, feeding principally on other mammals and on birds even larger than themselves, and, like most of the typical Carnivora, destroying, when the chance occurs, many more than are required. In this way they may inflict great damage on owners of livestock. In Ireland a couple of Pine Martens (*Martes martes*) killed in one night no fewer than fourteen lambs, and seven the next night, merely sucking the blood of their victims. On the second occasion they were seen in the early morning leaving the place of slaughter, and were tracked to their lurking place, a magpie's nest. But very little in the way of animal food comes amiss to them. They will eat snakes, lizards and frogs; the big Fisher Marten or Pekan of North America derives its English name it is said, from its liking for the fish-bait used by the trappers, and the Pine Marten has been seen hunting on the sea-shore for mussels. Their diet, however, does not consist by any means solely of animal food, since they are partial to honey and to berries and fruits of various kinds, and even nuts, according to their habitat.

The Pine Marten has been known to take fearlessly to water when pursued, and it is probable that all are good swimmers. In trees they commonly lie up in the nests of hawks, crows and magpies, or even in the " drays " of squirrels, especially in summer in colder latitudes ; but more often they take advantage of the shelter of hollow trees, rock crevices or burrows, the depths of which they line with grasses or dead leaves for breeding. The number of young is usually from two to four, but the Pine Marten has been known to produce exceptionally as many as six or seven. The eyes are closed at birth, and remain so for about a fortnight in *M. foina* according to Blanford's unstated authority ; but according to Anthony the period has been reported to be four weeks in the common American Marten (' Handbook of North American Mammals,' p. 19).

Key to the ready identification of the two British Indian genera of Martens :—

a. Pale hue of the throat, when present, not sharply set off above by a dark stripe running along the side of the neck from behind the ear ; general colour of the upper side, including the limbs and tail, tolerably uniform. MARTES, p. 319.

a'. Pale hue of the throat emphasized by a dark band running along the side of the neck from the ear or by the wholly or mainly dark nape ; general hue of the upper side, at least in the north Indian species, showing regional contrasts of black or dark brown and tawny or yellow ..... CHARRONIA, p. 326.

Other more important structural characters are mentioned under the diagnoses of the genera.

Genus **MARTES** Pinel.

Martes, Pinel, Actes Soc. d'Hist. Nat. Paris, i, p. 55, 1792 ; Miller, Cat. Mamm. Western Europe, p. 365, 1912 (with synonymy).

Type of the genus, *Mustela martes* Linn.

Distribution.—From the limits of tree-growth in Europe and Asia, as far south as the Mediterranean and the mountains of Afghanistan, and the HIMALAYAS ; in America also from the northern tree-line to the central United States.

The British Indian representative of this genus is distinguished from the typically Oriental genus *Charronia* by the sum of a number of characters, the most important being the structure of the baculum described below. The colour of the upper side is tolerably uniformly brownish, with paler under hair, never varied with black and yellowish, as is usually the case in *Charronia*, and the pale of the throat, when present, is never set off by a dark band extending backwards from the

ear or by a wholly dark nape ; the rhinarium or nose-pad is relatively smaller, with the nostrils closer together, flat above from the front view and angularly pointed below, and there is a distinct groove dividing the upper lip ; the feet have the inner lobe of the plantar pad, the pollical and hallucal elements

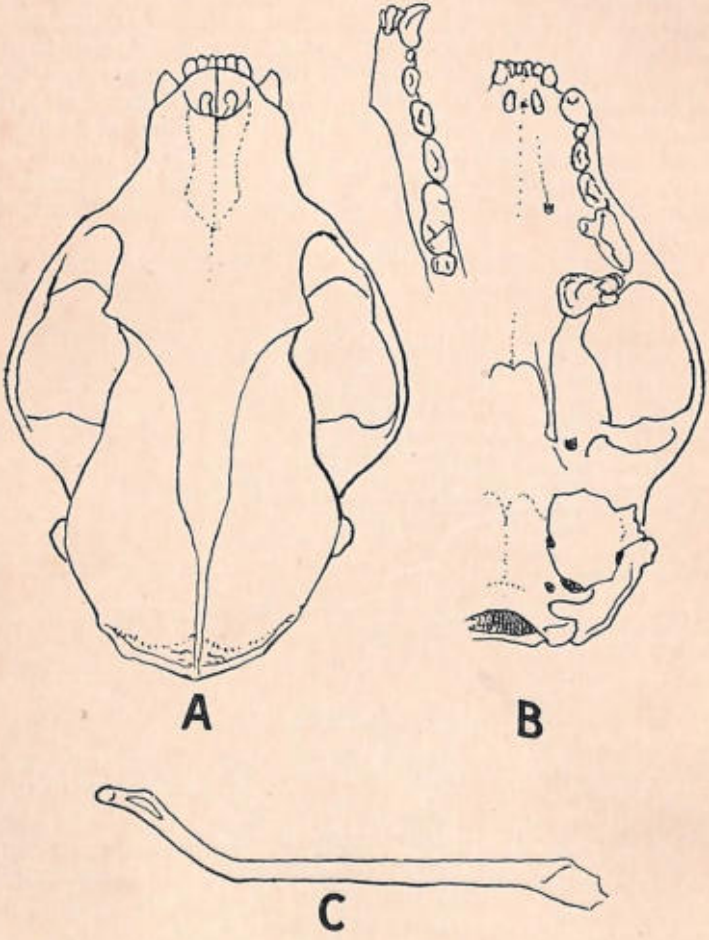


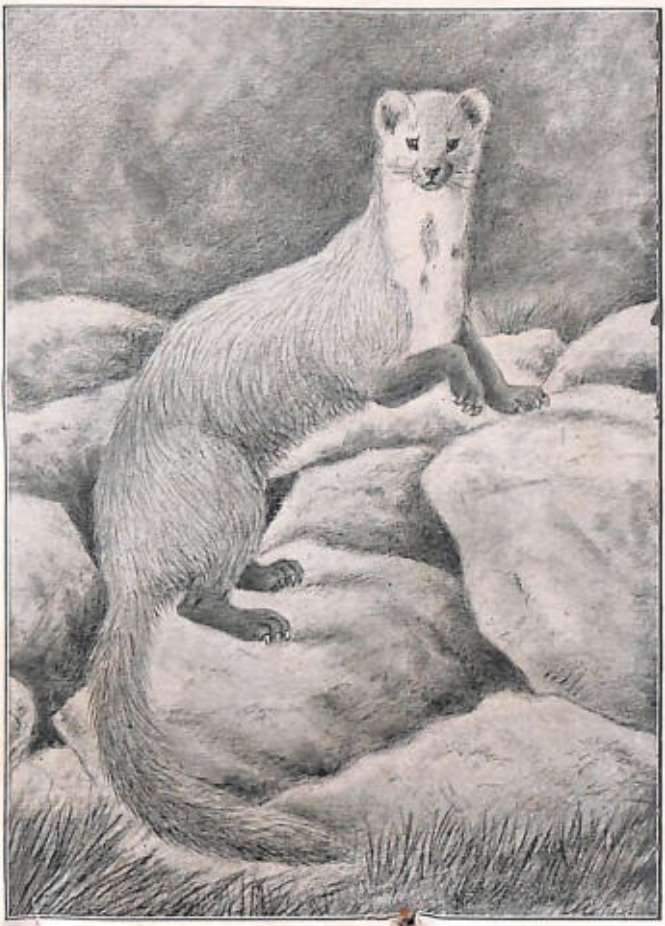
Fig. 72.

A. Upper view of skull of ad. ♂ Beech Marten (*Martes foina intermedia*) from Bogarmang Glen, Hazàra (Whitehead). Natural size.
B. Left half of lower side of the same.
C. Lower teeth of the right side of the same.
D. Baculum of European Beech Marten (*M. foina foina*) from the left side.

ZOOLOGICAL GARDEN
CALCUTTA.



Yellow-throated Marten (*Charronia flavigula*).



Beech Marten (*Martes foina intermedia*).

and the inner lobe of the carpal pad smaller, and the soles of the feet generally are more thickly clothed with long hair.

The skull has the cranial portion relatively shorter on the average as compared with the facial portion, the distance between the front edge of the foramen magnum and the anterior margin of the mesopterygoid fossa being shorter than the distance between the latter point and the incisor teeth ; also the zygomatic width is on the average relatively greater. In the teeth the upper molar has its inner lobe more expanded, its length being more than half the width of the tooth and exceeding the basal length of the canine.

The baculum is quite characteristic ; its distal portion is inclined upwards and forwards, without being expanded or hooked, and ends in a rounded knob, behind which is a slit. In the developing bone the termination consists of two branches, an anterior, bearing the knob, and a posterior, and the slit results from the union of these two when the baculum is fully formed.

The only British Indian species of *Martes* is the so-called Beech or Stone Marten (*M. foina*), which is a Palæarctic trespasser into the Himalayas. A few additional species occur in Europe and Asia, but the only one which need be cited for comparison is the so-called Pine Marten (*Martes martes*). Many English naturalists formerly thought both lived side by side in Great Britain and Ireland * ; but Alston (Proc. Zool. Soc. 1879, p. 468) pointed out that the Pine Marten is the only British species, and described some of the cranial and dental characters by which he thought the two might be distinguished. These were amplified, corrected and restated by Miller in 1912, and two years later I described some external differences between them.

73. **Martes foina** Erxleben. The Beech or Stone Marten.

[*Mustela*] *foina*, Erxleben, Syst. Regn. Anim. i, p. 458, 1777.
Martes foina, Miller, Cat. Mamm. West. Europe, p. 374, 1912; Pocock, Proc. Zool. Soc. 1914, p. 1062.

Locality of the *type*, Germany.

Distribution.—Central and southern Europe, and central and western and south-western Asia, except Arabia, and penetrating the HIMALAYAS as far east as SIKKIM.

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* Eyton, however, in 1838 (Mag. Zool. ii, p. 540), maintained that there was only one species in Shropshire ; and this was confirmed in Ireland by W. Thompson (Nat. Hist. of Ireland : Mammalia, p. 9, 1856). I have borrowed some of the facts recorded under the general habits of *Martes* (p. 318) from Thompson's paper and others from J. G. Wood's 'Illustrated Natural History,' 1863.

Distinguished from *Martes martes* by its smaller, more widely separated ears and larger pads of the feet, the four elements of the plantar pads being broadly instead of comparatively narrowly united. In the teeth pm^3 usually has its outer and inner edges lightly convex, the inner lobe of pm^4 is smaller, and the greatest diameter of m^1 exceeds the outer length of pm^4, whereas in *M. martes* pm^3 is lightly concave externally, strongly convex internally, the inner lobe of pm^4 is larger and the greatest diameter of m^1 is a little greater than or about equal to the external length of pm^4. The skull has the brain-case less elevated, the interorbital area and the muzzle wider, and the concavity of the dorsal profile of the muzzle much more pronounced than in *Martes martes*.

These differences, taken from Miller's diagnoses, are, however, somewhat elusive. The diameter, for example, of m^1 may be only ·5 mm. less than the outer length of pm^4, and in the British Indian race of *M. foina*, named *intermedia* because it was believed by its describer to be intermediate between *martes* and *foina*, the outer surface of pm^3 is concave as in *martes*.

73 *a*. **Martes foina intermedia** Severtzow. (Pl. VII.)

Mustela intermedia, Severtzow, Proc. Mosc. Soc. Nat. viii, p. 2, 1873 (translated Ann. Mag. Nat. Hist. (4) xviii, p. 45, 1876).
Martes leucolachnæa or *Martes foina leucolachnæa*, Blanford, Second Yarkand Miss.: Mammalia, p. 26, 1879.
Mustela foina, Blanford, Mamm. Brit. Ind. p. 160, 1888 (with synonymy).
Martes toufœus, Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, p. 343, 1919 (not *toufœus* Hodgson).
Martes foina intermedia, Ognev, Mamm. E. Europe and N. Asia, ii *, p. 626, 1931 (with synonymy, including *altaica* Satunin, 1914).

Locality of the *type* of *intermedia*, Eastern Turkestan, basin

* Since the types of *intermedia* and *leucolachnæa* came respectively from eastern Turkestan and Yarkand, there is no reason to doubt the correctness of Ognev's view that their names are synonyms. Blyth, in 1847 and 1863, identified specimens of this marten from Tibet as *M. toufœus* Hodgson, without having access to Hodgson's specimens; but Blanford, who examined the latter, rightly decided that identification to be incorrect, and in his volume on the Mammals of British India adopted the opinion of Scully (Proc. Zool. Soc. 1881, p. 202), who knew this marten in Chitral and Kashmir, that it is the same as the European Beech or Stone Marten (*M. foina*), and not the other European species, the Pine Marten (*Martes martes*), as supposed by Horsfield in 1851 and Adams in 1858, who called Kashmir specimens *M. abietum*, this name being a synonym of *martes*. It is not clear why Wroughton, who had Hodgson's skins of *toufœus* in his hands, reverted to Blyth's determination. *M. toufœus*, based upon skins traded from Lhasa and Sling in Tibet, is a different animal, related to the Japanese Marten (*M. melanopus*), with which it will probably be found to intergrade through a form from Kansu named *M. m. kansuensis* by Thomas.

of the Chu, Tallas and Narin from 4,000 to 9,000 ft.; of *leucolachnæa*, Yarkand.

Distribution.—From Eastern Turkestan, including the Tian Shan, Afghanistan, BALUCHISTAN, the WESTERN HIMALAYAS, and, according to Ognev, the Altai.

Distinguished from typical *foina* by its considerably fuller winter coat, more varied colouring both seasonally and independently of the season, and by the greater frequency

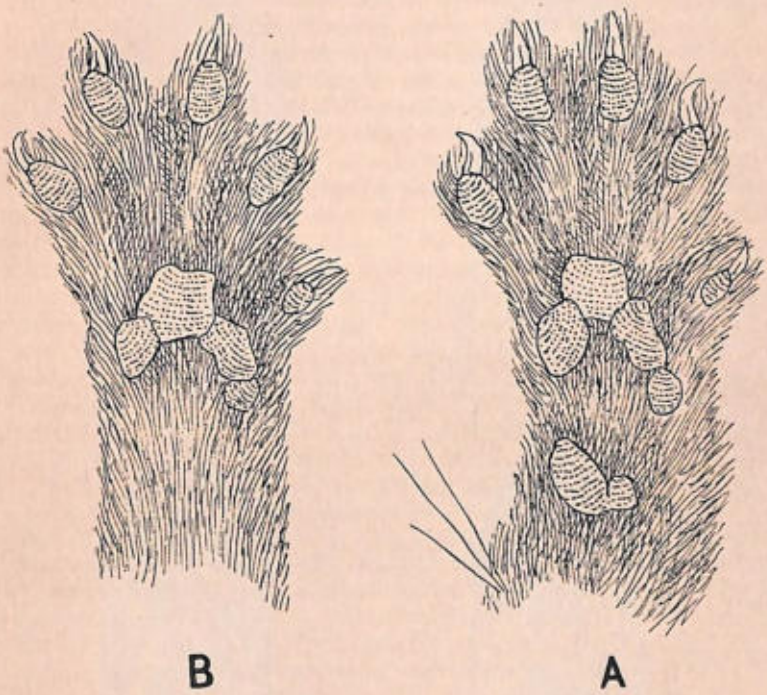


Fig. 73.

A. Lower side of right fore foot of the Himalayan Beech Marten (*Martes foina intermedia*) from Kyelung, Lahul, 2,400 ft. (Wells).
B. The same of the right hind foot.

(Figures natural size, drawn from relaxed dried skin.)

of the invasion of the white throat by brown pigment, amounting in some skins to its almost complete obliteration. Also in the few available skulls the outer surface of pm^3 is perceptibly concave as in *M. martes*, although there is no bulge on the inner surface of the tooth.

Colour and length of coat exceedingly variable seasonally, ranging above from rich, reddish, chocolate-brown, pale

ochreous-brown, tawny, drab-brown, grey-brown, often varied by lighter patches when the contour-hairs are moulting to dominantly cream-white when they are wholly shed, leaving the underfur exposed, the fur itself varying from pale ashy-grey, pinkish-white or buff to nearly clean white. The lower side is a little paler than the upper. The throat is typically white

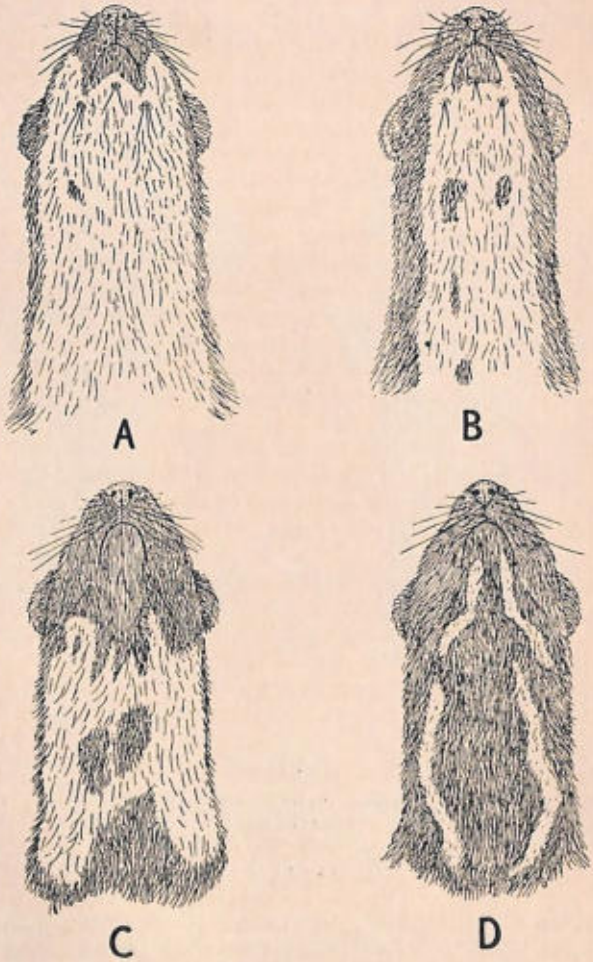


Fig. 74.—Lower side of the head and neck of four skins of the Himalayan Beech Marten (*Martes foina intermedia*) showing individual variation in the extent of the whiteness of the throat. A, Gilgit; B, Kyelung, Lahul; C, Quetta; D, Wana in Waziristan. It may be noted that in A, the most extensively white, the vibrissæ of the two inferior genal tufts and of the median interramal tuft on the chin rise from patches of brown-pigmented hair.

or yellowish as far back as the fore legs, but the white is generally broken up by brown patches, and is sometimes almost entirely obliterated by invasion of that colour. The legs and the tail are usually darker than the body. The coat ranges seasonally from about 30 to 50 mm. in length, and the soles of the feet are thickly haired in winter.

Skins from the following British Indian localities have been examined :—Quetta ; Chitral, 5,000 ft. (Capt. H. T. Fulton) ; Gilgit, 5,000 ft. (Col. Biddulph and Major E. H. James) ; Hunza, N. Kashmir (Dr. Scully) ; Ladakh (Capt. Strachey) ; the Bogarmang Glen, Hazàra, N.W.F.P. (Capt. E. H. T. Whitehead) ; Wan, S. Waziristan and Kyelung Lahul, 10,400 ft. (Wells). Dated skins of this series were collected in February, April, May, July, August and October, and exhibit the seasonal variations in the coat and colour described above. One from Gilgit, July, for example, is woolly, with hardly any contour-hairs, and the general colour is pale buffy or whitish, whereas another from the same locality, February, has the luxuriant whitish-grey underwool covered with buffy-tawny contour-hairs about 40 mm. long. The skin from Hazàra, May 29, is just completing the moult, the colour of the new coat on the head and shoulders being pale sepia-brown, but many of the still retained old contour-hairs on the back are brittle and bleached to greyish. The skin from Lahul, August, is the darkest of all, a dark dull brown, with dark ashy wool and the coat about 30 mm. This is a " native " skin, and may be " smoked," although the whiteness of the throat looks natural.

A skin from Tibet (Capt. Strachey) and another from Tibet, N. of Sikkim (Mandelli), attest the extension of the range of this Marten considerably to the east. To the west of British Indian territory there are skins from Kandahar and Hazàra in Afghanistan (O. B. St. John) and two from Vernoe, Turkestan (Lansdell), the latter in winter coat, with the contour-hairs 45 to 50 mm. long, identified by Blanford as *leucolachnæa* and agreeing closely with winter skins from Chitral and Gilgit. The skin from Kandahar is also like British Indian skins, but the one from Hazàra is darker than most, darkish brown, the difference between these two Afghan skins being no doubt seasonal. The range of this race to the west of Afghanistan and Baluchistan is doubtful, but a flat skin from Pushtiku in western Persia is indistinguishable. Skins from Damascus (M. Portal) and Xanthus, Asia Minor, are also very similar, and no doubt link *M. foina intermedia* with *M. f. bunites* Bate (Proc. Zool. Soc. 1906, p. 318) and Miller (Cat. Mamm. West. Eur. p. 380, 1912), based on examples from Crete which racially differ from *intermedia* by being more uniformly coloured throughout the year, by the shorter, less luxuriant coat and the better developed postorbital processes in the skull.

The flesh-measurements (in English inches) of three British Indian examples of *intermedia* and of one from Eastern Turkestan recorded by Scully are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Gilgit (Scully) ; ad. ♂	18	10	3
Chitral ; ad. ♂	17½	9½	3½
Hazàra, N.W.F.P. ; ad. ♂	16½	10⅜	3⅜
Eastern Turkestan (Scully) ; o	17	11	—

An adult ♂ of typical *foina* from Switzerland recorded by Miller had the head and body 18⅛ and the tail 10⅜. The weight of the Eastern Turkestan specimen was 1 lb. 10¼ oz.

Skulls of adult ♂ specimens of typical *foina* from Spain, France, Germany and Switzerland measured by Miller were from 79 to 84½ mm. in condylobasal length, and of ♀ specimens from 76 to 78½ mm., suggesting a sexual difference in size which is not apparent in the available skulls of *intermedia*.

Habits.—Of the habits of this race of the Beech Marten in British India very little has been recorded ; but there is no reason to suppose they differ in any important respect from those of other related martens found elsewhere.

According to Scully it was common in the Gilgit district, but was usually found high up in the hills and only very rarely near the villages as low as 5,000 ft. Major McGrath records seeing one under a rock at Sonemarg in Kashmir at 11,000 ft. The only other small mammal observed in the vicinity were picas or mouse-hares, upon which the marten probably preyed.

In Turkestan Severtzow stated it was found in the mountains from about 4,000 to 9,000 ft., usually in fir-forests or amongst bilberry-bushes, but sometimes above the limit of tree-growth.

Genus **CHARRONIA** Gray.

Mustela or *Martes* of all authors until 1918.

Martes, section C, *Charronia*, Gray, Proc. Zool. Soc. 1865, p. 108 ; id., Cat. Carn. etc. Brit. Mus. 1869, p. 86.

Charronia, Pocock, Ann. Mag. Nat. Hist. (9) i, p. 308, 1918 ; G. M. Allen, Mamm. China and Mongolia, p. 363, 1938.

Lamprogale, Ognev, Mem. Soc. Amis Sci. Nat. no. 2, pp. 26–30, 1928 ; Pocock, Proc. Zool. Soc. 1936, p. 531 *.

* This Marten, like other species of the genus, was for the most part assigned to *Mustela* until 1911, when Thomas showed that the type of *Mustela* is *erminea*. Thereafter it was called *Martes* until 1918, when I resuscitated for it the subgeneric name *Charronia*, proposed by Gray, my main reason for separating it being the difference in the structure of the baculum as described in the main text. For this Ognev substituted, in 1928, the name *Lamprogale*, on the grounds that *Charronia* was preoccupied. Without verifying this statement I adopted *Lamprogale* in 1936, but G. M. Allen later pointed out that the alleged antedating name was spelt *Charonia* not *Charronia*, and I now agree with his decision that *Charronia* may be used for the Marten, since it is not, strictly speaking, preoccupied.

Skull-measurements (in mm.) of British Indian examples of *M. foina intermedia*.

Locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
Quetta ; ad. ♂	80	—	47	18	19	16	9	10
Hazàra ; ad. ♂	80	77	51	17½	21	17	9½	9
Gilgit ; ad. ♂	78	75	47	18	20	16	8	9½
Gilgit ; ad. ♀	80	77	47	19	19	16	9	10
Ladak ; ad. ♀	78	75	51	19	20	16	9	9

Type-species of *Charronia* and *Lamprogale*, *Mustela flavigula* Bodd.

Distribution.—The mountainous regions of NORTHERN INDIA from HAZÀRA to ASSAM, thence northwards through China to Amurland and eastwards and southwards through BURMA, Indo-China, Siam, the Malay Peninsula, Sumatra and Java to Borneo. Isolated in the hills of SOUTH INDIA. Absent from CEYLON.

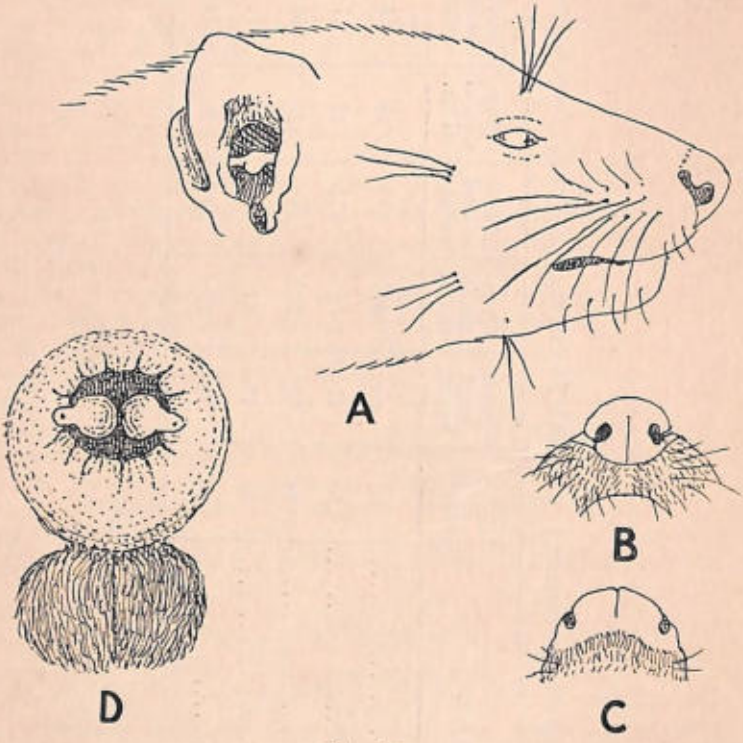


Fig. 75.

A. Side view of head of Yellow-throated Marten (*Charronia flavigula flavigula*). Drawn from a fresh specimen in the Zoological Gardens, London.
B. Front view of rhinarium and upper lip of the same.
C. Upper view of rhinarium of the same.
D. Anal area of the same race, showing the flask-shaped anal glands protruding from the orifice and the scrotum beneath. (Adapted from an unpublished drawing by Hodgson.)

Distinguished from *Martes* by its typically more varied coloration, especially by the presence of at least a dark stripe running along the side of the neck from behind the ear and

throwing into relief the pale whitish or yellowish hue of the throat. Also the rhinarium, or nose-pad, is larger, with more widely spaced nostrils, its upper and lower edges viewed from the front convex, and there is no divisional groove on the upper lip ; the internal lobes of the plantar pads and of the carpal pad are larger and the sole of the foot is less hairy, at least in British Indian forms. In the skull the cranial portion is on the average at least longer as compared with the facial portion, the length from the foramen magnum to the anterior edge of the mesopterygoid fossa typically exceeding

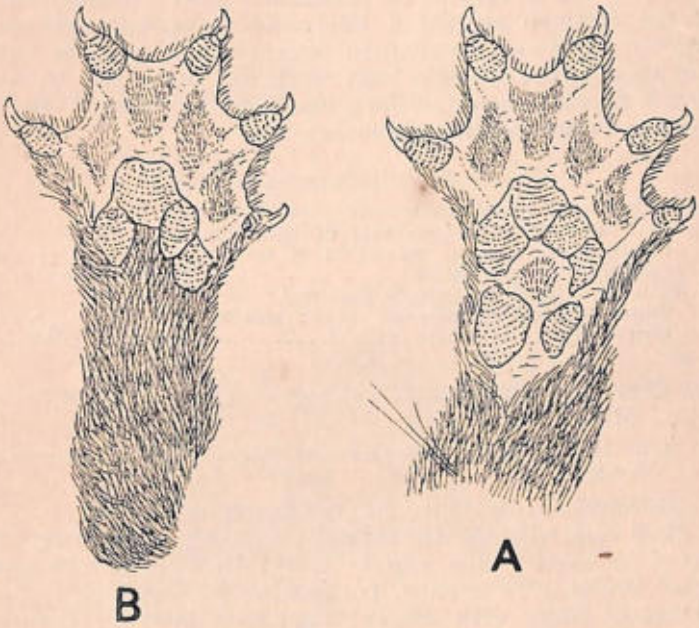


Fig. 76.

A. Lower side of right fore foot of Yellow-throated Marten (*Charronia flavigula flavigula*), showing the patches of hair on the otherwise naked sole. Drawn from a fresh specimen in the Zoological Gardens, London.

B. Right hind foot of the same, showing the hairs of the metatarsal area extending to the plantar pad.

the median length of the palate ; and in the teeth the upper molar is less expanded internally, the length of the inner lobe being barely half the width of the tooth and less than the basal length of the upper canine. The chief difference, however, lies in the shape and structure of the baculum, the distal end of which is curved somewhat abruptly upwards and backwards in the form of a hook and is slightly expanded

at the tip, which is provided with four processes varying in development in the two species (fig. 80, p. 342.)

There is also some evidence that the secretion of the anal glands is nauseous and protective (p. 337), which is not apparently the case in *Martes*.

The occurrence of this genus in the Himalayan region and in South India, but not elsewhere in Hindostan, recalls the distribution of the two species of *Hemitragus*, known popularly as the Himalayan and Nilgiri Tahr respectively, and also of the two genera of Otters, *Lutra* and *Amblonyx*, as recorded above (p. 306) ; but in view of the remarkable powers of adaptation of the northern species of *Charronia* to varied conditions, attested by its wide distribution, both in latitude and longitude, and its range in altitude from much less than 1,000 to over 10,000 ft., the absence of the genus from the whole of Central India is an unexplained phenomenon.

Key to the British Indian Species.

a. Skull high, its dorsal profile convex from back to front ; terminal processes of baculum comparatively long ; coloration of upper side of body more varied ..... [p. 330. *flavigula* (Bodd.),

a'. Skull low, its dorsal profile flattened ; terminal processes of baculum short ; coloration of upper side nearly uniform ..... [p. 340. *gwatkinsii* (Horsf.),

74. **Charronia flavigula** (Boddaert). The Yellow-throated Marten. (Pl. VII.)

(For bibliographical references see below under the subspecific headings.)

Distribution.—As above, but not SOUTHERN INDIA.

Skull high, with the dorsal profile sinuously convex from the tip of the nasals to the occipital crest ; baculum with its main shaft straight, its terminal portion less hooked, and its four processes large, with deeply emarginate intervals between them ; the coloration of the upper side less uniform, usually strongly contrasted, with the head, limbs, loins and tail black or deep brown and the shoulders and fore back pale.

Key to the British Indian Subspecies.

a. Hind foot uniformly hairy behind from the hock to the plantar pad ..... [p. 331. *flavigula* (Bodd.),

a'. Hind foot not uniformly hairy behind, naked above the plantar pad.

b. Head black, sharply contrasted with yellowish hue of shoulders and fore back ; abdomen pale ..... [p. 338. *indochinensis* (Kloss),

b'. Head brown, only a little darker than the nape, shoulders and fore back ; abdomen deep brown ..... [p. 339. *peninsularis* (Bonh.),

74 *a*. Charronia flavigula flavigula (Boddaert).

Mustela flavigyla, Boddaert, Elench. Anim. p. 88, 1785.
Mustela melina, Kerr, Anim. King. p. 183, 1792.
Viverra quadricolor, Shaw, Gen. Zool., Mamm. i, pt. 2, p. 429, 1800.
Mustela leucotis, Bechstein, Uebers. vierf. Thiere, ii, p. 375, 1800. (Not *Mustela leucotis*, Ham. Smith, Griffith's An. King., Mamm. ii, p. 297, 1827.)
Mustela hardwickei, Horsfield, Zool. Journ. iv, p. 239, 1834.
Galidictis chrysogaster, Ham. Smith, Jardine's Nat. Libr. xv, Mamm. i, p. 167, 1842.
Mustela flavigulla, Blanford, Mamm. Brit. Ind. p. 158, 1888 (in part).
Mustela flavigula typica, Bonhote, Ann. Mag. Nat. Hist. (7), vii, p. 341, 1901.
Lamprogale flavigula flavigula, Pocock, Proc. Zool. Soc. 1936, p. 532 (where additional synonyms of some Chinese races are cited).

Vernacular.—*Kasia*, *Koseah* or *Koosiar* (Sirmur); *Tuturula* or *Tooturulæ*, *Chitrola* ♂, *Chitroli* ♀ (Garhwal and Kumaun); *Sakku* (Lepcha); *Shingsam*, *Humiah* (Bhotia); *Malsampra* (Pahari); *Nabashing*, *Sat Kalauk* (Burmese).

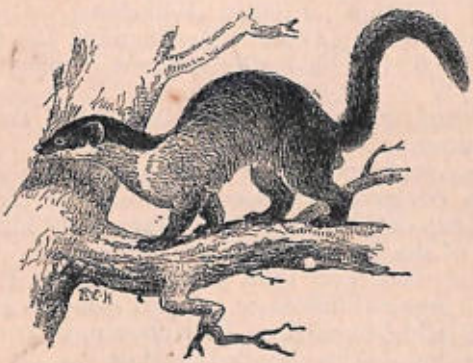


Fig. 77.—Yellow-throated Marten (*Charronia flavigula*), apparently representing the typical race. (From Blanford.)

Locality of *type* of *flavigula*, *melina*, *quadricolor* and *leucotis*, based on Pennant's "White-cheeked Weesel," unknown, but traditionally fixed as Nepal; of *hardwickei*, Nepal; of *chrysogaster*, Mussoorie.

Distribution.—From Hazàra and Kashmir eastwards through the Himalayas to Assam, Upper Burma, Tibet, and South China, at altitudes ranging from 600 to 11,000 ft.

Distinguished from the other British Indian races by the absence of a naked area of skin above the plantar pad of the

hind foot, by a larger mat of hair between the plantar and carpal pads of the fore foot, by its longer, more luxuriant winter coat, of which the contour-hairs range from about 35 to 40 mm. or over, the fur from 15 to 20 mm., and by its larger average size.

The following list of the chief localities, altitudes and collectors of the numbers of specimens in the British Museum shows the range of this race in British India :—Hazàra (Wynne); Peshawar (Whitehead) ; Nathia Gali, Murree Hills (Pitman) ; Gugga Nullah, Kashmir, 9,000 ft. (Dunn) ; Kishtwar, Kashmir, and Kashmir, 7,000 ft. (Ward) ; Tissa in Chamba, 5,400 to 6,7000 ft. (Wells) ; Kothi in the Kulu Valley, 8,500 ft. (Wells) ; Kumaun, various localities from Ramnagar, 2,000 ft., to Dhakuri, 9,000 ft. (Crump) ; Nepal, without special localities (Hodgson) ; various localities in Gorkha (Baptista) ; Nagarcot, 3,000 ft. (Kennion) ; Chungtong in Sikkim, 5,350 ft. (Crump) ; Bhutan Duars, 600 ft. (Crump) ; Assam, Tura in the Garo Hills, 1,400 ft (Wells) ; Sangrachu, 3,500 ft., and Mokokchung, 4,500 ft. (Mills) ; Nam Tamai, 3,000 to 4,000 ft., in Upper Burma (Kaulback) ; Homalin on the Upper Chindwin (Shortridge) ; Myitkyina on the Irrawaddy, 40 miles N. of Bhamo, 4,500 ft. (Whitehead and Kemmis) ; Suikin, near Bhamo, 4,000 ft. (Harrington) ; the Chin Hills, 3,000 to 5,000 ft., and the Kubaw Valley, 6,000 ft. (Mackenzie) *.

Most of the specimens were collected for the Bombay Mammal Survey.

The colour varies greatly, sometimes seasonally, sometimes individually irrespective of season, both Shore (Zool. Journ. v. p. 271, 1830–1835), who claimed that adults killed at the same time of the year may differ considerably in colour, and Adams (Proc. Zool. Soc. 1858, p. 516), who stated that there is a marked seasonal difference, summer skins being dark and winter skins light, being right. Both phenomena are illustrated by a long series of skins collected in winter mainly at Gorkha in N.W. Nepal (Baptista). One from Satthar Hill, January 20, has the normal dark areas black, the shoulders and fore back dark brown, the belly deepish brown, and the throat pale orange. This is noticeably darker than a skin from Sepelar, dated November 20, and than several skins collected between January 10 and March 3 at various places in Gorkha. These almost insensibly lead from the tint of the skin from Satthar Hill to the tint of one from Kuwopany, March 23, which has the normal dark parts deep brown, the shoulders and fore back

* Evidence for the extension of the race into S.E. Tibet is supplied by a skin from the Kong Tö Valley, 6,000 ft. (Kingdon Ward), and into Yunnan by skins from the Lichiang Range, 10,000 to 11,000 ft. (Forrest).

very pale, faintly buffy-grey, the belly pale isabelline or soiled white, and the throat white. Although the coat in this skin is in perfect condition as regards luxuriance and texture, there is little doubt that its pale colour is due to bleaching towards the end of the winter season. This is borne out by one of Hodgson's Nepalese skins, which, although undated, is evidently in winter coat and was no doubt collected a few weeks later because it is still more bleached, the sides of the shoulders and the flanks back to the thighs being pale creamy or buffy-white, the mid-line of the fore back greyish, the brown of the loins reduced to a broad band on the croup, with the belly, the throat and the sides of the neck white. Moreover, the contour-hairs of the back are brittle and curled at the tip, indicating the imminence of the spring moult. This skin differs greatly in colour from the dark skin from Satthar Hill, although both are in winter coat, and this Satthar skin is darker than an undated but obviously summer skin of Hodgon's, but the latter is darker than all the other winter skins from Gorkha.

Variations similar to those of the Nepalese skins are exhibited by skins from other districts of the Himalayas. As further evidence that the coloration-phases are not local an instance or two may be cited. A very dark skin, with the fore part of the body darkish brown, collected in Kashmir in May, closely resembles a skin from Myitkyina in Upper Burma collected in July. Another from Myitkyina, collected in November, has the fore body tawny-grey and the loins brown, and is very like a skin from Peshawar in Hazàra ; whereas a third skin, undated, from Myitkyina has the fore body brightish ochreous-yellow and nearly resembles a skin collected at Dhakuri, Kumaun, 9,000 ft., in September (Crump). Perhaps the darkest recorded skin was the type of *chrysogaster* from Mussoorie, which was also peculiar for the orange-yellow hue of the belly. The type of *hardwickei* from Nepal was, on the contrary, of the yellowish type, like many the skins from Gorkha and others from Bhutan, Upper Burma, and elsewhere.

Individual variation in Burmese skins from the same locality and killed at nearly the same time of the year is shown by the series from Nam Tamai (Kaulback) collected between the end of September and the beginning of December. The nape may be nearly wholly blackish or noticeably invaded in the middle by ochreous ; the fore back varies from clear yellow to ochreous-brown, the loins from dark brown to black, the throat from rich orange-yellow to yellowish-white, the belly from whitish to pale chocolate-brown, and the chest may match the yellow throat or the brown belly.

The following flesh-measurements (in English inches) show the approximate variations in size in individuals of this race :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Chamba ; ad. ♂	24¼	16¼	4½
Nagarcot, Nepal ; ad. ♂	20½	16½	3½
Chamba ; ad. ♀	21	17½	4+
Bhutan Duars ; ad. ♀	18¼	15½	3⅜

The average of nine adult ♂♂ is : head and body 22½+, tail 17+ ; and of the same number of adult ♀♀, 19½ and 16.

The largest measured specimen is an adult ♂ from the Murree Hills (Dunn), the head and body being 25 in. and the tail 19, the tail being exceptionally long ; but this head and

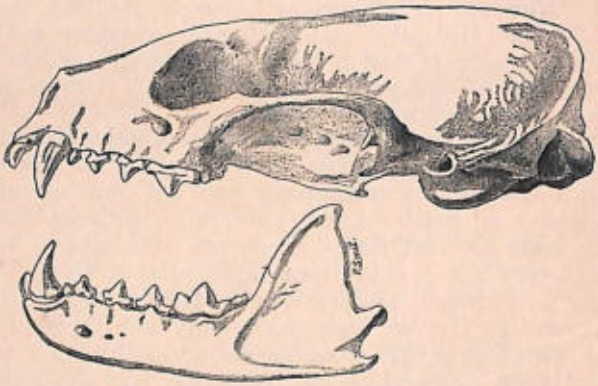


Fig. 78.—Side view of skull of *Charronia flavigula*. This skull from an unknown locality has the dorsal profile flatter than in most skulls of the species. (From Blanford.)

body measurement would have been equalled, if not surpassed, by two unmeasured ad. ♂♂ from Suikin, Bhamo, in Upper Burma, which have skulls slightly longer than in the Murree Hills example.

The skulls vary considerably in size in both sexes as shown by the table of measurements, in which the largest and smallest ♂ and ♀ skulls are entered (p. 341). The table suggests that Nepalese skulls are smaller than those found in Assam and Burma ; but that is not the case. Three ♂ skulls from Kumaun (Crump), Chamba (Wells), and the Murree Hills (Dunn) are 104 mm. in condylobasal length, and one from Myitkyina, Upper Burma, is 102 ; and two ♀ skulls from Myitkyina (Kemmis) and Homalin (Shortridge), in Upper Burma, are respectively 90 and 89 mm. in condylobasal length. Although there is practically nothing to choose in condylobasal length

between the smallest ♂ and the largest ♀ skull, ♂ skulls are on the average considerably longer. In 15 adult ♂ British Indian skulls it is 92 mm.

Adult ♂ skulls from the same locality may vary considerably in shape in response to the moulding of the masticatory temporal muscles. In the first on the list from Kha Cho, Suikin, Bhamo (Harrington), the postorbital area expands posteriorly and passes gradually into the squamosal area of the cranium, its width in the middle exceeding by 3 mm. its width just behind the postorbital processes. In another

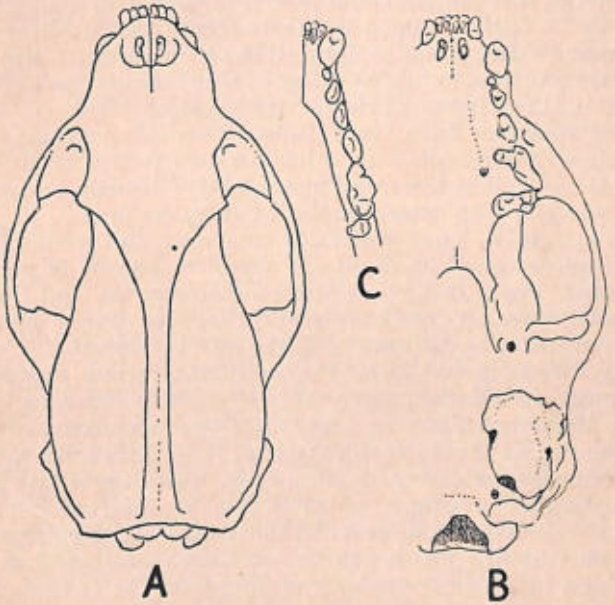


Fig. 79.

A. Upper side of adult ♂ skull of *Charronia flavigula flavigula* from Naini Tal, Kumaun. In this skull the temporal ridges are not coalesced to form a sagittal crest. Two-thirds natural size.
B. Left half of lower side of the same skull, showing the upper teeth and other features.
C. Lower teeth of the right side of the same.

from the same place and with almost exactly the same length the area in question is noticeably constricted, its width in the middle at the constriction being 21 mm., 5 mm. less than the width behind the processes. The bullæ in this latter skull are also larger than in the former, the dimensions respectively being 20×10 and 17×8 mm. In both these skulls the sagittal crest is complete ; but in another

adult ♂ skull from Myitkyina, a little north of Bhamo (Kemmis), there is no sagittal crest, the two strong temporal ridges being 10 mm. apart at their nearest point and 18 mm. close to the occipital crest, although the postorbital area is constricted. Thus there may or may not be a sagittal crest in adult ♂ skulls, and it is not present in any adult ♀ skulls I have seen.

Habits.—The capacity of this Marten for adaptation to varied environments has already been referred to. Being an expert and agile climber, leaping from bough to bough of high trees, it is usually found in well-wooded districts, but it is said to be fairly common in the deserts of the North-western Frontier Provinces, and in Burma it has been captured, although it is not common, in the low-lying, swampy country on the right bank of the Upper Chindwin (Shortridge). Two of Kaulback's specimen from Nam Tamai were killed amongst the boulders of a river-bed in thick jungle. It lies up in holes in rocks or hollow trees, and hunts by day, usually in couples, but sometimes in small parties of three or more. It preys upon rats, mice, hares, snakes, lizards, eggs, and ground birds, like francolins and pheasants, is a pest to keepers of poultry, and there are records, both from the Himalayas and Burma, of its killing at all events fawns of the barking deer or muntjac. It is reported to kill native house-cats in Kumaun; in the Naga Hills it is said to feed upon human corpses exposed in the open, and Mackenzie was told by reliable Burmans in the Chin Hills that three or four will attack an unarmed man. Probably, like the European martens, it feeds on fruits as well. Its fondness for nectar, at all events, was observed by Muir, who watched a couple of specimens in Garhwal climbing about a rhododendron-bush and thrusting their snouts into the blossoms to lick up the sweet secretion; and another pair was seen by a friend similarly feeding from the flowers of the silk-cotton tree.

But despite its voracity and predatory habits this Marten is easily tamed. According to Adams it may be trained to follow its master like a dog, and Shore tells of a specimen so domesticated that, although given full freedom, it never made any attempt to return to the wilds. The extraordinary activity of this Marten was impressively displayed by a specimen kept in the Zoological Gardens in London in a cage some 6 ft. high and about 3 ft. deep. Its favourite form of exercise was to leap up against the front bars, thence to pass to the roof in an inverted position and descend the back wall head first, merely touching the bars, the roof and the wall in its swift course, which it traversed repeatedly with such speed and precision that no onlooker could doubt for a moment its power to capture squirrels in trees. According to Crump

however, the Marten is ungainly on the ground, its mode of progression being a cumbersome gallop with the back highly arched.

Many recorded facts about this Marten point to the conclusion that its peculiar coloration, especially the emphatic contrast between the shining black head and the white or yellow throat, is a recognition mark, making for conspicuousness, such as is carried by most animals protected by a nauseous odour. Attributes commonly associated with this special means of defence are fearlessness of exposure, the owners courting rather than avoiding observation, and frequently attracting attention by noisy behaviour. On this last point we have the testimony of Adams that this Marten when moving about constantly utters a low chuckle which is prolonged into a harsh cry when it is excited. Its fearlessness is attested by Muir's observation in Garhwal that two specimens feeding in a rhododendron bush paid no heed to a stream of baggage coolies passing along a track only 40 yards below them. The facility with which the animal is tamed, of which there is more than one record, is also evidence of fearlessness.

Another quality acquired by such protected animals is tenacity of life. In support of this may be quoted Crump's account of a specimen in Kumaun which was shot at short range and dropped flat and motionless, as if killed, but in ten minutes it had disappeared, leaving a large pool of blood. Two days later it was found dead more than half a mile from the spot, despite the heavy charge of shot through the liver and stomach. It is true the accounts of the odour of the Marten do not precisely agree. Blanford's remark that it has a very slight unpleasant odour was no doubt taken from Bennett, who, in 1830, stated that a specimen in the Zoological Gardens had in a slight degree the unpleasant odour for which the polecat is notorious; but this specimen was "extremely tame, good tempered, playful, and familiar." Hence it had no provocation to use its glandular secretion in self-defence. Shortridge also described the polecat smell as not unpleasantly strong in two specimens he shot in Tenasserim, probably because they were dead. On the other hand, Gwatkins recorded this Marten as "fetid," an epithet only justifiable if the odour was offensive.

The balance of evidence derived from the colour, behaviour, tenacity of life, and scent of this Marten favours the view that it must be added to the list of specially protected members of the Weasel family. The unusual protrusion of the anal glands and the suggestion of a saccular enlargement of the integument round the orifice, shown in Hodgson's illustration here reproduced (fig. 75, D, p. 328), favours the view of the use of the secretion for defensive purposes.

74 *b*. **Charronia flavigula indochinensis** (Kloss).

Martes flavigula indochinensis, Kloss, Proc. Zool. Soc. 1916, p. 35.
Lamprogale flavigula indochinensis, Pocock, Proc. Zool. Soc. 1936, p. 543.

Vernacular.—Possibly at Tavoy the same as the Burmese names for the typical race cited by Peacock (p. 331).

Locality of *type*, Koh Lak in S.E. Siam.

Distribution.—N. Tenasserim (Tavoy), Siam, and Annam.

Distinguished principally from typical *flavigula* by the presence of a naked area of skin, varying somewhat in extent, above the plantar pad of the hind foot. On the fore foot also the area between the plantar pad and the carpal pads is either naked or provided with a smaller patch of hair than in Upper Burmese and Himalayan skins. The winter coat moreover is shorter and less luxuriant, the longest contour-hairs being from about 24 to 27 mm. and the fur from 10 to 14 mm., and the general colour on the average is paler, rather yellower on the shoulders and fore back, with the loins less extensively and less deeply pigmented and the nape more profusely speckled with yellow; and in all the available skins the belly is mostly soiled white and the throat pale yellow. But in coloration skins of this race can be matched by skins of typical *flavigula*, especially by some from Upper Burma. There is, however, no evidence of the occurrence of darkish brown or paler, tawny brown skins such as are found throughout the range of *L. flavigula flavigula* even in Upper Burma.

The only specimen of this race recorded from British India is an adult ♂ collected by W. Davison at the foot of Mt. Nwalaboo in Tavoy. It agrees closely with Siamese specimens and, although unmeasured, was evidently, judging from its skull, as large as the largest known specimen of the race. The following flesh-measurements (in English inches) of skins from Siam and Annam show the known range in dimensions of males and females.

Locality and sex.	Head and body.	Tail.	Hind foot.
N. Chiengmai, Siam; ad. ♂	23½	17⅞	4½
Kontoum, Annam; ad. ♂	20½	17⅞	4½
Klongmenao, Siam; ad. ♀	19½	15⅞	3¾
Rajburi, Siam; ad. ♀	17¾	15	3½

These dimensions are about the same as in *Ch. flavigula flavigula*, but the skull, as shown in the table, appears to be on the average rather smaller, the average condylobasal length in four adult ♂♂ being 99½ mm., and in three ad. ♀♀ 90⅓ mm.

Habits.—Probably E. H. Peacock's record that "many jungle Burmans insist that Martens occasionally run down and

kill barking deer," thus confirming reports regarding the Himalayan race, refer to this Marten at least in part (' A Game Book for Burma,' p. 274, 1933).

74 *c*. **Charronia flavigula peninsularis** (Bonhote).

Martes flavigula peninsularis, Bonhote, Ann. Mag. Nat. Hist. (7) vii, p. 344, 1901.
Lamprogale flavigula peninsularis, Pocock, Proc. Zool. Soc. 1936, p. 547.

Vernacular.—Bangbone (Malay at Bankachon) ; *Anga Prao* (Malay).

Locality of *type*, Bankachon, Victoria Point, Tenasserim.

Distribution.—S. Tenasserim and the Malay Peninsula.

Resembling *Ch. f. indochinensis*, and differing from *Ch. f. flavigula* in the presence of a naked area above the plantar pad of the hind foot, but distinguished from both by having the head brown, not black, and the nape the same colour as the shoulders, usually buffy or yellowish-brown and sharply contrasted with the lateral blackish stripes of the neck ; the shoulders and fore back are not so yellow as in *indochinensis*, and the abdomen is always darkish brown and strongly contrasted with the white or dirty white hue of the chest, the inguinal region is always extensively whitish, and the throat varies from orange-yellow to cream. The coat is short and thin, with little if any seasonal variation, the contour-hairs ranging from about 19 to 22 mm. and the fur from 8 to 10 mm.

The only recorded British Indian examples of this typically Malayan race are an adult ♂ (type) collected on June 20 at Bankachon, Victoria Point, Tenasserim, by Davison, and an adult ♀ from the same locality collected by G. C. Shortridge on December 30. They differ a good deal in colour, perhaps seasonally. The ♂ has the nape, shoulders, and fore back brightish tawny-brown, the chest and throat are yellow, the throat being richer than the chest. The ♀ has the nape, shoulders, and fore back greyish-tawny, duller-tinted than in the ♂, the chest is dirty white and the throat cream.

The ♂ from Bankachon was not measured in the flesh, but the flesh-dimensions of the ♀ were as follows : head and body 19⅜ in., tail 16⅝ in., hind foot 3⅛ in. An adult ♂ from Trang, N. Malay Peninsula, was only a trifle larger, but a ♀ from Perak was 2 in. shorter in the head and body. These dimensions do not differ appreciably from those of *indochinensis* ; but slight inequality in size between the two races is suggested by their skull-measurements, the average condylo-basal length in 3 ♂ skulls being 97⅜ mm., and in 4 ♀ skulls 87 mm.

Habits.—Nothing seems to have been recorded of the habits of this race, which has been recorded up to 6,000 ft. in Pahang, apart from Shortridge's record that two specimens he shot in Bankachon were hunting together by day high up in a tall tree in thick forest. He noticed that they had the characteristic polecat smell, although not unpleasantly strong. This observation was no doubt made after the animals were dead.

Other races of *Ch. flavigula* not contained in the British Indian fauna have been described. *Ch. flavigula borealis* Radde is distinguished by having a more luxuriant winter coat and a larger skull, reaching 110 mm. in condylobasal length. It inhabits northern China, Amurland, and Korea if, as I think, the form named *flavigula koreana* by Mori is identical with it. Possibly a race occurring in Szechwan and described as *flavigula szetchunensis* by Hilzheimer may, when better known, prove admissible as intermediate between typical *flavigula* and *borealis*. But the race from Fokien in S.E. China named *kuatunensis* by Bonhote cannot be separated from typical *flavigula* on the evidence of the few known skins and skulls. The above-mentioned local races closely resemble typical *flavigula* in colour and are either as large or a little larger ; but in Formosa there is a race, *xanthospila* Swinhoe, which is decidedly smaller and differently coloured, nearly resembling the Malayan race described above as *Ch. f. peninsularis*, but distinguished at least by having the hind foot fully haired as in typical *flavigula*. There is also a Javan race which I named *robinsoni*, differing in colour from *peninsularis*. Finally, the Sumatran race *henricii* has a smaller skull than the Malayan and in the Bornean race *saba* it is still a trifle smaller. These races are described in my paper quoted above.

75. Charronia gwatkinsii (Horsfield).

Martes gwatkinsii, Horsfield, Cat. Mamm. E. I. Co. p. 90, 1851.
Mustela flavigula var. *gwatkinsii*, Blanford, Mamm. Brit. India, p. 159, 1888.
Mustela gwatkinsii, Bonhote, Ann. Mag. Nat. Hist. (7) vii, p. 349, 1901.
Lamprogale gwatkinsii, Pocock, Proc. Zool. Soc. 1936, p. 550.

Locality of *type*," Madras."

Distribution.—Southern India, Nilgiri Hills, S. Coorg, Travancore.

Distinguished from all the races of *Ch. flavigula* mainly by the structure of the skull and of the baculum, although this bone is not known in the southern races of *flavigula* from the

Skull-measurements (in mm.) of the British Indian species and races of *Charronia*.

Name, locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
Ch. flavigula flavigula.							
Bhamo, Upper Burma; ad. ♂	106	65	29	24	23	10+	11½
Gorkha, Nepal; ad. ♂	99	59	22	21	21	9	10
Garo Hills, Assam; ad. ♀	96	50	24	20	18	10	10½
Gorkha, Nepal; ad. ♀	88	52	25	20	20−	9	10
Ch. flavigula indochinensis.							
Tavoy, Tenasserim; ad. ♂	(98±)	64	24+	22	22	11	11+
N. Chiengmai, Siam; ad. ♂	100	59	21	22	22−	9½	10
Klongmenao, Siam (type); ad. ♀	92	50	25−	20	18	9+	10
Dak-to, Annam; ad. ♀	88	52	22	19½	17	10	9
Ch. flavigula peninsularis.							
Bankachon, S. Tenasserim (type); ad. ♂	(98+)	60	23	22	21	10	10½
Trang, N. Malay Peninsula; ad. ♂	97	58	21	22−	22+	10−	10
Bankachon, Tenasserim; ad. ♀	90	50	22−	20−	19	9	9½
Gap Pablong, N. Malay Peninsula; ad. ♀	84	51	23	20	19	9	9
Ch. gwatkinsii.							
Virajpet, S. Coorg; just ad. ♂	89	50	21	19	18	9	9
Nilgiri Hills; ad. ♀	96	58	21	19	20	8	—
"Madras" (type); ad. ♀	—	49	22	19	18	8−	8−

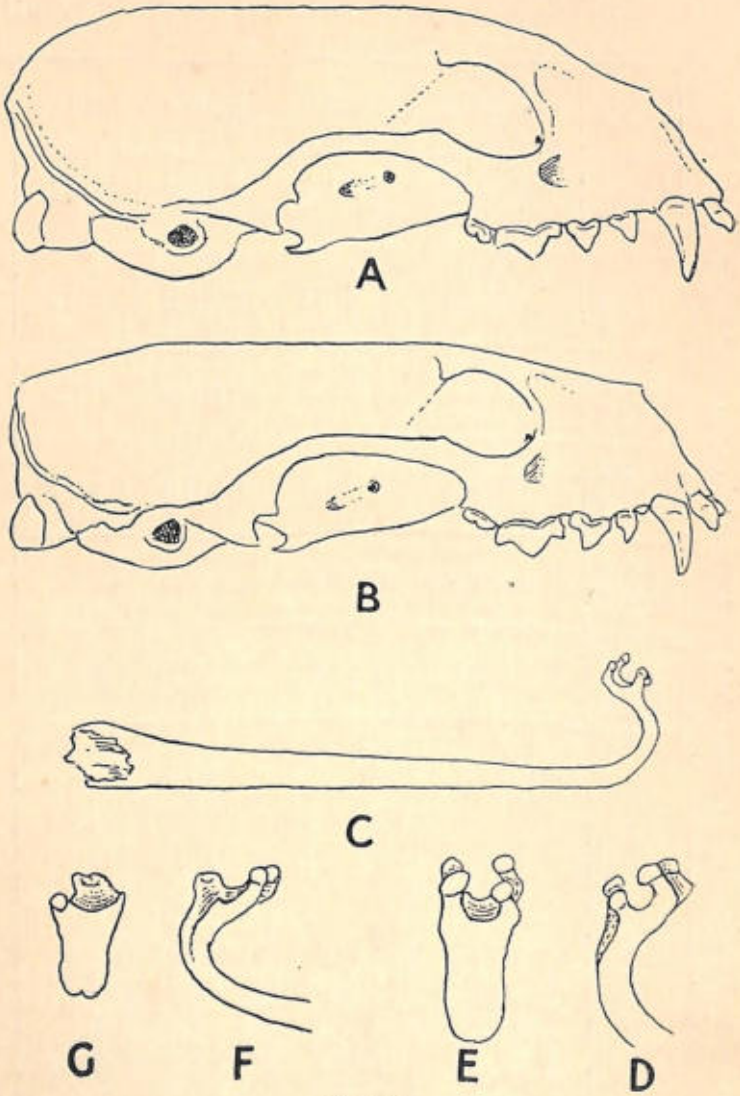


Fig. 80.

A. Side view of adult ♀ skull of *Charronia flavigula flavigula* from Almora, Kumaun (Crump). Natural size.
B. The same of *Charronia gwatkinsii* from the Nilgiri Hills, showing the flatter dorsal profile, less elevated zygomatic arch. Natural size.
C. Baculum of *Charronia flavigula flavigula* from the right side.
D. Tip of the same from the left side.
E. Tip of the same from the front.
F. Tip of the baculum of *Charronia gwatkinsii* from the left side. Specimen collected by Shortridge at Virajpet, S. Coorg.
G. Tip of the same from the front.

Malay Peninsula, Sumatra, Java, and Borneo. The skull is low and flattened above like an otter's, the slope from the frontal region to the tip of the nasals and from the crown to the occipital crest being slight as compared with the skull of *flavigula*, which is tolerably evenly convex along its dorsal profile; the zygomatic arches are also less arcuate when viewed from the side. The baculum has its main shaft lightly arched, convex above, concave below, instead of straight, and its apical portion is more strongly hooked, with the terminal processes much smaller, the posterior two merely defined by a shallow notch and the left of the anterior pair represented by a small tubercle. As in the North Indian race of *Ch. flavigula*, there is no appreciable naked area on the hind foot above the plantar pad, but the colour above is much less varied even than in the darkest skins of that race, being tolerably uniformly dark brown from the head to the loins, with the shoulders and fore back at most a little more rufous-brown than the rest. The abdomen also is deeper brown than in the British Indian races of *Ch. flavigula*, and the throat varies from rusty yellow to nearly lemon-yellow. But the colour of the upper side and of the abdomen differs but little from the colour of some Bornean examples of *Ch. flavigula saba*.

A ♂ from Virajpet, S. Coorg, 3,000 ft., collected by G. C. Shortridge, and measured in the flesh was: head and body 20⅜ in., tail 16½, hind foot 4½*. The weight was 4½ lb.

Habits.—Judging from the very few specimens of this species in the British Museum it is nowhere plentiful. This conclusion is confirmed by Shortridge, who supplied the following information about the specimen he collected :—"Apparently rare in Coorg; the single one obtained was only recognised by a very few of the local natives. It is said to be largely diurnal in habits and, although to a considerable extent arboreal, to hunt a great deal on the ground, occasionally in small parties." No doubt it is as predatory in habits as *Ch. flavigula* and as varied in diet. One, indeed, that was shot in a tree in Travancore, as cited by Blanford, appeared to be feeding on cicadas.

* The actual measurement of the head and body on the label is 615 mm.=24⅛ in.; but this was no doubt a mistake for 515 mm., because the skull is much too small for a specimen nearly 25 in. in head and body length, and the dried skin shows that the tail was considerably more than two-thirds the head and body.

Subfamily MUSTELINÆ.

Weasels, Stoats, and Polecats.

Distinguished in external features from the Martinæ by the longer, more cylindrical body, shorter legs and tail, smaller ears, and abbreviated muzzle; but the principal differences are supplied by the skull and teeth. The muzzle is shorter, more rounded above, the cranial portion comparatively longer, the prepalatine foramina open on the maxilla well in advance of the palatine suture, the wall of the bulla is depressed on to the tympanic annulus and thick and spongy, with air-cells continuous with those of the mastoid; teeth with trenchant cusps, essentially as in the Martinæ, but in correlation with the abbreviated jaws the postcanine teeth are reduced in number to four above and five below, the first premolar, retained in the Martinæ, being lost. The dental formula in British Indian genera is $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{3}{3}, m.\frac{1}{2}=34$.

The Weasels, Stoats, and Polecats constituting this subfamily are clearly a more specialized group than the Martens. They are more predatory, more terrestrial, and less scansorial in habits, and, so far as is known, all make use of the nauseous secretion of their anal glands for defence when attacked.

Setting aside the Marbled Polecat (*Vormela*), which is now admitted on all hands to represent a distinct genus, the status of the numerous species commonly known as Polecats, Minks, Stoats, and Weasels is at present unsettled. Miller, in 1912, referred all the European species to the genus *Mustela*, admitting *Putorius* Cuvier, 1817, as a subgenus for the Polecat, *Lutreola* Wagner, 1841, for the Mink, and *Mustela* Linn., 1758, for the Stoats and Weasels. But *Putorius*, he wrote, "appears to be sharply circumscribed, so that it might readily be regarded as a distinct genus." I adopted that suggestion in my Monograph of the Polecats in 1936, and adhere to it in this volume.

In his definition of *Lutreola* Miller remarked that although "well characterized in its extreme development .... the subgenus grades insensibly into true *Mustela*, typified by *erminea*, through such Asiatic members of the genus as *M. sibirica*, *M. canigula*, and others," the intergradation being so complete that it may well be questioned whether *Lutreola* should be retained.

Satunin, however, in 1911 (Mitth. Kauk. Mus. v, pp. 5 and 27), had not only adopted *Lutreola* as a subgenus, partly on the fictitious belief that the feet are more fully webbed *

* For refutation of this belief see my paper (Proc. Zool. Soc. 1925, p. 21, fig. 5).

for swimming than in Polecats and Stoats, but proposed a new subgeneric name *Kolonokus* for *sibiricus*, its type, *altaicus* and four Chinese species, *davidianus*, *moupinensis*, *astutus*, and *fontanieri*, distinguishing it from *Mustela* by having the lower side coloured like the upper except for a white chin and a patch on the throat, and *Kolonokus* was adopted by Ognev in the same sense in 1931 (Mamm. of Eastern Europe and Northern Asia, p. 714). But the names cited by Satunin as indicating six definable species of *Kolonokus* denote in my opinion only two species, namely *sibiricus*, of which *fontanieri*, *davidiana*, and *moupinensis* are subspecies, as G. M. Allen pointed out, and *alpinus* (=*altaicus*), of which *astutus* (=*temon*) is a subspecies: and *altaicus* contradicts the definition of *Kolonokus* by having the under side distinctly paler than the upper and nearly as contrasted as in *Mustela*. Since, moreover, the differences in cranial and other characters between *altaicus* and *sibiricus* are greater than the differences between *sibiricus* and *lutreola*, and since *altaicus* is quite as closely akin to *erminea* as to *sibirica*, perhaps more so, *Kolonokus* appears to be a composite, undefinable group-name.

Key to the British Indian Genera of Mustelinæ.

a. Back variegated with black and yellow irregular lines and blotches; skull with foramen ovale close to bulla; lower carnassial (m_1) with distinct inner cusp (metaconid) ..... [p. 384. VORMELA Blasius,

a'. Back without definite pattern; skull with foramen ovale well in advance of bulla; lower carnassial without inner cusp.

b. Ear with bursa reduced to a shallow marginal groove; contour-hairs of coat long and loose, not concealing the under hair, which is pale; legs black, darker than the back; skull with mastoid width exceeding the length between the lower edge of the foramen magnum and the anterior edge of the mesopterygoid fossa.. [p. 380. PUTORIUS Cuvier,

b'. Ear with well-developed bursa; contour-hairs of coat close, concealing the under hair, which is dark; legs, except when the paws are white, the same tint as the back; skull with mastoid width not exceeding the length of the area mentioned ..... [p. 345. MUSTELA Linn.,

Genus **MUSTELA** Linnæus.

Mustela, Linnæus, Syst. Nat. ed. 10, i, p. 45, 1758; Miller, Cat. Mamm. Western Europe, pl 381, 1912.

Type of the genus, *erminea* Linnæus (fixed by Thomas in 1911).

Distribution.—The northern districts of the Old World from the Arctic coast southwards to the Mediterranean and North Africa in the west, and to Sumatra and Java in the south-east; restricted in British India to the HIMALAYAS and BURMA. In America ranging from the Arctic to the northern parts of South America.

Essentially distinguished from the other genera of British Indian Mustelinæ by the characters mentioned in the analytical key; but in the comprehensive sense in which the term *Mustela* is here used the genus is very variable in some of its external features. The coat may be short and sleek or tolerably long and full, and the tail, which may be bushy or short-haired, varies from about one-third to over one-half the length of the head and body and from about twice to over three times the length of the hind foot; the soles of the feet may be thickly covered with hair, reducing the size of the pads and obliterating the inner lobe of the carpal pad, or wholly naked, with a large four-lobed plantar pad and a double carpal pad. In the head, however, the rhinarium or nose-pad, with the hairy undivided upper lip beneath it, and the ear, with its well-developed bursa, seem to be very constant in general form.

The skull is subject to some specific variations in detail, and differs considerably individually with age and muscular moulding; but the part of the skeleton which supplies valuable systematic characters is the baculum or *os penis*. This bone, instead of being tolerably constant in structure as it is in all the genera of Canidæ and Ursidæ, exhibits great range in structure within the limits of the genus *Mustela* as here understood. It is very different, for example, in the two British Indian species, *M. kathiah* and *M. altaica*, which have recently been united as races of one species. On the other hand, it may be very similar in such widely different species as the Common Weasel (*M. nivalis*), not yet recorded from British India, and the so-called Siberian Mink (*M. sibirica*), of which several subspecies come into our fauna. Unfortunately this bone has not been described in a very large number of the species usually assigned to *Mustela*, and has consequently been very little used in classification. When known it will no doubt help considerably towards an understanding of the affinities of the different forms of this genus, and not improbably will be employed for splitting it up into several subgenera, if not genera *.

* It may be of interest to record that in the British representatives of the Mustelinæ the bacula of the English and Irish Stoats (*M. erminea* and *M. hibernica*) are alike, and quite different from that of the Weasel (*M. nivalis*), which is very like that of the Polecat (*Putorius putorius*), different as these two species are in other respects.

Key to the British Indian Species based on External Characters.

a. No pale median dorsal or ventral streak; soles of feet, at least in winter, hairy round the pads.
  b. Fore paws and usually the hind paws conspicuously white and contrasted with the rest of the legs.
    c. Tail less than half the length of the head and body, its tip black; upper side in summer darker and more sharply contrasted with lower; size smaller ..... [p. 348. *erminea* Linn.,
    c'. Tail more than half the length of the head and body, the same tint throughout; upper side in summer paler and less contrasted with lower; size larger ..... [p. 352. *altaica* Pall.,
  b'. Paws normally the same tint as the legs, at most occasionally some white hairs on the toes, rarely (in *kathiah*) some abnormal, albino spots on the fore paws.
    d. Never a very sharp contrast between the upper and the under sides; soles of feet hairy round pads at all seasons; four pairs of mammæ ..... [p. 362. *sibirica* Pall.,
    d'. A very sharp contrast between the upper and under sides; soles of feet nearly naked round pads in summer; two pairs of mammæ ..... [p. 357. *kathiah* Hodgs.,
a'. A pale dorsal and ventral abdominal streak; soles of feet naked at all seasons ..... [p. 376. *strigidorsa* Hodgs.,

Key to the Species based mainly on the Baculum.

a. Apex of the baculum not definitely bifid.
  b. Baculum slender, its distal half with comparatively steep upward inclination, its apex not hooked or backwardly curved .... [p. 348. *erminea* Linn.,
  b'. Baculum with its apex forming a more or less definite backwardly directed hook.
    c. Postorbital area of skull in adult nearly parallel-sided, without angular constriction; tip of baculum forming an abrupt hook with a pair of low tubercles above just behind the extreme apex ..... [p. 362. *sibirica* Pall.,
    c'. Postorbital area of skull angularly constricted in adult; baculum when abruptly hooked otherwise shaped.
      d. Tip of the baculum abruptly hooked, with a basal tubercular prominence on the right side, its extreme tip truncated and widened by the divergence of the ridges bounding the groove ..... [p. 352. *altaica* Pall.,
      d'. Tip of the baculum more gradually, less strongly hooked, without basal tubercle, the ridges not divergent and the apex rounded ..... [p. 357. *kathiah* Hodgs.,
a'. Apex of the baculum definitely bifid; the distal half of the bone forming a stronger, more sickle-like curve than in the others ..... [p. 376. *strigidorsa* Gray,

76. Mustela erminea Linnæus. The Stoat or Ermine.

Mustela erminea, Linnæus, Syst. Nat. ed. 10, i, p. 46, 1758; and of most recent authors, including Miller, Cat. Mamm. Western Europe, pp. 385–98, 1912.

Locality of the *type*, Sweden.

Distribution.—Northern and Central Europe eastward into Asia and, in my opinion, North America.

Colour above in summer typically darker or lighter, dull, fawn-brown, white or yellowish below, the upper and under tints sharply contrasted along the flanks, the sides of the neck, the upper lip and muzzle; the legs externally and in front like the upper side, but with the paws whitish and contrasted; the tail conspicuously black at the end, its terminal hairs long, often forming a tuft, the rest of it short-haired, above the same colour as the back, below generally whitish from the base nearly to the terminal tuft. Colour in winter typically all white with the exception of the black tail-tuft. Mammæ four pairs.

The baculum in European races is comparatively long and slender and has its distal half inclined upwards with its tip not hooked but spoon-shaped and ending in a rounded knob (fig. 81, E, F, p. 349).

Skull with a short, rather abruptly constricted postorbital area, the muzzle short, convex above, and with the sides converging towards the canines, where it is narrower than the interorbital area; the infraorbital foramen large; the zygomatic arch elevated and arcuate in profile; the mastoids sometimes prominent in well-developed skulls.

76 *a*. Mustela erminea ferghanæ (Thomas). The Himalayan Stoat or Ermine.

Putorius erminea, Blanford, Mamm. Brit. Ind. p. 165, 1888.
Putorius ermineus ferghanæ, Thomas, Ann. Mag. Nat. Hist. (6) xv, p. 452, 1895, and (8) xiii, p. 566, 1914 (*Mustela*).
Mustela whiteheadi, Wroughton, Journ. Bomb. Nat. Hist. Soc. xviii, p. 882, 1908, and xxvi, p. 345, 1919 *.

Locality of *type* of *ferghanæ*, Mt. Kara Karyk, Ferghana, Turkestan; of *whiteheadi*, Kaghan Valley in Hazara.

* The type of *M. erminea ferghanæ* was described by Thomas as an adult ♂ on information supplied by the collector. But later he changed his opinion on receiving several larger ♂ specimens of apparently the same stoat from Djarkent in Semiretschensk. The skull of the type of *ferghanæ* has all the characters of a ♀, and is almost exactly the same size as in the smaller of the two ♀ skulls from the Kaghan Valley, the typical locality of Wroughton's *whiteheadi*; and the summer skins of *whiteheadi* from that locality differ in no respects from the skin of the type of *ferghanæ*, a palish skin collected in June but unmeasured in the flesh. All the skins from Djarkent are in winter coat, and naturally are like the skins in winter coat from Chitral and elsewhere assigned to *whiteheadi*.



Stoat or Ermine (*Mustela erminea ferghanae*) : winter coat.



Stoat or Ermine (*Mustela erminea ferghanae*) : summer coat.

Distribution.—From Semiretschensk, Tian Shan, and Ferghana southwards to CHITRAL, HAZARA, and KASHMIR.

Very similar to the European races, but smaller, apparently at least 1 inch shorter in the head and body than the smallest European specimens and similarly shorter in the tail. The skull is correspondingly smaller, the condylobasal length in

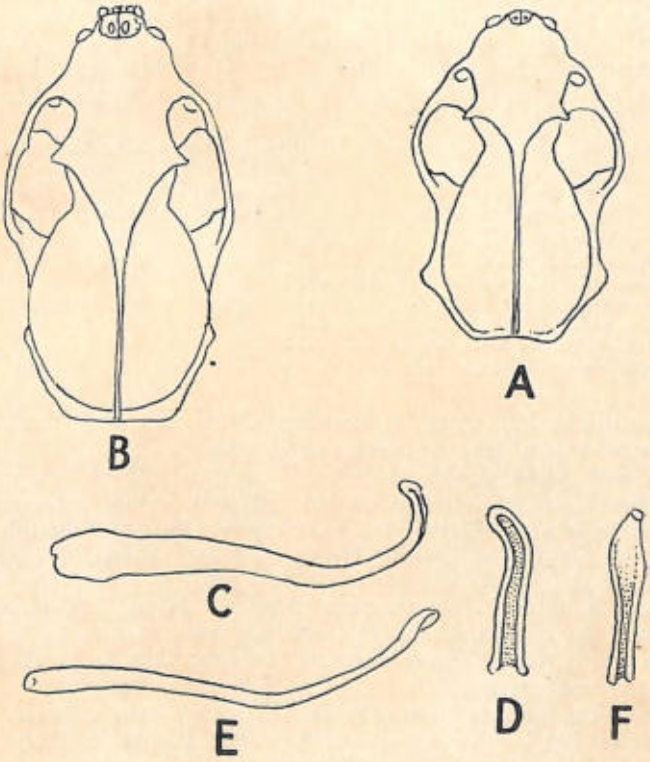


Fig. 81.

A. Upper view of adult ♂ skull of *Mustela erminea ferghanæ* from Parrachinar, Kurrum Valley (Rattray). This is an oldish skull, well moulded muscularly, with broad zygomata and prominent mastoids, approximately nat. size.
B. The same of adult ♂ skull of *Mustela kathiah* from Chapa, Tong-king (Delacour and Lowe). Approximately nat. size.
C. Right side view of baculum of the same, showing the raised, slightly hooked simple tip.
D. Distal end of the same from the front, showing the rounded tip turned slightly to the right.
E. Right side view of baculum of typical *Mustela erminea*, showing the unhooked tip.
F. Distal end of the same from the front, showing the spoon-shaped tip ending in a rounded knob.

the ♂ being about the same as in the ♀ of the central European races * (fig. 81, A, p. 349, and fig. 83, E, p. 355). The baculum in this race is unknown.

Colour of summer coat varying from uniformly dull, palish chocolate or sepia-brown to more tawny-brown, and, as in the European races, the paws are white, the under and upper sides sharply demarcated along the flanks and neck, and the tail below is whitish in its basal half. Frequently there are flecks of white on various parts of the head, in one skin a tolerably large white spot on the summit of the nose. In the white winter phase the pads of the feet are almost wholly concealed by hair (fig. 82, A–D, p. 351).

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

Locality and sex.	Head and body.	Tail.	Hind foot.
Djarkent ; ad. ♂	9¼	3⅜	1⅝
Djarkent ; ad. ♂	8⅘	3⅛	1⅝
Kaghan Valley (type of *whiteheadi*) ; ad. ♂	8⅜	3⅜	2
Kaghan Valley ad. ; ♂	8⅜	3	1⅝
Kaghan Valley ; ad. ♂	8⅛	3⅜	1⅝
Prejevalsk, Tian Shan ; ad. ♂	7⅝	2⅝	1⅛
Kaghan Valley, Hazara ; ad. ♀	7⅛	2⅜	1⅛

The dimensions given by Blanford (head and body 9 to 11 in.) were taken from European specimens.

Of four skins in the winter or " ermine " phase two only are dated, namely, one from the Kurrum Valley, February, which has a few scattered brown spots on the nape and shoulders, and one from the Laspur Valley, Chitral, March, Another from Chitral, undated, has a faint brown spot on the left flank. Finally, there is the skin ticketed " Nepal " (Hodgson) referred to by Blanford, who said it was reputed to have come from Tibet, quite correctly adding that it is clearly a native-made skin.

The skins of this stoat examined by me were collectd at the following localities :—Kaghan Valley, 10,000 to 13,500 ft. (Col. Whitehead and Major Harrington) ; in Kashmir, without precise locality (F. J. Mitchell) ; at Tasha Maidan, Pir Panjal, and at Apharwai, both at 11,500 ft. (B. B. Osmaston) ; at the Gangabul Lake (R. W. Burton) ; the Kurrum Valley, 9,000 ft. (Col. R. H. Rattray) ; at Coudla Lahul, 10,000 ft. (H. W. Wells), and at Chitral (Maj. F. Wall). Also the Laspur Valley, Chitral, 9,500 ft. (Capt. V. R. Hill).

Habits.—According to Col. Whitehead this stoat is fairly common about the rocks in the Kaghan Valley, where it

* Detailed measurements of the western and central European races may be found in Miller's volume quoted above.

hunts by day and is bold, fearless, and inquisitive. He watched a specimen dashing about a hillside, following up the course of a stream, and hunting every hole in search of prey. Major Harrington also states that it is found in stony or rocky places, and according to Capt. Hill it is said to be fairly com-

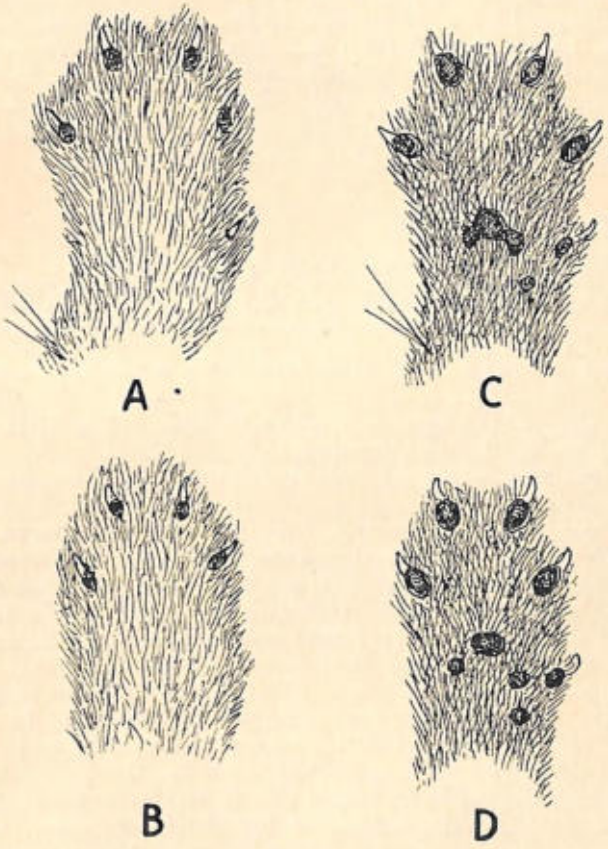


Fig. 82.

A. Lower side of right fore foot of *Mustela erminea ferghanæ* from Lashur, Chitral, 9,600 ft. (Capt. R. Hill). Winter coat, with the hair turned aside to show the digital pads.
B. Lower side of right hind foot of the same.
C. Lower side of right fore foot of the same race from the Kaghan Valley, 11,500 ft. (Whitehead). Summer coat, with the pads uncovered by hair, but the plantar pad reduced in size, and the carpal pad concealed.
D. Right hind foot of the same specimen with the plantar pad broken up into four elements.

mon in the Laspur and Yarkhum Valleys, Chitral, at high altitudes.

Near Pahlgum, Kashmir, 14,000 ft., Major McGrath saw a specimen in full summer coat in August under a rock jutting out from the snow, the surroundings being snow and rock, with no trace of living thing to serve as the stoat's prey. One observed by C. H. Donald in the cleft of a large boulder in the Larka Pass, 13,000 ft., N.E. of Dharmsala, was so fearless that it allowed him to approach within 4 or 5 feet before retreating into the cleft. This attribute was confirmed by B. B. Osmaston, who shot one amongst loose rocks at 12,000 ft. near Gulmarg in the Pir Punjal Range.

77. **Mustela altaica** Pallas.

Mustela altaica, Pallas, Zoogr. Ross. As. p. 98, 1811.
Putorius alpinus, Gebler, Mém. Soc. Imp. nat. Mosc. vi, p. 212, 1823.
Mustela sacana, Thomas, Ann. Mag. Nat. Hist. (8) xiii, p. 566, 1914.
Kolonocus alpinus, Ognev, Mamm. East. Europe and North. Asia, ii, p. 728, 1931.
Mustela altaica, G. M. Allen, Mamm. China and Mongol. p. 378, 1938.

Locality of the *types* of *altaica* and *alpinus*, the Altai Mts.; of *sacana*, Djarkent in Semirechensk.

Distribution.—Central Asia southwards to Tibet and the Himalayas.

A tolerably large weasel, with the tail long, more than half the length of the head and body, and bushy in the winter. Coat in winter full and soft but not long. General colour of the upper side in the typical form brighter yellowish or duller sandy, but never bright ochreous, a little darker and browner in some races but never deep chocolate; limbs externally like the back but with the paws whitish and contrasted; tail like the back throughout, including the tip; under side typically yellowish or cream, and in skins in good coat rather sharply demarcated from the tint of the upper side along the flanks and side of the neck; from the abdomen and chest the white extends along the inner surface of the limbs, and the edge of the upper lip up to the rhinarium in front is white.

77 *a*. **Mustela altaica temon** Hodgson.

Mustela temon, Hodgson, Journ. As. Soc. Beng. xxvi, p. 207, 1857; Scully, Proc. Zool. Soc. 1881, p. 203; Wroughton, Journ. Bomb. Nat. Hist. Soc. xxvi, p. 345, 1919.
? *Putorius astutus*, A. M.-Edwards, Nouv. Arch. Mus. vii, Bull. p. 92, 1870; and Rech. Mamm. 1874, p. 345, pls. 60, fig. 3, 61, fig. 2.
Putorius alpinus, Blanford, Mamm. Brit. Ind. p. 168, 1888.

Mustela longstaffi, Wroughton, Journ. Bomb. Nat. Hist. Soc. xx, p. 931, 1911 ; and xxvi, p. 345, 1919 *.
Mustela alpina longstaffi, De Beaux, Atti Soc. Ligust. xiv, p. 61, 1935.

Vernacular.—*Neoli* in Garhwal (Osmaston) ; *Temon* (Hodgson), *Dremo*, *Rheno*, and *Sabong* (Bailey) in Tibet.

Locality of *type* of *temon*, Sikkim ; of *astutus*, Moupin ; of *longstaffi*, Teza in the Upper Sutlej Valley.

Distribution.—Kansu, Moupin, Tibet, and the HIMALAYAS from SIKKIM to GILGIT, from about 10,000 to 13,500 ft., also Alchori in Kara Korum, about 7,000 ft. (De Beaux).

Distinguished from typical *altaica* by the colour being on the average darker and by some skull characters mentioned below.

The general colour of the upper side is variable, hardly any two skins being alike ; typically it is uniformly brighter or duller fawn, sandy-brown, drab-brown, or a little darker, sometimes obscurely mottled with darker and lighter shades when the coat is moulting ; the fore paws usually have more white on them than the hind paws, in which it may be restricted to spots on the toes. The lower side is yellowish or cream, typically rather sharply marked off from the upper along the flanks and the sides of the neck, but sometimes the two almost imperceptibly blend, when the upper side is paler and the lower darker than usual.

Mammæ four pairs, in a suckling ♀ (Sept.) from the Pattan Valley, Lahul. The baculum of a specimen from Gyantse, Tibet, has the main shaft slightly undulating, with a lateral groove in its proximal half and a deep ventral groove in its distal half ; the end is abruptly hooked upwards and slightly backwards, and has a simple truncated tip and an angular prominence on the right side at the base of the upcurved portion.

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* *P. astutus* Milne-Edwards was based on a single specimen from the mountains of Moupin, and described as deep brown above with the belly tinted with yellow and the fore paws white, the head and body being 10 in. and the tail 4½. Since the tail is relatively exceptionally short, no doubt the other measurement was taken from the stretched, probably mounted skin. I suspect the specimen was a ♀. The description of the skin agrees very closely with the skin of the type of *temon*. The extension of this form into S. Kansu is attested by two adult ♂ specimens in the British Museum, collected by J. A. Smith, 25 miles S.E. of Taochou, which are inseparable from Himalayan skins. G. M. Allen (Amer. Mus. Novit. no. 358, p. 4, 1929) referred *astutus* to *kathiah*, but the extensive whiteness of the fore paws excludes it, I think, from that species. When he described *longstaffi* Wroughton seems to have compared only the type of that alleged race with the type of *temon*, neglecting all the other available skins which show that his diagnosis has no value.

Flesh-measurements (in English inches) :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Stazurma, Ladakh ; ad. ♂	10½	6½	1⅜
Nubra Valley, Ladakh ; ad. ♂	10½	6½	1⅝
Upper Sutlej (*longstaffi* type) ; ad. ♂	10	5⅝	1⅝
Near Leh, Ladakh ; ad. ♂	9⅝	6⅝	—
Gnatone, S.E. Sikkim ; ad. ♂	9⅝	5	1½
S. Kansu ; ad. ♂	9⅜	5⅝	1⅝
Sikkim (*temon* type) ; ? ad. ♀	9½	6½	—
Pattan Valley, Lahul ; ad. ♀	8⅝	4⅝	1½
Bampa, Garhwal ; ad. ♀	8½	4⅝	—

Of five ad. ♂ Tibetan specimens measured, the largest, collected by H. Ludlow 5 miles from Gyantse, was 11 in. in head and body length, and the smallest, collected by Col. Bailey at Gyantse, was 9⅛ in., the average of the five being head and body 10 in., tail 5¼ in.

The only recorded weight is that of the ♀ from Lahul (H. W. Wells), which was only 4½ oz.

The skull, as in other species of *Mustela*, varies considerably with age and muscular moulding after its full length has been attained. Its postorbital area is very similar to that of *M. erminea ferghanæ* ; but although the skull is considerably longer, sex for sex, than in that species, it is not so robust, being relatively narrower, the zygomatic, mastoid, postorbital and interorbital widths being about the same in adult ♂ skulls of the two species, and there is less difference in dimensions between the skulls of the two sexes. Also the zygoma in profile view is more horizontal and less arched and the infra-orbital foramen is a little smaller. The size and direction of the inner cusp of the upper carnassial (pm^4) is about the same in the two, but this tooth and the lower carnassial (m_1) are slightly larger in *M. altaica temon*. The skull of the latter differs from that of the typical form from Central Asia in having the anterior end of the bulla lower, less inflated. In both the sagittal and frontal crests and the mastoid processes are poorly developed, and the skull as a whole is not sufficiently like that of *sibirica* to justify the inclusion of the species in "*Kolonokus*," to which it was assigned by Ognev (fig. 83, D, F, p. 355).

The baculum has its distal third gently sloped upwards and its end abruptly hooked with a tubercle at the base of it on the outer side and the edges of the recurved portion constricted and divergent at the ends (fig. 86, D, E, p. 363).

Habits.—Writing about this weasel in Lahul, Wells reported it to be by no means common, but when the snow is deep a few are generally killed, mostly near villages. It lives amongst rocks and preys upon small mammals and birds.

In the typical race found in the Altai the pairing season,

according to Gebler, is in February, and the litter, not exceeding five in number, is born in May ; but the ♀ of *temon* from Lahul, above mentioned, was evidently rearing young in September. Possibly there are two litters during the season.

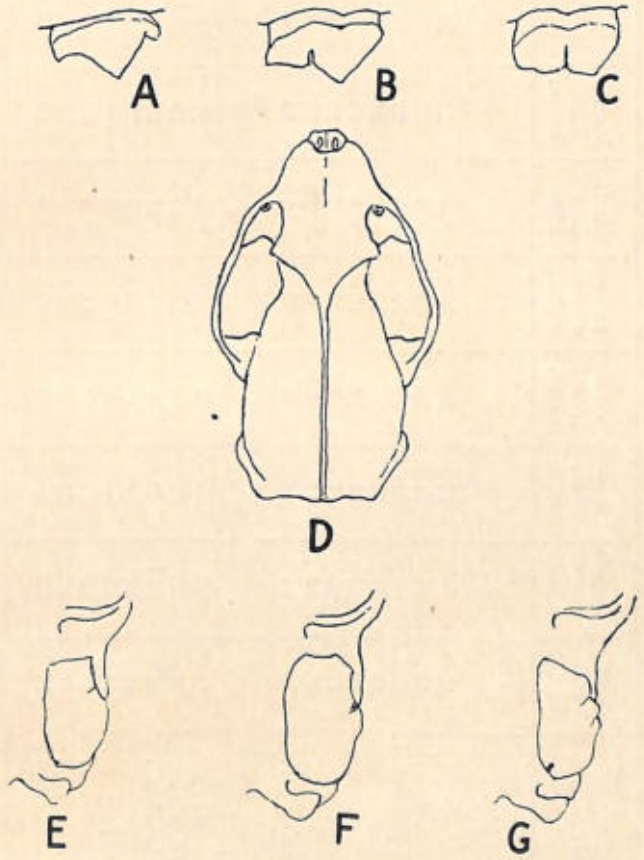


Fig. 83.

A, B and C. Outer view of upper carnassial (pm^4) of right side of the Wolverene (*Gulo*), one of the Mustelidæ, of an Indian Jackal and of a Red Bear from Kashmir, showing the presence of the notch between the main cusps in the last two and its absence in the first as in other genera of Mustelidæ (see under definition of the family, p. 265).

D. Upper view of skull of adult ♂ *Mustela altaica temon* from N. Sikkim.

E. Left auditory bulla of *Mustela erminea ferghanæ* from the Kaghan Valley, one of the specimens described by Wroughton as *M. whiteheadi*.

F. The same of *Mustela altaica temon* from Leh, Ladakh.

G. The same of *Mustela kathiah*.

Skull-measurements (in mm.) of *Mustela erminea ferghanæ* and of *Mustela altaica temon*.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
M. erminea ferghanæ.									
Djarkent; ad. ♂	45	—	22	10	—	—	24	5	5
Kaghan Valley; ad. ♂	43	24	21	8	10	9	23	5	5
Kaghan Valley (*whiteheadi* type); ad. ♂	42	—	21	8	10	8	22	4½	5
Kurrum Valley; ad. ♂	43	26	23	7	10	10	24	9½	5
Pir Panjal; ad. ♂	42	28	21	11	10	8	23	5	4½
Kaghan Valley; ad. ♀	37	20	17	7	8	7	19	4	4
Kaghan Valley; ad. ♀	35	19	17	7½	9	7	18	4	4
Ferghana (*ferghanæ* type); ad. ♀	35	18	16	8	8	7	18	4	4
M. altaica temon.									
S. Kansu; ad. ♂	50	25	—	8	10	—	27	5½	6
Sikkim (*temon* topotype); ad. ♂	49½	25	23	10	11	10	29	5½	6
Upper Sutlej (*longstaffi* type); ad. ♂	49	27½	23	9	10	10	28	6	5½
Upper Sutlej; ad. ♂	49	26	22½	10	10	10	28	6—	6
Moupin (*astutus* type); ad. ♀?	46	23	—	9½	9	8	—	—	—
Sikkim (*temon* type); ad. ♀	46	25	21	9	11	9	25	5	5
Gilgit; ad. ♀	46	22	21	9	9	8	25	5	5
Bampa, Garhwal; ad. ♀	42	22	20	9	9	8	22	5	5



White-footed Weasel (*Mustela altaica temon*).



Yellow-bellied Weasel (*Mustela kathiah*).

78. **Mustela kathiah** Hodgson. The Yellow-bellied Weasel.

Mustela (*Putorius*) *kathiah*, Hodgson, Journ. As. Soc. Beng. iv, p. 702, 1835.
Mustela (*Putorius*) *cathia* vel *auriventer*, Hodgson, Journ. As. Soc. Beng. vi, p. 563, 1837; *auriventer* vel *cathia*, id., *op. cit.* x, p. 909, 1841; *auriventer* vel *kathia*, id., *op. cit.* xi, p. 280, 1842.
Putorius cathia, Blanford, Mamm. Brit. Ind. p. 169, 1888.
Mustela kathiah, G. M. Allen, Amer. Mus. Novit. no. 358, p. 4, 1929; Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 1932.
Mustela altaica kathiah, G. M. Allen, Mamm. China and Mongol. p. 381, 1938 *.

Vernacular.—*Kathiah Nyul* (Nepalese); *Musk-neula* (Hindi at Naini Tal).

Locality of *type*.—The Kachar, the northern region of Nepal.

Distribution.—The HIMALAYAS at least from MUSSOOREE eastwards, ASSAM, UPPER BURMA, Tong-king and South China.

Colour above, of the entire tail, and of the front and outside



Fig. 84.—The Yellow-bellied Weasel (*Mustela kathiah*). Copied from one of Hodgson's drawings. (From Blanford.)

of the limbs, except for some albino spots occasionally on the fore paws, earthy or deep chocolate-brown; the edge of the upper lip, the chin, and a little of the fore throat whitish, but

* G. M. Allen, in 1938, in his volume quoted above, ranked *kathiah* as a subspecies of *altaica* on the supposition that the two probably intergrade in colour in Szechwan. I am unable to accept that conclusion, which must have been reached presumably without examination of the skulls. Skulls of *altaica* from the Altai and Lake Baikal, and of the specimens from Ladakh and the Upper Sutlej, named *longstaffi* by Wroughton, have longer, more strongly inflated bullæ, with the anterio border transversely truncated and a shorter area between it and the glenoid joint for the mandible and the inflation involves the mastoid, shortening the distance between it and the occipital condyle and nearly concealing the foramen lacerum posticum. In skulls of *kathiah* the bulla is actually shorter in skulls with a longer condylobase, the anterior end is angular, with the area in front of it longer, the inflation is noticeably less, does not involve the mastoid, so that the distance between the swelling and the condyle is less and the foramen in question is fully exposed. The bacula of the two species are differently shaped, as shown by the figures (pp. 349 and 363).

the rest of the under side sulphur-yellow or ochreous, this tint extending on the inner side of the thighs and sometimes nearly reaching the hock of the hind leg, and on the fore leg sometimes stopping short just below the elbow, sometimes extending along the inner side, usually interruptedly, to the paw.

The tail is more than half, sometimes nearly two-thirds the length of the head and body, and fairly long-haired in winter. The pads of the feet are always uncovered at all seasons, the areas behind and in front of the plantar pad are

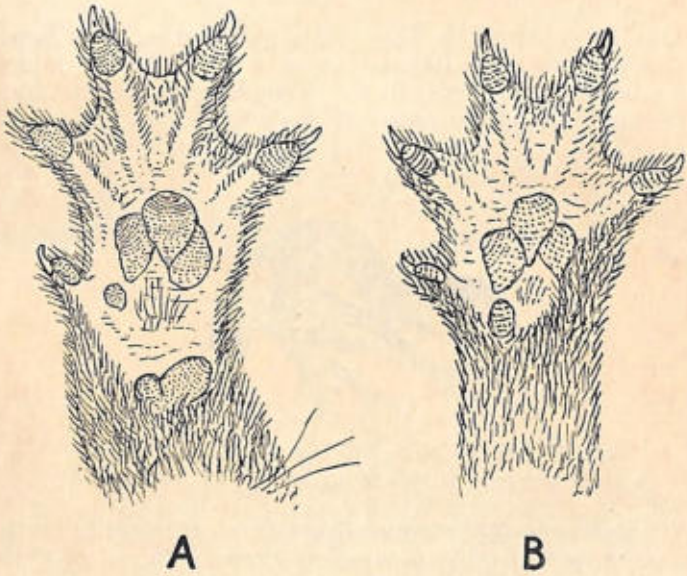


Fig. 85.

A. Lower side of left fore foot of the Yellow-bellied Weasel (*Mustela kathiah*), showing the mainly naked sole round the plantar pad and the sparsely hairy webs.
B. Lower side of left hind foot of the same.
(Drawn from a relaxed, undated, but no doubt summer skin sent by Hodgson from Nepal.)

normally and thickly covered with hair in the winter, but in summer the soles are nearly naked, there being merely a small patch of hair on the fore paw between the plantar and carpal pad and a few hairs towards the edge of the webs on both fore and hind feet (fig. 85, A, B, p. 358).

Mammæ two pairs only in a suckling ♀ from Darjeeling, July.

The baculum in a large ♂ from Chapa, Tong-king, is 30 mm. long, gradually attenuated from its thickened base, grooved throughout below, and with a groove on each side of the proximal half of the shaft; the distal third is upcurved, and on this portion the ventral groove is narrower, the end is hooked backwards and the simple condyle-like tip is curved over towards the right; although in its backwardly hooked tip this baculum resembles that of the common weasel and some other species of *Mustela*, its simple apex is more like that of *M. erminea* (fig. 81, C, D, p. 349).

Hodgson's Nepalese skins of this species vary from dark chocolate to rusty brown. These are probably seasonal differences, since one skin in moult exhibits the two tints in patches. In two skins from Mussoorie there is some white on the fore paws, mainly on the toes, but it differs in extent in the two and is not alike on the right and left sides of either. It suggests casual albinism. In the other specimens examined the paws are brown. Differences of tint above and below and the degree of extension of the pale hue on the inside of the fore and hind legs seem to be quite independent of geographical distribution.

Specimens examined came from the following localities :— Mussooree in Dehra Dun, 5,400 ft. (Hutton), Naini Tal in Kumaun, 5,700 ft. (Crump), Kachar in Nepal (Hodgson), Sikkim (Mandelli), Pashok, Darjeeling (Baptista), Bhutan (Pemberton), Sangrachu, 3,500 ft., and Mokokchung, 4,500 ft., in the Naga Hills (Mills); Nam Tamai, Upper Burma, 3,000–4,500 ft. (Kaulback); and, beyond the limits of British India, from Mongtze in Yunnan, 5,000 ft. (La Touche), Xien Quang Koo in Laos and Chapa in Tong-king, 5,000 ft. (Delacour and Lowe), Ching-Fung-Ling (Rickett), and Fokien (La Touche).

Very few of the British Indian specimens were measured in the flesh. I have therefore added to the following table the dimensions (in English inches) of some collected beyond our limits.

Locality and sex.	Head and body.	Tail.	Hind foot.
Kachar, Nepal (Hodgson); ♀	10	5	—
Naini Tal, Kumaun; ♂	9	6⅜	1⅜
Yunnan; ad. ♂	9⅜	7½	—
Laos; ad. ♂	10¼	—	1¾
Tong-king; ad. ♂	9⅜	6½	1½
Tong-king; ad. ♂	11½	7	1⅝
Naini Tal, Kumaun; ad. ♀	9	5⅜	1⅜
Pashok, Darjeeling; ad. ♀	8½	5½	1½

The specimen measured by Hodgson had an exceptionally short tail, only half the length of the head and body. In all the others the tail is relatively much longer. The discrepancy is no doubt due to methods of measurement.

The weight of the ♂ from Naini Tal was only 5½ oz.

The skull, of which the bulla was described in the footnote, p. 357 (see also fig. 83, G), has the zygomata arcuate in profile view as in *M. erminea ferghanæ*, and a similar abrupt, sub-angular constriction of the postorbital area in well developed adult specimens of both sexes. Also in such skulls there is a low sagittal crest and a pair of crests running from it to the angularly prominent postorbital processes. But it has the bullæ much less inflated than in *M. erminea ferghanæ*, and is relatively narrower, the mastoid processes only projecting slightly beyond the cranium in well-developed skulls, and generally concealed in dorsal view. Its actual length is a little greater, sex for sex, both the muzzle and the occipital area behind the root of the zygomata being more elongated (fig. 81, B, p. 349 ; and fig. 83, G, p. 355).

The largest ♂ skull, from Chapa, Tongking, has a condylo-basal length of 53 mm. Two from Laos and Yunnan were 49 and 48 respectively ; but the first Nepalese skull entered on the table, with an estimated length of 48 mm., would no doubt have surpassed 50 mm. when full grown, since it is immature and has its second set of teeth not fully erupted. A ♀ skull from Chapa, with all sutures on the base of the skull closed, is 43 mm., as in the Darjeeling skull.

Habits.—According to Hodgson's original account of this species in Nepal it was prized by the inhabitants for ridding houses of mice and rats, which soon vacated any house into which one of these readily tamed weasels was introduced, and the wealthy took advantage of its ferocity, courage, and agility to entertain themselves by pitting it against fowls, geese, and even goats and sheep, which it killed by severing the artery of the neck. Hodgson's description of the secretion of the anal glands as " a horrible, offensive, yellowish grey fluid " suggests that the odour is at least as nauseous as in the polecat and surpasses that of the common weasel and stoat in that respect. Crump reported the species as well known in Naini Tal, where, according to the natives, it has a wide range. Kaulback's specimens from Nam Tamai were collected in " dense hill jungle."

A specimen of this weasel from Baltoro in Karakoram, about 12,000 ft., was described as a new subspecies, *M. kathiah caporiaccoi*, by De Beaux (Atti Soc. Ligust. xiv. p. 65, 1935). It was distinguished from the typical form by being paler, more washed out above in colour, very like the weasel he identified as *M. alpina longstaffi* in tint. As recorded above, the typical form varies seasonally in tint ; but the palest specimen I have seen is not quite so pale as the darkest

Skull-measurements (in mm.) of *Mustela kathiah* and *M. strigidorsa*.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
M. kathiah.									
Nepal (Hodgson); yg. o	(48±)	25	21	13−	9	9	26	—	6−
Nepal (Hodgson); o	47	24	—	11	9	9	25	5	5+
Nepal (type); o	46	24	20	12	10−	—	—	5	—
Naini Tal, Kumaun; ad. ♂	(48±)	—	—	11	9	10	25½	5+	6
Sikkim; ad. ♂ ?	(45±)	26	21	10	10	10	28	5½	6
Naga Hills; ad. ♀	44	22	19	9	9	8	23½	4½	5
Darjeeling; ad. ♀	43	22½	19	10	9	8½	24	5−	4½
Mussooree; ad. ♀	42	24	18	8	8	8	23	4	5−
M. strigidorsa.									
Sikkim; ad. ♂	(65±)	35	—	15½	15	14	38	7	7
Naga Hills (Frost); ad. ♂	57	33	28	12½	15	12½	34	7	7

example of *M. altaica temon*. Until additional specimens come to hand from Karakoram and other northern districts of Kashmir the exact status of this weasel must remain *sub judice*.

79. **Mustela sibirica** Pallas.

Mustela sibirica, Pallas, Reise Prov. Russ. Reichs. II (Appendix), p. 701, 1773 ; id., Spic. Zool. xiv, p. 86, pl. 4, fig. 2, 1780 ; and of subsequent writers.

Locality of the *type*, Vorposten Tigerazkoi, near Usst-kamengorsk, W. Altai. (See text of the 'Reise,' p. 570.)

Distribution.—Central and Eastern Asia at least as far south as the HIMALAYAS, UPPER BURMA, and Java.

A large weasel with the tail a little over half the length of the head and body and about three times as long as the hind foot or more. The winter coat is typically long and full, with the tail also long-haired, but tapering. The general colour varies from bright golden or foxy red to deep chocolate-brown, but is tolerably uniform on the body and limbs, the lower side being only a little lighter than the upper, with no sharp line of demarcation along the flanks, and the limbs outside and inside are like the dorsal and ventral surfaces of the body, but the tail in some forms has a dark, contrasted tip ; the throat may be wholly reddish or brown, or whitish or white invaded in the middle with reddish blotches, and the head is more or less fuscous above, especially on the muzzle, but the muzzle almost always has at least the chin and the edge of the upper lip white and is sometimes wholly white above and laterally as far back as the eyes. The soles of the feet, apart from the pads, are thickly covered with hair at all seasons, and in British Indian races the hairs do not overlap and conceal the pads in winter (fig. 90, A, B, p. 374).

Mammæ four pairs *. Baculum distally inclined upwards and recurved at the tip as in the Polecat, Mink, Weasel, and some other species of *Mustela* (fig. 86, C, p. 363).

The skull is long and relatively narrow, with the muzzle nearly parallel-sided and the postorbital area long, also nearly parallel-sided, not abruptly constricted, the mastoids projecting, the zygomata not noticeably arcuate upwards, and the anterior border of the bullæ truncated (fig. 86, A, B, p. 363 ; and fig. 89, p. 373).

The colour of the typical race, according to Pallas, is more or less intensely fulvescent, inclining to red, all over, but with the muzzle black nearly to the eyes, except for the nose, part of the upper lip, and all the lower jaw, which are white.

* Verified on the skin of a suckling ♀ of *M. sibirica davidiana* from Amoy.

General Habits.—Next to nothing seems to have been reported about the habits of the British Indian races of this species, but so far as is known they do not apparently differ in any essential respects from those of the closely related Chinese races, of which a good account has been given by H. de C. Sowerby (China Journ. xx, pt. 1, p. 46, 1934), who wrote of them as

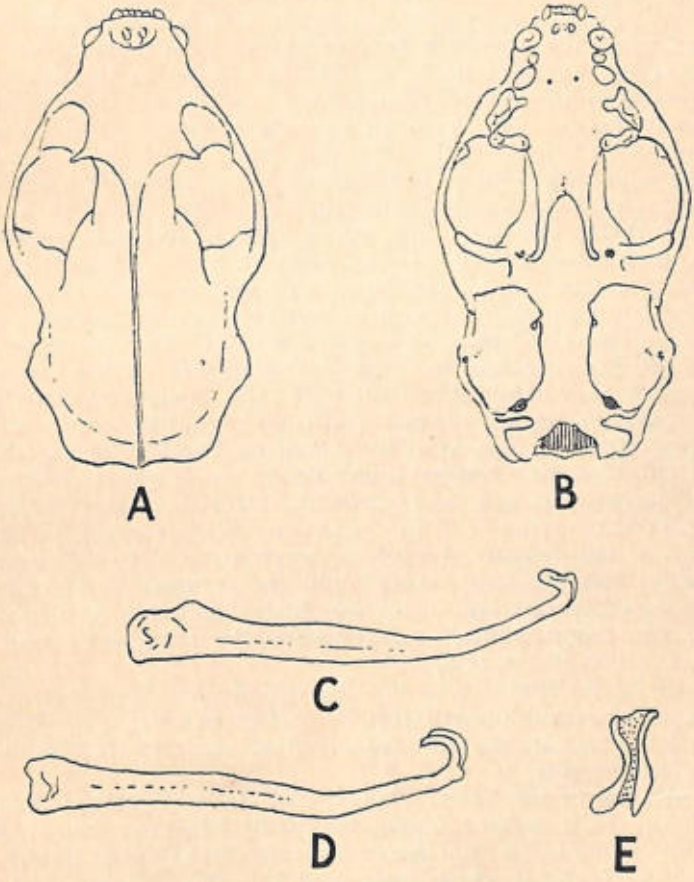


Fig. 86.

A. Upper side of ad. ♂ skull of *M. sibirica moupinensis* from Mogok, Upper Burma (Hampton).
B. Lower side of the same.
C. Baculum of typical *M. sibirica* from the right side (copied from a figure by Ognev).
D. Right side view of baculum of *M. altaica temon*, from the Tibetan frontier (Watson).
E. Anterior end of the same from the front.

the " Siberian Mink." According to him they occur in human dwellings in all parts of China, and are plentiful even in densely populated cities, where they frequent the drains and wage incessant warfare upon the equally plentiful rats and mice. Although beneficial as vermin-killers, they are a great pest to the owners of fowls and pigeons, invading their roosting places and killing far more of these birds than they can eat. They have, however, remarkable powers of adaptation to different environments. In the cities Sowerby has seen them in court-yards and crossing roads, and in the country in the densest forests, in low-lying swampy areas by rivers, and in dry sandy valleys. In the open they seem mostly to lie up in burrows made by other animals, even by badgers; but although they seem to hunt mainly by night they are by no means strictly nocturnal, since they were seen abroad by day. For their size they are strong and remarkably active. A single specimen will kill and carry off a fowl of the largest size; and as evidence of their activity may be cited Sowerby's story of a couple that secured and carried away a brace of wild duck he had nailed to a vertical wall 8 ft. from the ground, which they could only have reached by leaping. When caught in traps they exhibit the greatest ferocity, sometimes uttering ear-piercing screams of rage and usually emitting a powerful scent after the fashion of the American skunk. In the case of two that were trapped and killed at the mouth of a drain in Shensi, " it was days before the place was free from the penetrating smell " of the secretion. This account of the nature and defensive use of the secretion of the anal glands brings this handsome weasel into the category of specially protected species, and leaves very little doubt that its characteristic bright reddish colour serves the purpose of ready recognition and warning.

Of its breeding habits nothing definite has been recorded beyond Sowerby's belief, from the capture of a young specimen in late summer, that the litter is born early in that season or in the spring.

Writing of the South Chinese race *M. s. davidiana*, Ping (Journ. Roy. As. Soc. China, lxii, p. 80, 1931) says that it is found in old houses and deserted gardens in the city of Nankin, and that its fur is greatly in demand for making " brush-pens," as is also the case with the other races found elsewhere in China, according to Sowerby. This same race was described by Ho (Contr. Biol. Lab. Sci. Soc. China, x, p. 258, 1934) as very common in S. China, where it lives amongst rocks or in hollow trees and old walls, frequently killing fowls by sucking their blood, and feeding generally upon reptiles, birds and their eggs, and small mammals.

Key to the British Indian Subspecies of Mustela sibirica.

a. Summit of muzzle dark above, at most a little white below the rhinarium; tip of the tail darker than the rest and contrasted, especially in the pale phase.

b. Very little, if any, white below the rhinarium; scarcely any contrast between the upper and under sides of the body; colour brighter on the average in the pale phase ..... [Hodgs., p. 365. *subhemachalana*

b'. More white below the rhinarium and a greater contrast between the upper and under sides; colour duller in the pale phase ..... [Edw., p. 367. *moupinensis* M.-

a'. Summit of muzzle white and broadly continuous with the extensively white area below the rhinarium; tip of the tail the same tint as the rest.

c. White of muzzle not reaching the eyes, which are encircled with fuscous or at least have a fuscous patch in front of them ..... [p. 374. *hodgsoni* Gray,

c'. White of muzzle extending back to the eyes, which have no fuscous in front of them ... [p. 372. *canigula* Hodgs.,

In 1863 Blyth cited the Himalayas and Tibet as possible localities of *M. sibirica*, and Gray, in 1865 and 1869, either copied him or came independently to the same opinion. This view, however, was rejected by Blanford, who apparently entirely failed to detect the close kinship between *M. sibirica* and some of the Himalayan weasels he knew. This kinship has been subsequently perceived by several authors; and I assign to that species the four British Indian races enumerated above in the analytical key.

Two of these races differ profoundly in colour individually both with age and season, the differences being at least as great as those used to distinguish many of the described races found farther to the north in central and eastern Asia.

79 *a*. **Mustela sibirica subhemachalana** Hodgson.

Mustela (*Putorius*) *subhemachalanus*, Hodgson, Journ. As. Soc. Beng. iv, p. 563, 1837; id., *op. cit.* xi, p. 280, 1842; Blanford, Mamm. Brit. Ind. p. 166, 1888 (*Putorius*); and of subsequent authors.

Mustela humeralis, Blyth, Journ. As. Soc. Beng. xi, p. 99 and p. 280 (footnote), 1842.

Mustela horsfieldii, Gray, Ann. Mag. Nat. Hist. xi, p. 118, 1843 *.

* Blyth's type of *humeralis* from Darjeeling, described as reddish-brown, was distinguished by having the shoulders and the sides of the neck densely mottled with white. This variation was compared by Blyth to the winter whitening of the ermine. But this seems hardly likely, since *M. sibirica* does not turn white in winter even in northern latitudes. Gray's type of *horsfieldii* is a specimen intermediate in colour between the brightest and darkest specimens of the typical form.

Vernacular.—Sing King (Lepcha in Sikkim).

Locality of *type* of *subhemachalana*, Nepal; of *humeralis*, Sikkim; of *horsfieldi*, Bhutan.

Distribution.—NEPAL, SIKKIM, BHUTAN, from 5,000 to 16,000 ft. alt.

Distinguished from typical *sibirica* by its smaller size, blackish tail-tip, and by the absence of the white patch on each side of the muzzle, which is wholly blackish except for the narrow white line on the edge of the upper lip and the white chin (fig. 87, A, p. 368).

The general colour is individually variable from bright foxy red to dark chocolate, with no appreciable reddish tinge, the under side being a little paler, but its tint blends on the flanks with that of the back. There is sometimes a conspicuous white patch near the middle of the throat, but this is always separated from the white of the chin and interramal area. The tail has a blackish tip, very conspicuous in pale skins, obscure in dark skins.

The individual variation in the colour of this weasel, originally indicated by Hodgson, is remarkable. As an instance may be cited two skins collected by Major Waddell in October in Sikkim, a bright ochreous-red ♂ at ? Dlome Sandu, 16,000 ft., and a deep chocolate ♀ at Chomnaga, 14,000 ft. As bright as the first of these are a ♂ collected by Crump in April at Gorkha, Nepal, and an unsexed, undated specimen from Bhutan (Pemberton). Other specimens illustrating intermediate shades came from Nepal (Hodgson) and Sikkim, precise localities in the latter district being Lachen, 12,000 ft. (Waddell), September, and the Chola Valley, 13,000 ft. (Elwes). Skins were also procured by Crump in Sikkim at 5,000 to 8,000 ft. A particularly interesting skin of a ♂ from Lachen, Sikkim, 10,000 ft. (Crump), December, is mottled with large blotches of paler tawny-brown and deep chocolate. It is in moult, the dark new coat replacing the paler faded old coat and attesting considerable seasonal differences in the brown phase.

Most of the skins are unmeasured and unsexed; but three adult ♂♂ are bright reddish and the brown ♂ changing coat is not quite fully developed judging from the skull. Apart from the deep chocolate-brown ♀ from Sikkim, there is a ♀ skin from Nepal (Hodgson) which is reddish-brown. From the evidence of all the skins it appears that the young at all events are brown; but whether the adults of both sexes are always bright and foxy there is not sufficient material to show. Probably the variation in colour is also seasonal, judging from the evidence supplied by the available skins of the next, closely allied race.

Flesh-measurements (in English inches) of only three ♂ examples are available :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Lachen, Sikkim ; ad. ♂	11⅝	6½	2
Lachen, Sikkim ; ad. ♂	10½	6	2–
Gorkha, Nepal ; ad. ♂	11½	6½	2

Hodgson's largest and smallest were: head and body 15½ and 10½ in., tail 6 and 4 in. respectively, and the same dimensions of the type of *humeralis* were 12 and 5 in. These were no doubt taken from dried skins, with the tail not measured by modern methods. Hodgson's largest must have been considerably stretched.

79 *b*. **Mustela sibirica moupinensis** (M.-Edwards).

Putorius moupinensis, Milne-Edwards, Rech. Mamm. p. 347, pls. 59, fig. 2, and 60, fig. 4, 1868–1874.

Lutreola sibirica moupinensis, Thomas, Ann. Mag. Nat. Hist. (9) x, p. 395, 1922.

Mustela sibirica moupinensis, G. M. Allen, Amer. Mus. Novit. no. 358, p. 4, 1929 ; Osgood, Field Mus. Nat. Hist., Zool. xviii, p. 261, 1932 ; G. M. Allen, Mamm. China and Mongol. p. 375, 1938.

Mustela hamptoni, Thomas, Journ. Bomb. Nat. Hist. Soc. xxvii, p. 500, 1921 *.

Locality of *type* of *moupinensis*, Moupin in Szechwan ; of *hamptoni*, Mt. Imaw Bum in Kachin, 9,000 ft.

Distribution.—Shensi, Kansu, Moupin, Szechwan, Yunnan, and Upper Burma.

Resembling *subhemachalana* in having a black tip to the tail, but distinguished on the average by the muzzle having a little more white in front on each side of the rhinarium (fig. 87, B, p. 368), by the generally rather duller colour of the dorsal surface, and by the paler under side being more strongly contrasted with the upper, although blending with it. The skull also is apparently larger.

The colour varies, as in *subhemachalana*, from very deep chocolate-brown, exhibited by a ♀ skin from the Adung Valley, Upper Burma, lat. 28° 10′ N., long. 97° 45′ E., on the confines of Tibet, 6,000 ft. (Kingdon Ward), November, to tawny-

* This race resembles typical *sibirica* in the white patch on each side of the muzzle, but is smaller, less full in the coat, seldom so bright above, paler below, and has a blackish tail-tip. When Thomas described *hamptoni* he compared it with *subhemachalana*, distinguishing it specifically by the larger skull; but later, when he identified some skins from Yunnan as *moupinensis*, he remarked that *hamptoni* would have been better compared with *moupinensis*. He did not point out any differences between them, and there is no doubt they are identical as G. M. Allen and Osgood suggested. Allen added to the synonymy of this race *Lutreola major* and *tafeli*, given by Hilzheimer (Zool. Anz. xxxv, p. 310, 1910), to two seasonally differing trade skins picked up at Sungpan in Szechwan.

yellowish or pale rusty-brown as in the type of *hamptoni*, an ad. ♂ from the left flank of Imaw Bum in Kachin, lat. 26° 10′ N., long. 98° 30′ E., 9,000 ft. (Kingdon Ward), October; a little duller and paler than that type is an ad. ♂ from Mogok, Upper Burma, 4,400 ft. (Hampton), June, which, in accordance with the season, is shorter-coated and somewhat faded, especially the tail-tip, which is hardly perceptibly brownish. Slightly brighter than the type of *hamptoni* is an ad. ♂ skin

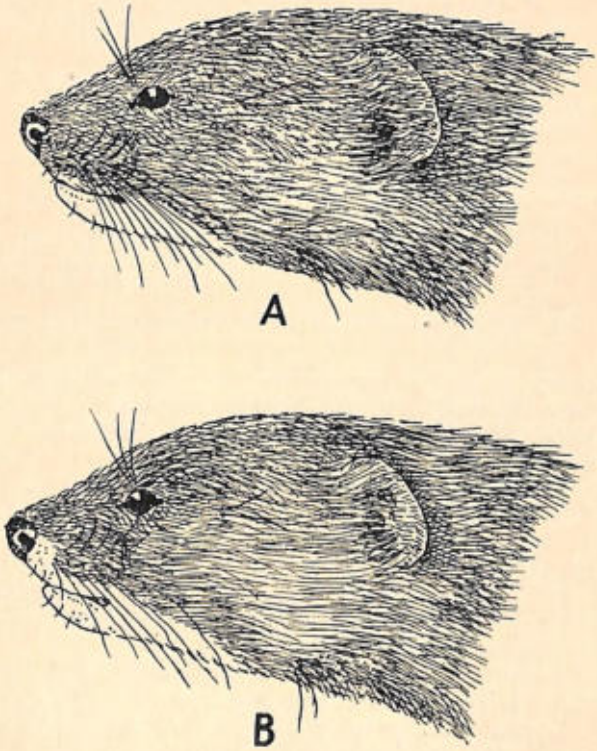


Fig. 87.

A. Side view of head of *Mustela sibirica subhemachalana* from Sikkim, with the white on the muzzle restricted to the side of the upper lip and the chin.
B. The same of *M. sibirica moupinensis*, with the white on the muzzle extending up on each side of the rhinarium.

from the Salween–Irrawaddy divide, Upper Burma (Lowis). Also very like the type of *hamptoni*, but a trifle brighter, is a skin from the Taron Valley, Upper Burma, 3,500 ft., September 30 (R. Kaulback). The handsomest of all the specimens

I have seen is one, also collected by R. Kaulback, from Diphuk La, Upper Burma, 13,500 ft., on May 25. It still carries its full winter coat, and is bright yellowish-red all over, as bright as in the brightest skins of *subhemachalana*, and showing very little contrast between the upper and under sides. It merely differs from some Sikkim skins of *subhemachalana* in having a trifle more white below the rhinarium. From the dates on some of the skins above mentioned it seems that this weasel is much duller and tawnier in hue in the summer and autumn than in late spring before the winter coat is shed.

These are the only available British Indian skins. Of skins outside our faunistic limits one of the most interesting came from the extreme S.E. of Tibet, lat. 28° 25′ N., long. 97° 15′ E., 11,000–12,000 ft. (Kingdon Ward). It is a native prepared skin in moult, and is like the Mogok skin all along the dorsal surface but has the longer-haired flanks much paler, pale fawn or buffy, and the under side buffy white. In having very little white on the muzzle it intergrades with *subhemachalana*. Other specimens I assign to this race which differ similarly to the Upper Burmese skins came from the Lichiang Range, Yunnan, 11,000 to 14,000 ft., October, November, and from the Mekong Valley, N.W. Yunnan, lat. 28° N., 7,000 ft., August (Forrest). There are also two immature skins, with short, tapering tails, labelled Aluntse in Szechwan, lat. 28° 28′ N., long. 99° 6′ E. (Kingdon Ward), which probably represent this race.

Only two of the three Upper Burmese specimens were measured in the flesh. For comparison the measurements (in English inches) of two from Yunnan are also entered :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Kachin (*hamptoni* type); ad. ♂	12	6¾	2
Adung Valley; youngish ♀	10½	6	1½
Mekong Valley, Yunnan; ♂	11½	6½	2—
Lichiang Range, Yunnan; ♀	11	5⅝	1⅝

According to M.-Edwards his type, measured over the curves, was 13⅜ in. from nose-tip to the root of the tail. This was probably taken from the stretched and mounted skin; but the tail must have been greatly stretched to reach 9⅛ in., even if the hairs at the tip were included.

Of the skins above discussed two are of interest as connecting *moupinensis* with the race from South-eastern China described by M.-Edwards as *davidiana*. This race, as G. M. Allen states, typically differs from *moupinensis* by having the tail uniformly coloured, without a noticeably darker tip, and the hue of the reddish winter coat brighter. But Kaulback's skin of *moupinensis* from Diphuk La is as bright, and Hampton's skin from Mogok has scarcely a trace of the dark tail-tip.

I agree with Allen that the skin described as *Putorius sibiricus noctis* from San-yen-tze * by Barrett Hamilton (Ann. Mag. Nat. Hist. (7) xiii. p. 390) is the same as *davidiana*, and I cannot distinguish from the latter the type of *Mustela* (*Lutreola*) *taivana* from Mt. Arizan, Formosa, 8,000 ft., described by Thomas (Ann. Mag. Nat. Hist. (8) xii. p. 91, 1913), who apparently did not detect its close likeness to the type of *noctis*. Its skull, that of a young adult ♂, had a condylobasal length of 58·7 mm.

An outlying representative of this species, which in spite of its geographical isolation I regard as a subspecies of *sibirica*, is the form from Tjibodas in Java, 5,500 ft., described as *Mustela lutreolina* by Thomas and Robinson (Ann. Mag. Nat. Hist. (8), xx, p. 261, 1917). The skin is in summer pelage, and merely differs from skins of *moupinensis* killed in that season by its rather blacker brown hue, with still darker tail-tip, and its shorter sleeker coat.

The only adult skulls of *moupinensis* available are those of the two ♂ examples assigned by Thomas to *hamptoni* and of a ♂ subsequently received from Kaulback. The skull of the type of this race, figured by M.-Edwards, was unsexed. It had probably reached its full length, but was not an old skull nor probably finally moulded, since the postorbital area is 2 mm. wider posteriorly than immediately behind the postorbital processes. Its cited measurements must be taken with reserve, since they are derived from the figures, said to be drawn natural size. Since its condylobasal length is the same as that of a considerably younger ♂ from the Mekong Valley, it may be a ♀ skull. The Mekong Valley skull has no trace of sagittal crest or of the divergent crests on the frontal which are shown in Milne-Edwards's figure of the type-skull. Of the two skulls assigned to *hamptoni*, the one from Mogok has a narrow parallel-sided postorbital area and stong crests. In the type, on the other hand, the postorbital area is pathologically inflated owing to infection by the Nematode parasite, to which the frontal bones of weasels are notoriously liable. Perhaps partly as a result of this the crests are not appreciably developed. The skull from Diphuk La is normal but small.

These three skulls are smaller on the average than those from Szechwan measured by G. M. Allen, in which the condylobasal length ranges from 61½ to 63½ mm. If further material from Upper Burma confirms this conclusion there will be reasons for considering the admission of *hamptoni* as a distinguishable race; but on the available evidence that does not seem to be advisable.

* According to the label this skin came from Ichang (Styan). Allen states that it was from Fukien. But the only locality resembling the one cited by Barrett Hamilton that I can find is spelt Shanyangshih, and is in Kiangsi, south of Lake Poyangku. [There is a Sungyang-hsien in Fukien.—Editor].

Skull-measurements (in mm.) of three British Indian races of *Mustela sibirica*.

Name, locality, and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m_1.
M. s. moupinensis.								
Kachin (type of *hamptoni*) ; ♂	61	30	14	12	12	35	6½	7
Mogok, Upper Burma ; ad. ♂	60	33	10	11½	13	35	7	7
Diphuk La, Upper Burma ; ad. ♂	56	29	13	11	11	—	6	6
Moupin (type of *moupinensis*) ; ? yg. ad. ♀	57	22½	13	12½	11½	30	6	7
M. s. subhemachalana.								
Lachen, Sikkim ; ad. ♂	55	27	11	11	10½	—	6	—
Lachen, Sikkim ; ad. ♂	53	26	12	11	10½	30	—	6
Gorkha, Nepal ; ad. ♂	54	28	13	11½	11	30	6	6½
Nepal ; yg. ad. ♀	43	24½	12	—	9	26	6	6
M. s. hodgsoni.								
Sanch Pangi, Kashmir ; ad. ♂	56	30	12	11	10½	30	6	6½
Gugga Nullah, Kashmir ; ad. ♂	54	29	11	11	11	30	6	7
Bara Tissa, Chamba ; ad. ♂	53	27	11	11	10½	29	5	6
Kaigerskote, Kashmir ; ad. ♀	53½	26	13	12	—	30	6	6½
Garhwal ; ad. o	51	27	12	11½	10	28	6—	6
Gugga Nullah, Kashmir ; yg. ad. ♀	49	24½	10	9½	9—	26	5½	6

Habits.—The general habits of this race are probably very similar to those recorded above by Sowerby of the more northern Chinese races. The following information about individual specimens is contained on the collector's labels. In the Mekong Valley lat. 28° N., at 7,000, ft., Forrest secured one "in the open," another "amongst scrub," and on the western flank of the Lichiang Range, at 12,000 ft., one was trapped in a "conifer forest." The type of *hamptoni* was taken by Kingdon Ward in the "open valley" at Imaw Bum; Kaulback's specimen from the Taron Valley was living in "dense hill jungle" and the one from Diphuk La in "snow-covered rhododendron scrub."

79 *c*. **Mustela sibirica canigula** Hodgson.

Mustela canigula, Hodgson, Journ. As. Soc. Beng. xi, p. 279; 1842.
Putorius canigula, Blanford, Mamm. Brit. Ind. p. 167, 1888; and of other authors (in part).

Locality of *type*, Lhasa in Tibet.
Distribution (according to Hodgson).—Tibet and Nepal.

Distinguished from the previously described races of *sibirica* by the colour of the face, the muzzle being white all round as far back as the eyes, which are not encircled with brown; the throat also is more extensively white, this tint being continued uninterruptedly from the chin and upper lip almost to the fore limbs (fig. 88, B, p. 373).

The coat is thick, the tail bushy, and the general hue of the upper side rather bright foxy-red, the under side of the body being paler; the tail is the same foxy-red throughout, with no trace of a dark tip.

This description is taken from the type-specimen, which is subadult by the skull, unsexed and undated. Its measurements, according to Hodgson, were: head and body 15½, tail 7½ in., but, as Blanford observed, the first dimension is untrustworthy since it was taken from a skin. The made-up skin does not suggest that the animal was larger than examples of the next race regarded by Blanford and others as identical with *canigula*.

I have entered this race as a constituent of the fauna of British India on the authority of Hodgson, who included it in the fauna of Nepal, adding that it is "common in Tibet, rarer in the Himalayas." This suggests that he saw several specimens, and he described the young as duller in hue and much less hoary, *i.e.*, white about the head. The only available example is the type above described. Hodgson may have been acquainted with examples of the next race and included them under *canigula*. At all events, the Himalayan specimens

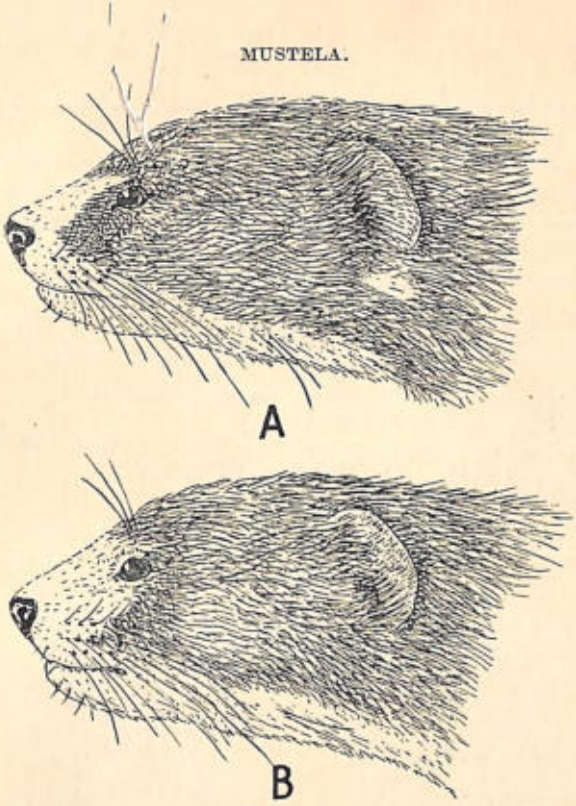


Fig. 88.

A. Side view of head of *Mustela sibirica hodgsoni* from Gugga Nullah, Kashmir (H. Dunn), showing the extension of the white on the muzzle over its summit, but not reaching the eye.
B. Side view of the head of the type of *M. sibirica canigula* from Lhasa, Tibet, showing the extension of the white on the muzzle over its side and above and below the eye.

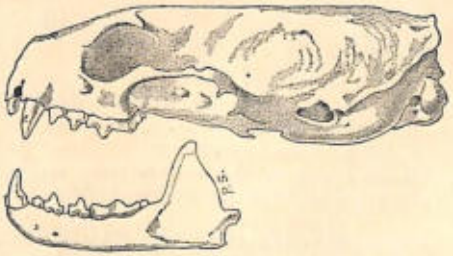


Fig. 89.—Side view of skull of *Mustela sibirica hodgsoni*, from unstated locality, showing the shape characteristic of *Mustela sibirica*, of which the upper and lower views are shown in fig. 86, A, B, p. 363. Nat. size. (From Blanford as *Putorius canigula*.)

identified by Blanford, Wroughton, and others as *canigula* belong to the next race.

The skull of the type is fragmentary, but such measurements of parts of it as can be taken agree closely with those of the next race, *hodgsoni*, entered on the table (p. 371).

79 *d*. **Mustela sibirica hodgsoni** Gray.

Mustela hodgsoni, Gray, Ann. Mag. Nat. Hist. xi, p. 118, 1843.
Putorius canigula, Blanford, Mamm. Brit. Ind. p. 167, 1888; and of other authors (not *Mustela canigula* Hodgson).

Vernacular.—*Bash Noogh* in Kashmir (Dunn).

Locality of *type*, "Himalayas."

Distribution.—Kashmir and the western Himalayas from Chamba to Garhwal at 7,000 to 9,000 ft. alt.

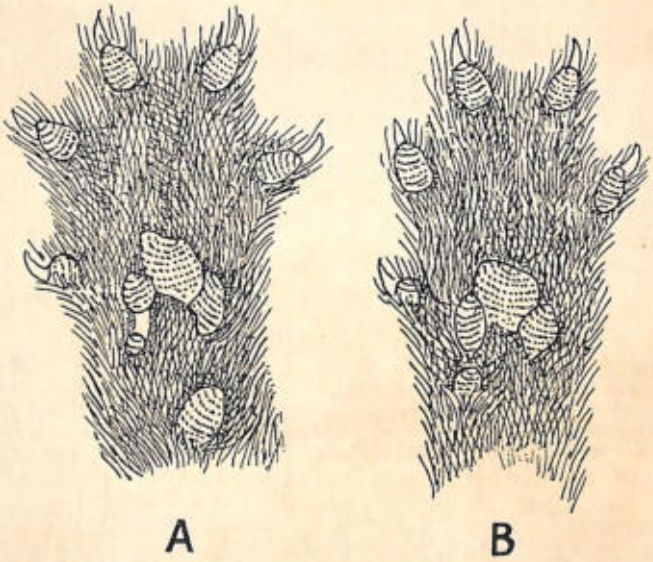


Fig. 90.

A. Lower side of left fore foot of *Mustela sibirica hodgsoni*, from Badarwa, Kashmir, 8000 ft. (Nat. size.)
B. Lower side of left hind foot of the same.
These figures illustrate the hairiness of the soles and the general form of the pads characteristic of British Indian races of *Mustela sibirica*.

Distinguished from *canigula* by the smaller amount of white on the muzzle, the dark hue of the head extending all round the eye and to a considerable distance half-way along the muzzle in front of it laterally; also, at least on the average, in the colouring of the throat, the white of the interramal area being

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Back-striped Weasel (*Mustela strigidorsa*).



Hodgson's Weasel (*Mustela sibirica hodgsoni*).

to a varying extent separated from that of the hind throat by foxy-red spots or patches extending from the side-neck behind the ear. From typical *sibirica* and all the other known races of that species, except *canigula*, *hodgsoni* differs by the greater amount of white on the summit of the muzzle. This forms behind the rhinarium a broad band which, as in *canigula*, bifurcates on each side in front of the eyes. In some northern skins of *sibirica* the rhinarium is at most encircled above by a narrow streak of white (fig. 88, A, p. 373).

The variation in general hue is less marked than in *subhemachalana* and *moupinensis* and calls for no special remark. Adults of both sexes may be quite as bright as *subhemachalana*, perhaps a little brighter, ranging from bright ochreous to foxy-red and rufous-brown, younger specimens being deeper brown.

Specimens examined came from the following localities in Kashmir :—Badarwa, 8,000 ft. (C. H. Donald), Punlodi Chumba and Sauch Pangi, 8,000 ft. (Kinloch) ; Kaigerskote, 7,000 ft., and Lungnye, 6,800 ft., (A. E. Ward) ; Astwaloo Nullah, 8,000 ft., and Gugga Nullah, 8,900 ft. (Major Dunn). Other localities are Bara Tissa, Chamba, 7,000 ft. (Wells), Dharmsala (Theobald), the Koli State, 7,000 ft., and Simla (A. E. Jones). A specimen was seen by Lydekker in the Chenab Valley.

The following are the dimensions (in English inches) of some flesh-measured skins :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Gugga Nullah, Kashmir ; ad. ♂	12+	7½	2+
Bara Tissa, Chamba ; ad. ♂	11¾	7	2
Kaigerskote, Kashmir ; ad. ♀.....	11¾	7	2

The weight of the specimen from Chamba was 9½ oz.

These measurements agree very closely with those of *sub hemachalana* and *moupinensis*, although the skull is a little smaller apparently than that of *moupinensis*. The example from Kaigerskote, of which the skull-measurements are also given in the preceding table, is marked ♀, but possibly by error, since it is as large to all intents and purposes as ad. ♂ specimens. The unsexed skull from Garhwal (Osmaston) has no skin, but was identified as *canigula* by the collector, and there is no reason to doubt that it belongs to *hodgsoni*.

Habits.—Blanford had no information to quote on the habits of this weasel ; but Col. A. E. Ward (Journ. Bomb. Nat. Hist. Soc. xxxiii, pt. 1, p. 67, 1928), who identified it as *subhemachalana*, said he had seen scores in various parts of Kashmir and that a pair bred regularly under the hut he occupied in the summer. According to Major Dunn's labels it frequents

native houses in winter and preys upon fowls. His specimen from the Gugga Nullah was shot near the river in May; and Wells's specimen from Chamba was killed amongst the rocks on the bank of the Bara River.

80. **Mustela strigidorsa** Gray. The Back-striped Weasel.

Mustela strigodorsa (Hodgson MS.), Gray, Proc. Zool. Soc. 1853, p. 191 *.
Mustela strigidorsa (Hodgson), Horsfield, Ann. Mag. Nat. Hist. xvi, p. 107, 1855; id., Proc. Zool. Soc. 1856, p. 398, pl. 49.
Gymnopus strigidorsus, Gray, Proc. Zool. Soc. 1865, p. 119; id., Cat. Carn. etc. p. 97, 1869.
Putorius strigidorsus, Blanford, Mamm. Brit. Ind. p. 170, 1888.
Mustela strigidorsa of recent authors on the Oriental Mammals.

Locality of the *type*, Sikkim.

Distribution.—Nepal, Sikkim, Assam, Upper Burma up to 7,000 ft., Arakan, Tenasserim, and Indo-China.

Distinguished from all the other species of *Mustela* by the presence of a narrow silvery dorsal streak extending from the occiput almost to the root of the tail, and of a corresponding yellowish ventral streak from the chest along the abdomen.

The largest of the British Indian species with the tail bushy and between one-third and one-half the length of the head and body. The general colour above varies from deep to paler chocolate-brown, sometimes a little paler on the head and usually slightly darkened alongside the dorsal streak, which in moulting skins may be ill-defined. Tail and limbs the same hue as the back. The upper lip from the rhinarium and the chin and the throat up to the level of the ears pale, varying from whitish to ochreous. On the hind throat and fore chest the pale hue gradually narrows in extent and is quite narrow between the fore legs, where it passes into the ventral streak which expands on the inguinal region between the thighs. The coat has a moderate amount of wool; the contour-hairs on the back vary seasonally from about 11 to 20 mm. and on the tail from 20 to 25 mm. The pads of the feet are well developed, the plantar pads being four-lobed, with the area round them entirely naked; on the fore leg the hair extends down to the pair of well-defined carpal pads and on the hind leg to the hallucal lobe of the plantar pad, leaving a naked area behind the three main lobes of the latter.

Mammæ not determinable; but I suspect there are only

* Although it is customary to adopt names as originally spelt, unless obviously misprinted, it is generally agreed that *strigodorsa* comes into the latter category owing to Gray's apparently tacit admission of the fact by his acceptance in 1865 of Horsfield's spelling of Hodgson's MS. name. This species is so unmistakable that it has no synonymy.

two pairs, as in *M. kathiah*, since I can only find two pairs in *M. nudipes*, an apparently related species.

The only flesh-measurements with which I am acquainted are the following, recorded by Osgood (Field Mus. Nat. Hist. Zool. xviii, p. 261, 1932) :—Phong Saly, Laos ; ad. ♀ ; head and body $11\frac{3}{8}$; tail 6 ; hind foot 2 in.

Specimens examined came from Nepal (Hodgson), Sikkim (Mandelli), Nam Tamai, and some nearby localities in Upper Burma, from 3,000 to 6,000 ft. (P. M. Leonard, Lord Cranbrook, and R. Kaulback) ; Putao, Upper Burma ; the Chin

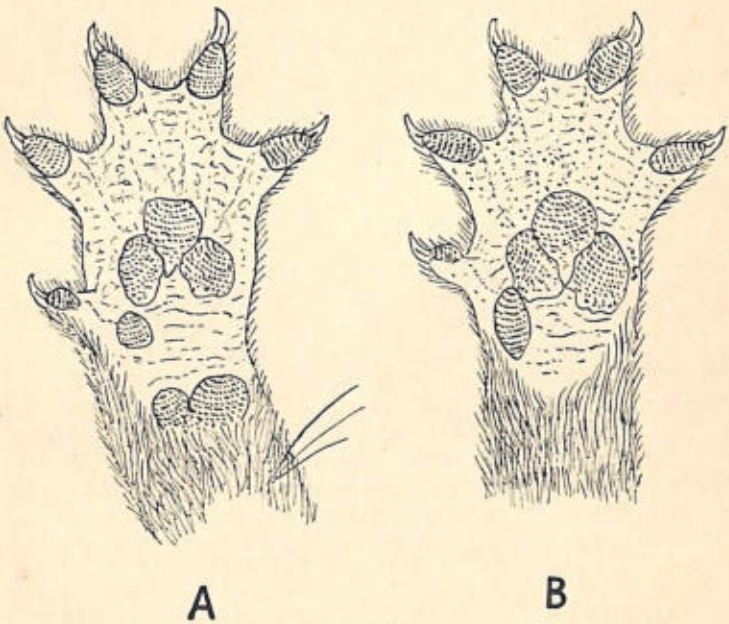


Fig. 91.

A. Lower side of left fore foot of *Mustela strigidorsa*, showing the naked soles.

B. Lower side of left hind foot of the same.

Hills, 60 miles west of Kindat, 7,000 ft. (J. M. D. Mackenzie) ; Paletwa in Arakan (W. S. Thom). The species was recorded from Thagata, Tenasserim, its most southern locality known, by Thomas in 1892.

A series of six skins collected by Kaulback in or near Nam Tamai illustrates the individual variation in colour in practically the same district. In one from Nam Tamai itself, 4000 ft., June, the throat is rich orange and the dorsal streak very faint ; in another from Gam Majaw, 4,000 ft., April, the throat is cream-yellow and the dorsal stripe is strongly

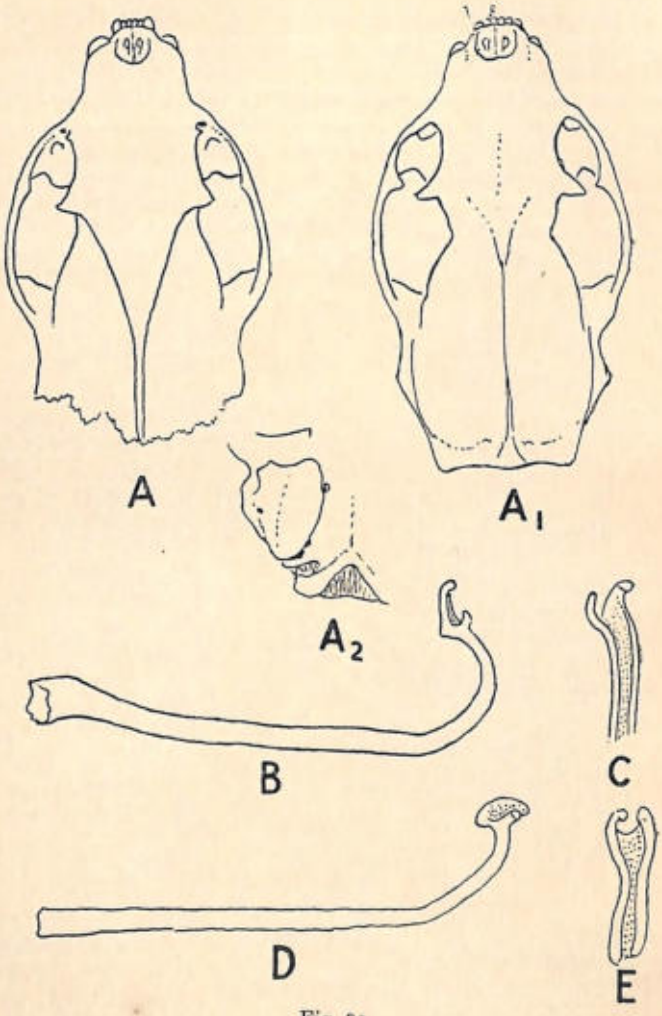


Fig. 92.

A. Upper side of skull of type of *Mustela strigidorsa*, ♂, from Sikkim (Hodgson).
A_1. The same of adult ♂ from the Naga Hills (Frost).
A_2. Right bulla of the same from below.
B. Baculum of the same from the right side, from Mogok, Upper Burma.
C. Anterior end of the same baculum from the front.
D. Baculum of *Mustela nudipes* from the right side, from Fort de Koek, Sumatra (Jacobson).
E. Anterior end of the same from the front.

pronounced, especially over the shoulders. The stripe is more strongly pronounced in the winter than in the summer coat.

The baculum differs from that of the other British Indian species in the strong upward and backward curvature of its distal half, resembling in this respect that of the yellow-throated marten, and in the subdivision of its tip into two erect processes, of which the left is large, sublaminate, and hooked forwards at the tip, and the right about half the height, slender, cylindrical, and incurved at the tip.

This species forms, in my opinion, a natural group with *M. nudipes*, which ranges from the Malay Peninsula to Borneo and is distinguished from *strigidorsa* by its white head and uniformly brightish red colour elsewhere. But the two are alike in the complete nakedness of the feet at all seasons and in having the tip of the baculum divided into a right and left process, one on each side of the groove. But in other respects the tip of this bone differs considerably in the two species, that of *nudipes* being hammer-shaped, and the shaft in this species is not strongly curved upwards in its distal half *.

All the available skulls of this species are mostly fragmentary. The most complete is that of the adult ♂ collected by Mandelli in Sikkim, of which the principal dimensions are entered in the table (p. 361), the condylobasal length being merely estimated. It shows no trace of sutures and is probably fully developed. In size it surpasses the skulls of the British Indian races of *M. sibirica*; but although it apparently equals in length the average of the larger races of that species, and has similar small spiniform postorbital processes, the postorbital area is not parallel-sided, its margins diverging from before backwards as in immature skulls of that species, and there is no trace of sagittal crest or of divergent crests on the frontals.

Habits.—Very little has been recorded of the habits of this comparatively rare species, but a story told by J. H. Hutton (Journ. Bomb. Nat. Hist. Soc. xxviii, p. 795, 1922) suggests that they differ in no respects from those of other species. At Kohima in the Naga Hills, 5,000 ft., when driving his car. he pulled up to avoid running over one of these weasels and a large rat (bandicoot) which were struggling in the middle of the road and took not the slightest notice of his approach, despite the noise he made. The weasel was holding like a bull terrier on to the nose of the rat, which must have been three times its weight, and was trying to pull it down, and the two rolled

* Gray made *nudipes* the type of a special genus *Gymnopus*. For this name, which was preoccupied, I proposed *Plesiogale*, which is as much, or as little, worth acceptance as the other subdivisions of *Mustela* (Proc. Zool. Soc. 1921, pp. 805 & 818).

over and over together in the road till the rat recovered its feet, when the tugging began afresh. The struggling combatants drifted across the road to the gutter, and when Mr. Hutton descended and stood close over them to get a better view the weasel took fright and bolted, but the rat, obviously nearly done for, was too exhausted to run away.

Kaulback's specimens from Upper Burma were killed in "dense hill jungle."

Genus **PUTORIUS** Cuvier.

Polecats.

Putorius, Cuvier, Règne Anim. i, p. 147, 1817; Miller, Cat. Mamm. West. Europe, p. 118, 1912 (as subgenus of *Mustela*).

Type of the genus, *Mustela putorius* Linn.

Distribution.—From Western Europe and N.W. Africa eastward through Central Asia into N. America.

The essential distinguishing characters of this genus are given above (p. 345) and need not be repeated. It may be added, however, that all the Old World forms of *Putorius* further differ from *Mustela* by having the chest and hind throat black as well as the legs and contrasted with the back. Another peculiarity of the coloration, unknown in the Old World species of *Mustela*, is the pattern of the head constituting the so-called "mask," the area surrounding the eyes and over the muzzle; this is emphasized in front by the white of the side of the muzzle, the lips and chin, and behind by a conspicuous pale patch in front of the ear, which typically passes over the forehead behind the eyes and may join the white of the fore throat below. This pattern is supplemented in the Old World species by the whiteness of the greater part of the ear, which is thrown into relief by a blackish patch in front of it and by the dark hue of the hair of the neck behind. The soles of the feet are hairy like those of *Mustela sibirica*.

This striking head-pattern, in conjunction with the display of the whitish or buff underhair of the back when the black-tipped contour-hairs are erected, make the Polecat particularly conspicuous, and no doubt have a warning significance like the familiar coloration of the Skunk and Zorilla, which the Polecat resembles in discharging in self-defence the nauseous secretion of the anal glands.

Until recently the Polecats of the Old World, with the possible exception of the Tibetan Polecat, described below, were considered to be represented by two well-marked species—the typical European form (*Putorius putorius*), which is darker in colour and has the postorbital area of the skull long, broad, and nearly parallel-sided, and the Central Asiatic form

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Tibetan Polecat (*Putorius putorius larvatus*). From Ladakh.



Marbled Polecat (*Vormela peregusna alpherakyi*). From Quetta.

(*P. eversmanni*), which is lighter in colour and seasonally very variable and has the postorbital area of the skull deeply constricted. But from the evidence of specimens intermediate between the two in colour and cranial characters I recently regarded the apparently distinguishable forms of *Putorius* from Europe and Asia as representing local races of *putorius*, the alternative course being the admission of an uncertain number of species (Proc. Zool. Soc. 1936, p. 691).

81. **Putorius putorius larvatus** Hodgson. The Tibetan Polecat.

Putorius larvatus, Hodgson, Journ. As. Soc. Beng. xviii, p. 447, pls. 11 & 12, 1849; Blanford, Mamm. Brit. Ind., p. 163, 1888.
Putorius tibetanus, Horsfield, Cat. Mamm. E. I. Co., p. 105, 1851.
Putorius putorius larvatus, Pocock, Proc. Zool. Soc. 1936, p. 707.

Locality of *types* of *larvatus* and *tibetanus*, Utsang, north of Sikkim, S. Tibet.

Distribution.—Tibet and KASHMIR.

Colour, especially of the head and tail, variable, probably seasonally, the fur and underhair of the back from creamy-white to "sordid fulvous," concealed more or less, according to their abundance, by the dark-tipped contour-hairs, which vary from about 50 to 65 mm. in length; the shoulders and nape are dark chocolate-brown, but the crown of the head may be only faintly tinged with brown and slightly contrasted with the frontal band, or deep brown and strongly contrasted, and the frontal band may be well defined by the dark brown crown behind and the mask in front, or very faintly defined by a few greyish hairs, so that the mask and crown are almost confluent. Hence the summit of the head may be almost wholly brown, or blackish, or largely white, apart from the mask; the tail may be wholly black, or have its basal third pale like the back, and the rest black or its middle third brownish relieved by grey and only the terminal third black; the limbs, throat, chest and inguinal region are black or deep brown, and there is a median dark streak on the abdomen, the sides of which are pale, like the back, but without the long black-tipped contour-hairs.

Only four undated skins of this polecat are known. The type from Utsang, according to Hodgson, had the tail black throughout, the "sordid fulvous" colour of the back largely obscured by an abundance of black-tipped contour-hairs, and the frontal band well defined between the dark mask and crown. This specimen is not known to have been preserved; but a second from Utsang, also obtained by Hodgson, which is the type of *tibetanus*, has the basal third of the tail like the back, the back paler, buffish-white and much less obscured by

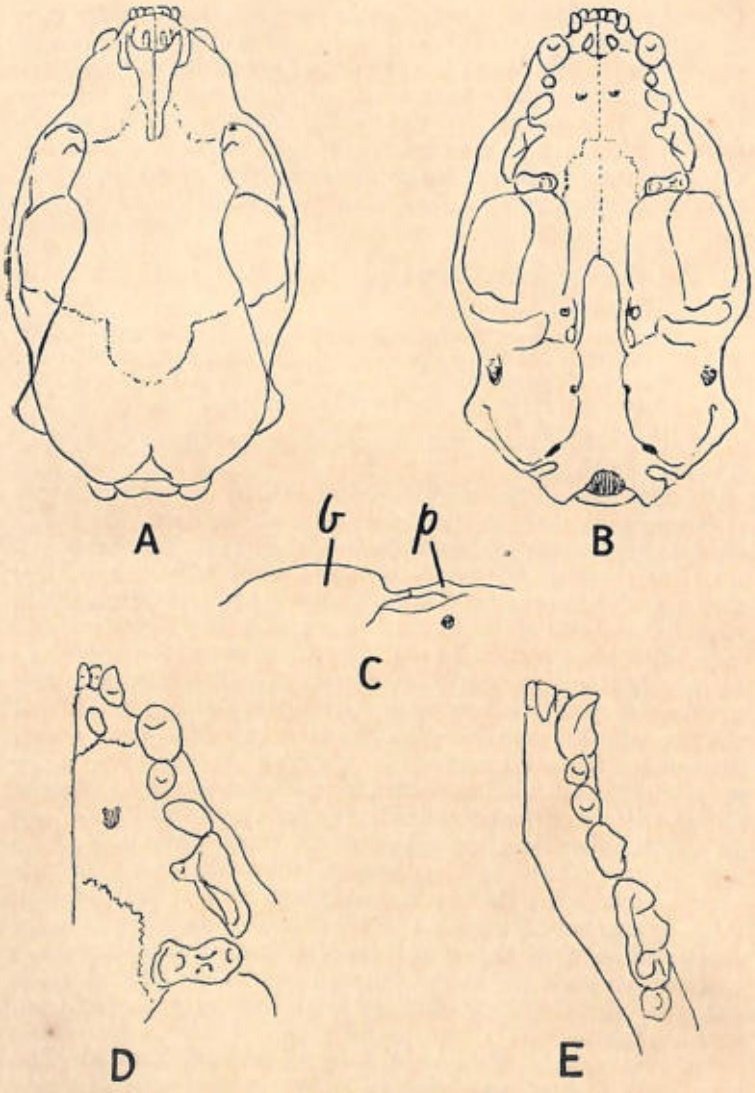


Fig. 93.

A. Upper view of young adult skull of *Putorius putorius larvatus*, drawn from the type of *P. tibetanus* from Utsang, Tibet. (Nat. size.)
B. Lower view of the same.
C. Side view, showing the junction of the hamular process of the pterygoid (*p*) with a process from the bulla (*b*), and the foramen ovale remote from the bulla.
D and E. Upper and lower teeth of the same (× 2).

the comparatively scanty contour-hairs, and the frontal band hardly distinguishable. A third, labelled "Himalayas," is very like the last. Finally, a skin from Ladak in Kashmir, obtained by General Strachey, is distinguished by its pale crown blending with the frontal band in front and with the dark hue of the nape behind.

The dimensions, according to Hodgson, are: head and body from 14 to 16 in., tail 6 in.; but the only two specimens he is known to have had were immature, and would probably have reached another two inches when mature, making them about the average size of large examples of other races.

From the scanty evidence supplied by the few known skins there appears to be no definable difference between this race of Polecat and one from Kansu described as *tiaratus* by Hollister in 1913 (see Proc. Zool. Soc. 1936, p. 705); but the skulls, on the available data, are different. I have been informed, for example, by G. M. Allen (*in litt.*) that in *tiaratus* the hamular process of the pterygoid does not reach the auditory bulla as it does in *larvatus*, as recorded below.

Skull.—The only known skull of *larvatus* is that of the type of *tibetanus*, preserved in the British Museum. Although the permanent teeth are fully erupted, all the sutures are fully open, indicating that with growth it would have increased in length and altered considerably in shape; but it is not possible to foretell with certainty to which of the more northern races it would have finally conformed. But in one particular, pointed out by Blanford, it is distinguishable from the skulls of all the other described races of *Putorius*. This is the junction of the hamular process of the pterygoid with the auditory bulla of the same side. According to Blanford the skull resembles the skull of *Vormelus* in that respect. This is only partly true. In the skull of *larvatus* the junction is effected by the outgrowth from the bulla of a slender bony rod which reaches the tip of the hamular, the position of the bulla and of the foramen ovale being normal for the genus. The peculiarities of the skull of *Vormela* as regards these parts are pointed out on p. 386. The condylobasal length of this skull of *larvatus* is 65 mm. Other dimensions are not sufficiently informative to record on account of its immaturity. Its length, when mature, would probably have been about 70 mm., about the average of other races of Asiatic Polecats.

Habits.—Nothing has been recorded about the habits of the Tibetan Polecat; but there is no reason to suppose they differ in essential respects from those of the European Polecat, which are tolerably well known and are like those of weasels and stoats. The English race adapts itself to various habitats, being found in forests, brushwood, amongst rocks or in the

Cambridge fens. It is usually, but not always, a nocturnal hunter *, preying mainly upon such vertebrated animals as it can overcome—mice, rats, rabbits, hares, birds up to the size of geese and turkeys, snakes, frogs, toads, newts, as well as eels and other fish. Although no doubt capable of climbing trees, it does not appear to do so habitually, and is not known to hunt for prey in the tree-tops. From its habit of killing every inmate of a hen-house if it gets access thereto it is—or was before it was largely exterminated on that account—a great pest to poultry-keepers. Since the Chinese race, already referred to, is believed to feed largely on marmots, there is no doubt that the Tibetan Polecat preys on the same rodent, as well as upon hares, mouse-hares, or picas, francolins, pheasants and so forth.

On the ground polecats lie up in burrows, rock-crevices, hollow tree-trunks, and other suitable shelters, making a nest, at least in the breeding season, of dry grass, moss or dead leaves. It is tolerably prolific, producing at a litter from five to seven young ; but the discovery by G. M. Allen of five and six pairs of teats in two skins of the Chinese race, *tiaratus*, apparently the nearest ally of *larvatus*, suggests that the latter may have a still larger number of young. The period of gestation in the European form is said to be nine weeks.

Reference was made above to the warning significance of the colour and pattern of Polecats ; and it is well known that a now nearly obsolete name for the animal in England was Foumart or Foul Marten, given to it in allusion to the nauseous stench of the secretion of the anal glands, a stench which has been described as "insufferably fetid" and as adhering for a long time to any substance upon which the secretion is discharged. But, as in the case of other mammals similarly equipped, the Polecat only resorts to this method of defence when wounded or attacked.

Genus **VORMELA** Blasius.

The Marbled or Tiger Polecat.

Vormela, W. Blasius, Ber. Nat. Ges. Bemberg, xiii, p. 9, 1884 ; Miller, Cat. Mamm. West. Eur. p. 428, 1912.

Type of genus, *Mustela sarmatica* Pall. (=*M. peregusna* Gueld.).

Distribution.—From Eastern Central Europe and South-western Asia to Central Asia and China.

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* The only wild example I have seen was actively on the move in the middle of the day amongst rocks close to the sea-shore at Parrog in Pembrokeshire, South Wales.

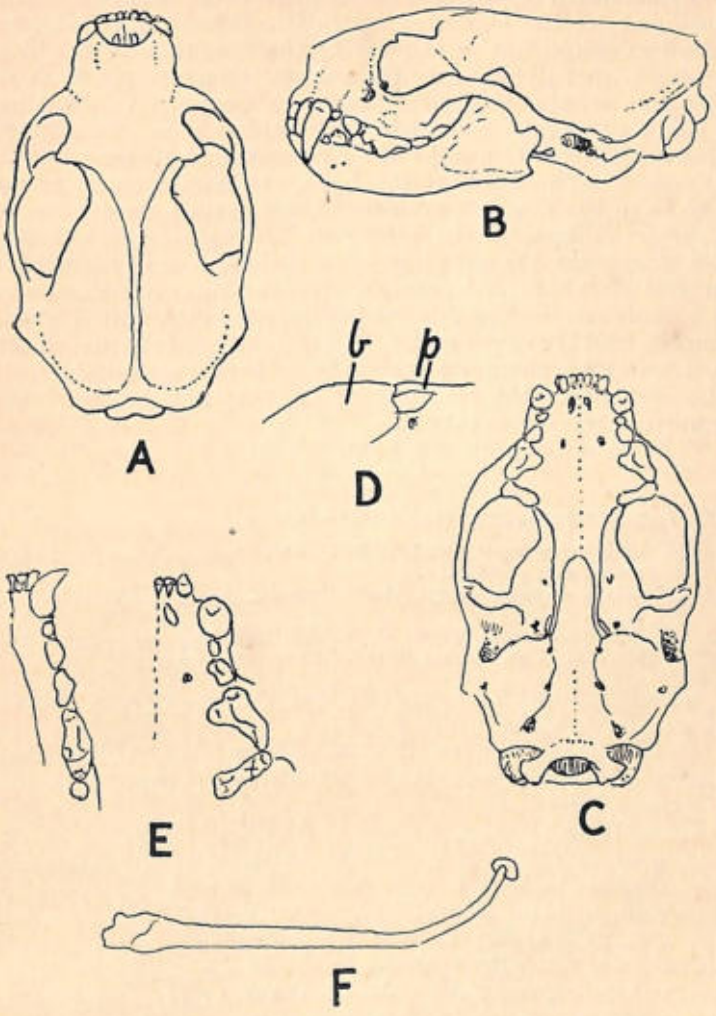


Fig. 94.

A. Upper view of skull of *Vormela peregusna alpherakyi* from Quetta. (Nat. size.)
B. Side view of the same.
C. Lower view of the same.
D. Side view, showing the junction of the hamular process of the pterygoid (*p*) with the anterior end of the bulla (*b*) and the foramen oval close to the bulla.
E. Upper and lower teeth of the same, enlarged.
F. Baculum of *V. p. peregusna* (after Ognev).

Distinguished from the other genera of British Indian Mustelinæ by the abnormal coloration of the upper side, as described below, but principally by the skull and teeth. The skull superficially is very like that of Eversmann's Polecat (*Putorius putorius eversmanni*) of western central Asia, having a similarly deeply constricted postorbital area, but differs from it and from the skulls of all Polecats and Weasels by the more forward position of the bulla, so that its anterior end is close to the foramen ovale and abuts against the tip of the hamular process of the pterygoid *. The principal dental differences are the presence of a definite cusp (metaconid) on the inner slope of the main cusp of the lower carnassial and of a small cusp on the anterior border, not in the centre, of the inner lobe of the upper molar. The retention of the metaconid is a primitive character which the other weasels have lost. The summit of the coronoid of the mandible is also more truncated and less pointed.

This genus contains only a single species.

82. **Vormela peregusna** (Güldenstädt).

[*Mustela peregusna*] Güldenstädt, Nov. Comm. Acad. Sci. Imp. Petrop. xiv, p. 441, 1770.

Mustela sarmatica, Pallas, Reise Provinz. Russ. Reichs. i, p. 453, 1771.

Vormela peregusna, Miller, Proc. U.S. Nat. Mus. xxxviii. p. 385, 1910; id., Cat. Mamm. West. Eur. p. 429, 1912.

Locality of *type* of *peregusna*, banks of the Don, S. Russia, of *sarmatica*, banks of the Volga.

Distribution.—Eastern Central Europe, S. Russia, Asia Minor, Persia, Afghanistan, Baluchistan, Central Asia and Northern China.

Resembling the larger species of typical Mustelinæ in size and general form, but differing in its peculiar coloration. The head is black or deep brown, relieved by white upper lips and chin, a white frontal stripe crossing the forehead above the eyes and passing on each side beneath the ears on to the throat, and sometimes joining in the middle line below it, and everywhere surrounded by black; the ears have a conspicuous white fringe of hairs, and across the occiput there is usually a white or buffish band, which is, however, often broken up more or less by spots or projections from the black of the crown and

* Blanford stated that the skull of the Marbled Polecat resembles the skull of the Tibetan and Himalayan race of the ordinary Polecat (*P. putorius larvatus*) in the junction of the bulla and the hamular. But in the latter species, as described above (p. 383), the junction is affected by an outgrowing slender process from the bulla reaching the hamular, the tip of which is normally remote from the bulla. Thus the resemblance is superficial and adaptive.

the brown of the nape ; the nape has a broad pale band on each side, not reaching the shoulder, and set off by the black of the throat below it and by the brown of the middle of the nape, which is, however, typically broken up by pale spots

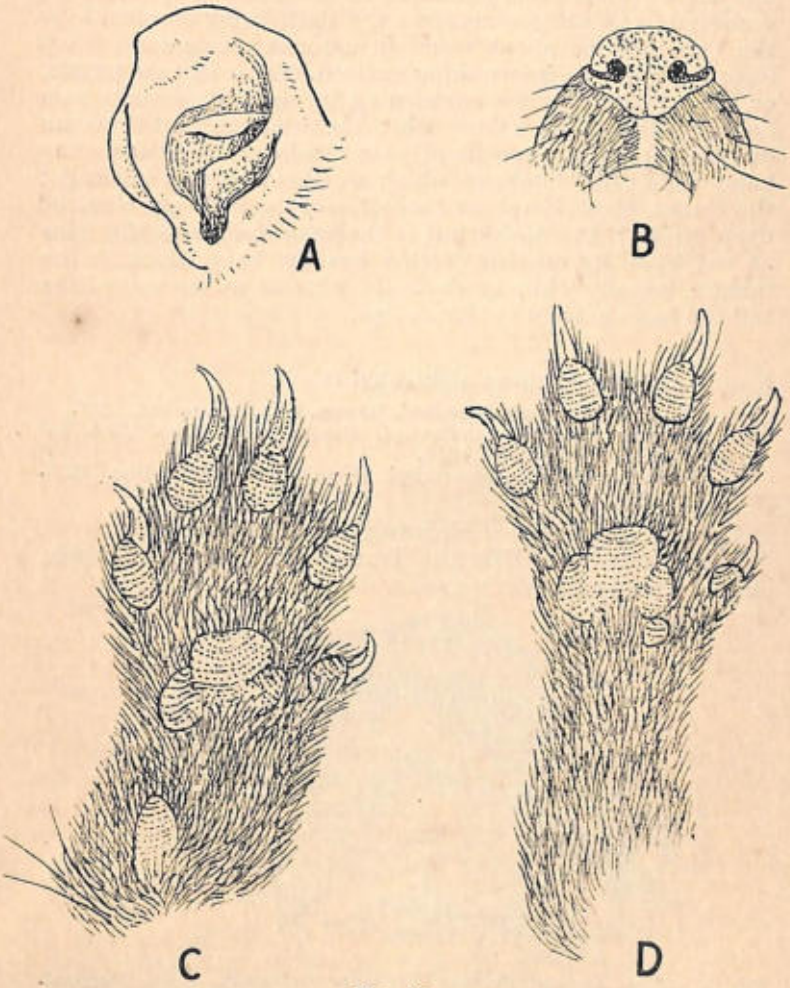


Fig. 95.

A. Ear of the Marbled Polecat (*Vormela peregusna*), showing the presence of the bursa which has been denied.
B. Rhinarium of the same from the front.
C. Lower side of right fore foot of the same claws; longer than in *Mustela*.
D. Lower side of right hind foot of the same.

(Figures drawn from several relaxed skins.)

or streaks and sometimes completely divided mesially to form a pair of brown stripes ; the upper side from the shoulders backwards is ornamented with a pattern of white or yellowish and blackish, rufous-brown or pale brown spots or blotches, but the respective abundance of these tints is very variable, sometimes the pale, sometimes the dark being dominant, or the two may be about equal in amount ; commonly they form an intricate interlocking pattern, like a jig-saw puzzle, or the pattern may be represented by dark spots on a pale field or pale spots on a dark field ; the most constant elements of this pattern are a pair of pale bands sweeping from the nape behind the shoulders, which are always brown laterally ; the throat, chest, limbs, and mid-line of the belly are black or deep brown ; the bushy tail is the same colour as the loins at the base, its median portion has the hairs black in the middle, broadly white at the ends, whereas at the end of the tail the hairs have broad black tips.

82 *a*. **Vormela peregusna alpherakyi** Birula.

Putorius sarmaticus, Blanford, Mamm. Brit. Ind. p. 164, 1888.
Vormela sarmatica alpherakyi, Birula, Ann. Mus. Zool. St. Petersb. xv, p. 333, 1910.
Vormela peregusna alpherakyi, Pocock, Proc. Zool. Soc. 1936, p. 719.

Locality of the *type* of *alpherakyi*, Transcaspia.

Distribution.—S. Eastern Transcaspia, Eastern Persia, Afghanistan and BALUCHISTAN.

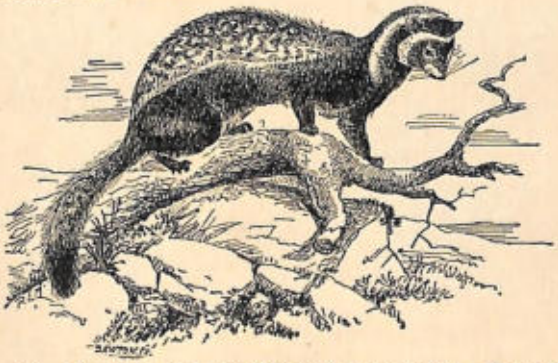


Fig. 96.—The Marbled Polecat (*Vormela peregusna*). From Blanford. This figure, drawn from a skin from an unstated locality, does not agree with any that I have seen in the disposition of the stripe on the neck.

This race is distinguished from the typical form, *V. p. peregusna*, which inhabits the steppe country of S.E. Russia and northern Caucasia, by having a broad white uninterrupted

or only partly interrupted band across the back of the head which behind the ears on each side joins the pale lateral stripe of the neck; also by the greater amount of brown in the pattern of the back, this tint typically exceeding the pale pattern instead of being considerably less in amount as in typical *peregusna*. The dark areas of the head vary from black to deep brown, of the back from deep chocolate to paler rusty brown, and the pale areas of the back from clear white to white with a wash of pale yellow or buff. The variation in colour is probably seasonal, but none of the skins in the British Museum received from Quetta (Dr. Leith) and from Kandahar (Hutton and Swinhoe) is dated. The greatest contrast in tint is exhibited by two of the Kandahar skins. Also none of these skins was measured in the flesh; but judging from the size of the adult skulls compared with adult skulls, accompanied by flesh-measured skins, of other races the head and body are from about 13 to 14 inches and the tail, without the hair, from about 6½ to 8½ inches.

There is nothing peculiar about the skulls of this race. Some measurements (in mm.) of the largest and smallest adult skulls from Kandahar and of one adult from Quetta are as follows :—

Locality and sex.	Condylo-basal length.	Zygomatic width.	Postorbital width.	Interorbital width.	Maxillary width.	Upper cheek-teeth.	pm^4.	m_1.
Kandahar; ? ♂	55	32	10	15½	13	17	6	6½
,, ; ? ♀	50	30	11	12	13	16	6	7
Quetta; ? sex	53	31	9	14	13	17	6	6

Other skulls, however, are a little larger. One from Gulran in Afghanistan has a condylobasal length of 56½ mm., and the two teeth 7 mm. respectively; and one from Serakhs in Transcaspia is 58 mm. in length with the teeth 7 mm. respectively. None of the skulls is sexed, but the largest are probably ♂.

Habits.—Hutton, who was well acquainted with this polecat at Quetta and Kandahar, where it was common, gave various particulars about its habits in the wild and in captivity. It lies up and breeds in burrows, a litter of three or four young being born at the end of March or the beginning of April. Like typical polecats and weasels it is essentially predatory and may be seen hunting by day, although, according to Hutton, it is mainly nocturnal and is probably compelled to be partly diurnal to secure the food it requires, since captive

specimens, when plentifully fed, lie up during the day and become active and restless at dusk. It preys upon birds, like quails, and upon rats, mice, lizards, beetles, and even snails. Probably also it kills snakes, judging from an experiment Hutton made of putting a large, harmless snake into the cage of one of his captives. That the polecat knew instinctively how to deal with an enemy of this kind was shown by its behaviour. With back arched and tail erect it advanced to the attack, retreating now and again to avoid a stroke, and watching for a chance to seize the snake behind the head. This snake was, however, too large for the polecat, and eventually beat off his antagonist. The voracity of the species was attested by this captive specimen, which on one occasion killed four wagtails one after another, then attacked and killed four rats, two large and two small, seizing the large ones behind the ears, so as to avoid being bitten, and hanging on till the victims succumbed after a prolonged struggle. Only the flowing blood of the prey was lapped up, the bodies being stowed away until nightfall, when the polecat returned for a further feed. When irritated it uttered a cry like a mongoose, and it emitted the same disagreeable fetid odour as other weasels. Hence there is no doubt that its peculiar coloration, especially the sharply contrasted pattern of the head and of the bushy tail, which is carried erect like a skunk's, acts as a danger signal, warning enemies to keep at a distance.

Subfamily HELICTIDINÆ.

Ferret-Badgers.

Intermediate in some respects between the Martinæ and the following subfamily, the Melinæ (Badgers). Distinguished principally in external characters from the Martinæ and Mustelinæ by structural characters adapted for less active, less predatory, more fossorial habits. The tail is about half the length of the head and body; the general build is heavier and the body is less supple. The snout, as in the Badgers, is long, cartilaginous, projects considerably beyond the lower jaw, and is terminated by a large subcircular rhinarium which has no philtrum dividing the upper lip; but, as in the Martens, the facial vibrissæ are abundant and long and the ear is tolerably large and provided with a well-developed bursa. The feet have the digits united by webbing up to the digital pads and the claws are strong, thick, comparatively little curved, those of the fore foot being especially long for digging, as in the Badgers, although the feet are not so broad; the soles, embracing all the pads, are entirely naked, except the heel,

but, as in the Martens and Weasels, all the pads are transversely striated; the plantar pads are four-lobed, longer than wide; there are two smallish, subequal carpal pads and two subequal, elongated, contiguous metatarsal pads, the latter being absent in Martens and Weasels. There are no known definite glandular areas associated with the anus, such as are found in Badgers, apart from the pair of normal anal glands described by Garrod as the size of peas; but in the ♂ of one species a large area of short-haired, possibly glandular skin in front of the scrotum has been described. There are two pairs of inguinal mammæ.

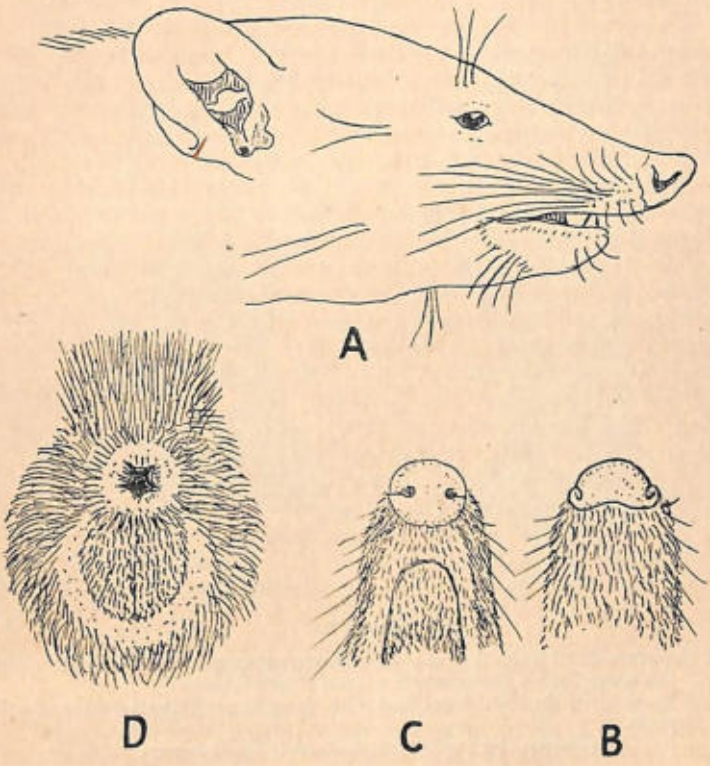


Fig. 97.

A. Side view of head of ♂ Ferret-Badger (*Helictis personata personata*), showing the probing snout, the well-developed facial vibrissæ, the ear with its bursa, etc.

B and C. Upper and lower views of the muzzle of the same, showing the shape of the rhinarium, etc.

D. Anal area of the same, showing the scrotum beneath the anus; surrounded by an area of naked skin, not observed in dry skins.

(Drawn from a fresh specimen from Rangoon.)

The skull in the number of its teeth, the backward position of the prepalatine foramina, and thin-walled auditory bulla more resembles that of the Martinæ than Mustelinæ ; but the muzzle itself is longer, narrower, and the whole skull attests comparatively poorly developed masticatory muscles, the temporal ridges on the cranium being usually widely separated. The teeth have less trenchant cusps, the greatest difference being in the upper carnassial (pm^4), which is rhombic in outline, its inner lobe being bicuspid and nearly as long as the outer portion ; the upper molar is a little smaller than the carnassial, but is about twice as wide as long as in *Martes*, although not

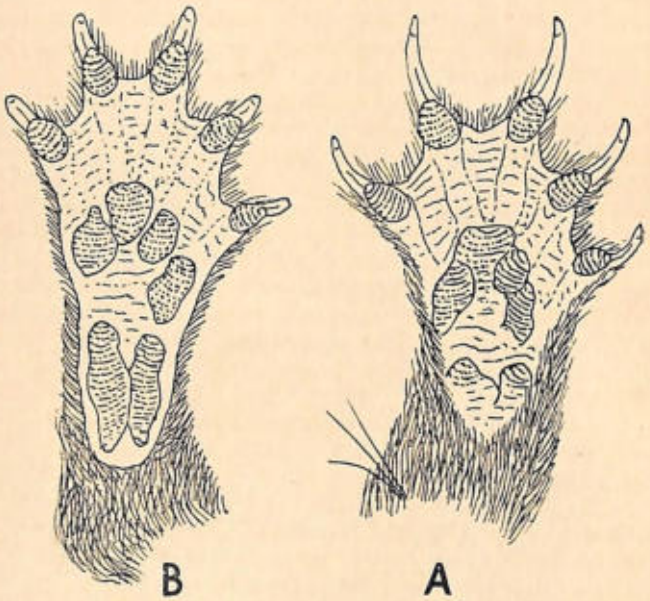


Fig. 98.

A. Lower side of right fore foot of *Helictis personata personata*, showing the naked soles, fossorial claws and striated pads.
B. The same of the right hind foot with the pair of elongated metatarsal pads.

(Drawn from a fresh specimen from Rangoon.)

so constricted ; the lower carnassial (m_1), like the upper, is also more crushing in character, the heel being noticeably larger as compared with the front part of the tooth than in *Martes*.

Although the bulla is thin-walled and closed behind, as in the Martinæ, it is distinguished from that of all the Mustelidæ by having its cavity divided into an anterior and a posterior

chamber by a bony rafter descending behind the tympanic annulus to the petrous, where there is a small communicating orifice.

The combination of Weasel-like and Badger-like characters in these Carnivora lends appropriateness to their popular name Ferret-Badgers.

The Classification of the Helictidinæ.

By Blanford and, following him, by Bonhote (Ann. Mag. Nat. Hist. (7) xii, p. 593, 1903) the Ferret-Badgers were assigned to the genus *Helictis* ; but Bonhote pointed out that the different kinds fall into two groups distinguished by their smaller or larger teeth. In the latter group, with which he was alone concerned, he included four species, *nepalensis* from Nepal, *personata* from Burma, *pierrei* from Cochin China, and *orientalis* from Java. In Thomas's revision (Ann. Mag. Nat. Hist. (9) ix, p. 194, 1922) he divided them into three genera :—*Helictis*, from S. China and Assam, characterized by its small teeth with the outer edge of pm^4 straight or concave, pm^2 not disproportionately larger than pm^1, and the baculum trifid, with three slightly thickened terminal prongs ; *Nesictis*, from Borneo, with the teeth as in *Helictis*, except that the outer edge of pm^4 is convex, but the baculum is terminally bifid, with simple prongs, hardly thickened, and not crested ; *Melogale*, from Nepal, Burma, Cochin China, and Java, characterized by its larger teeth, the outer edge of pm^4 being convex and pm^2 disproportionately larger than pm^1, and the baculum bifid, with one of the terminal prongs curved and crested, the other thickened. But, as G. M. Allen pointed out in 1929, the characters on which Thomas relied for his generic diagnosis are too variable and intergradational to be granted the value assigned to them. He therefore gave a subgeneric significance to the three names in question. In this volume they are granted specific status.

Genus **HELICTIS** Gray.

Helictis, Gray, Proc. Zool. Soc. 1831, p. 94, and of subsequent authors, including Blanford, Mamm. Brit. India, p. 172, 1888 ; Thomas, Ann. Mag. Nat. Hist. (9) ix, p. 194, 1922 ; G. M. Allen, Amer. Mus. Novit. no. 358, p. 7, 1929, and Mamm. China and Mongolia, p. 391, 1938.

Melogale, Geoffroy, Bélanger, Voy. Zool. p. 137, 1834 ; Thomas, Ann. Mag. Nat. Hist. (9) ix, p. 194, 1922 ; G. M. Allen, Amer. Mus. Novit. no. 358, p. 6, 1929 (as subgenus).

Nesictis, Thomas, Ann. Mag. Nat. Hist. (9) ix, p. 194, 1922.

Locality of the *type* of *Helictis, moschata* Gray, Canton ; of *Melogale, personata* Geoffr., Pegu ; of *Nesictis, everetti* Thomas, Mt. Kina Balu, N. Borneo.

Distribution.—Southern China, NEPAL, ASSAM, BURMA, Siam, Indo-China, Java, and Borneo. A peculiarity of the distribution is the apparent absence of the genus from Tenasserim, the Malay Peninsula and Sumatra.

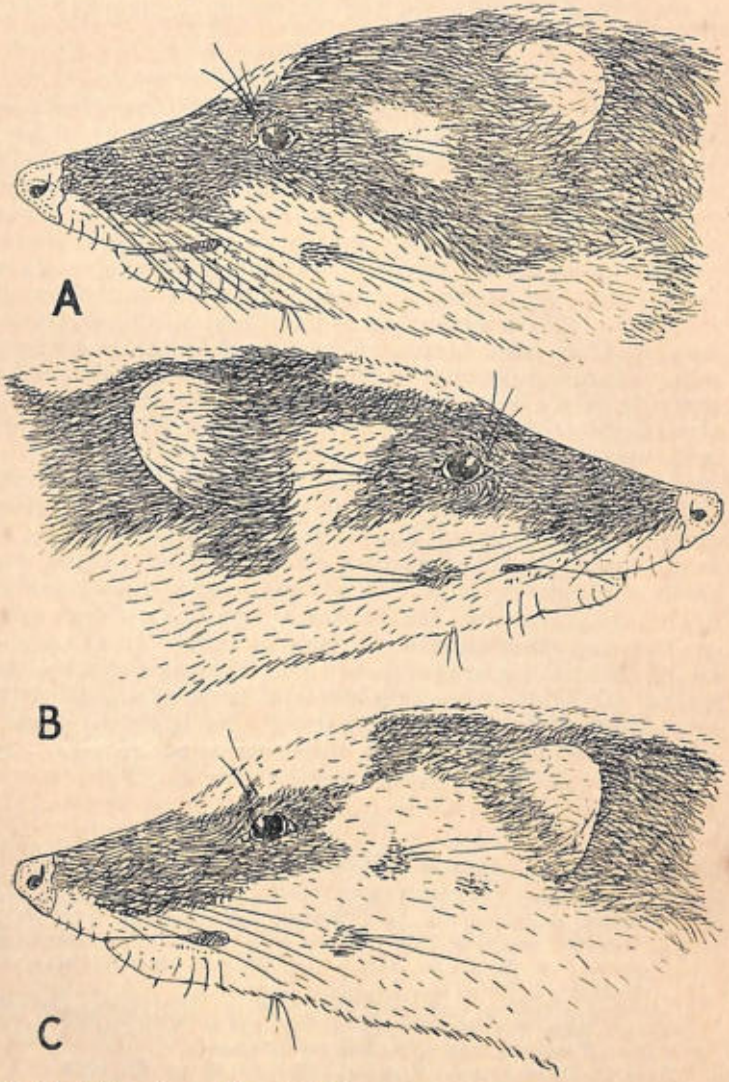


Fig. 99.—Side view of head of three examples of *Helictis moschata taxilla* from Chapa, Tong-king, showing the individual variation in the relative amounts of black and white in the " mask " in the same locality. (Drawn from dried skins.)

The principal characters of this genus are contained in the definition of the subfamily, and need no repetition. It may be known at once from the other genera of Oriental Mustelidæ by its external appearance, especially by the peculiar colouring, consisting of a nearly black and whitish or yellowish pattern of the head, forming a definite but individually variable "mask," a white streak, or the remnants of it, on the nape, sometimes on the shoulders and fore back, and of white-tipped erectile hairs on the longish, bushy tail, especially at its end.

In specimens from the same locality the proportions of the white and blackish or deep brown constituting the mask are very variable. In fig. 99 (p. 394) heads of three examples of *H. moschata taxilla* from Chapa in Tong-king are drawn to illustrate the variation. In fig. A there is a smallish white frontal patch on the forehead between the eyes, a patch on the temple between the eye and ear and just behind the upper tuft of genal vibrissæ, a patch on the crown between the ears and extending backwards on to the nape, these three patches being isolated and separated by wide areas of blackish hair. In fig. B the frontal patch is considerably larger, extending further over the forehead; the patch on the temple is also larger, separated by a narrower blackish area from the frontal patch and below continuous with the white of the lower cheek; the linear patch between the ears broadens considerably where it runs over the nape. In fig. C the frontal patch is still more extensive in all directions, and is continued backwards as a median streak to join the stripe on the crown, which passes backwards over the nape; the white on the temple is also much more extensive, is separated from the frontal patch by a very narrow blackish band, and below is widely continuous with the white of the lower cheek, passing in front of the upper genal tuft of vibrissæ which rises from an isolated brown spot. In this head the white is dominante in the mask, in A the black is dominant, B being intermediate between the two. In the three heads the upper lip, chin, throat and ears are white or yellowish, and the lower tuft of genal vibrissæ rises from an isolated small blackish patch, called by G. M. Allen the "rictal spot."

Similar variations in the pattern of the "mask" occur in all the races of *Helictis* in which a considerable number of examples are available for examination, and since the details of the pattern appear to be of no systematic significance they are at most briefly alluded to in the descriptions of the different kinds of Ferret-Badgers noted below. The probable meaning of the coloration of the head and of the whitish-tipped tail is discussed below (pp. 416-417).

The two species represented in the British Indian fauna may be distinguished as follows :—

a. Teeth small, shorter and narrower, the jaw correspondingly narrower especially above the posterior root of pm^4 ; temporal ridges weaker, wide apart and nearly parallel ; baculum ending in three symmetrically arranged processes.	[p. 396. *moschata* Gray,
a'. Teeth massive, longer and wider, the jaw broader to accommodate them, especially above pm^4 ; temporal ridges stronger, less widely separated, usually with a sinuous curvature ; baculum ending in two asymmetrical processes	[p. 407. *personata* (Geof.),

83. **Helictis moschata** Gray.

Helictis moschata, Gray, Proc. Zool. Soc. 1831, p. 94 ; and of subsequent authors, including G. M. Allen, Mamm. China and Mongolia, p. 392, 1938. Additional bibliographical references are contained in the text that follows.

Locality of the *type*, China.

Distribution.—Southern China, Formosa, Hainan, Tong-king, Laos, Yunnan ; Upper Burma and Assam.

Principally distinguished from the other British Indian species of *Helictis* by its dentition and some cranial characters associated with it. The teeth are comparatively small in all their dimensions and in the size of their cusps, the external length of pm^4, for instance, being only about one-fourth the total length of the upper cheek-teeth ; its outer edge is slightly concave ; pm^1 is less noticeably smaller than pm^2. In association with the weak dentition the muzzle is considerably narrower, especially just above the insertion of pm^4, and the chief masticatory muscles, the temporals, are less powerful and encroach to a smaller extent over the upper side of the cranium, the two ridges which mark their edges being even in the adult weaker, more widely separated, and subparallel.

The baculum, known in the typical race from Canton, ends in three symmetrically arranged processes, one median, inferior and slender, the others thicker, upturned proximally, directed forwards distally, thus hook-shaped.

The general colour above varies from blackish or deep purplish-grey, darker adjoining the pale areas of the head and neck, to various shades of brown, the contour-hairs, except around the pale areas, being very frequently bleached to a greater or less extent, giving a decidedly grey or silvery cast to the pelage ; the " mask," cheeks, nuchal stripe, and under side are yellowish-buffy or white. The only difference in coloration apparently between this species and the next is the shorter, more frequently interrupted dorsal streak, which seldom extends beyond the withers.

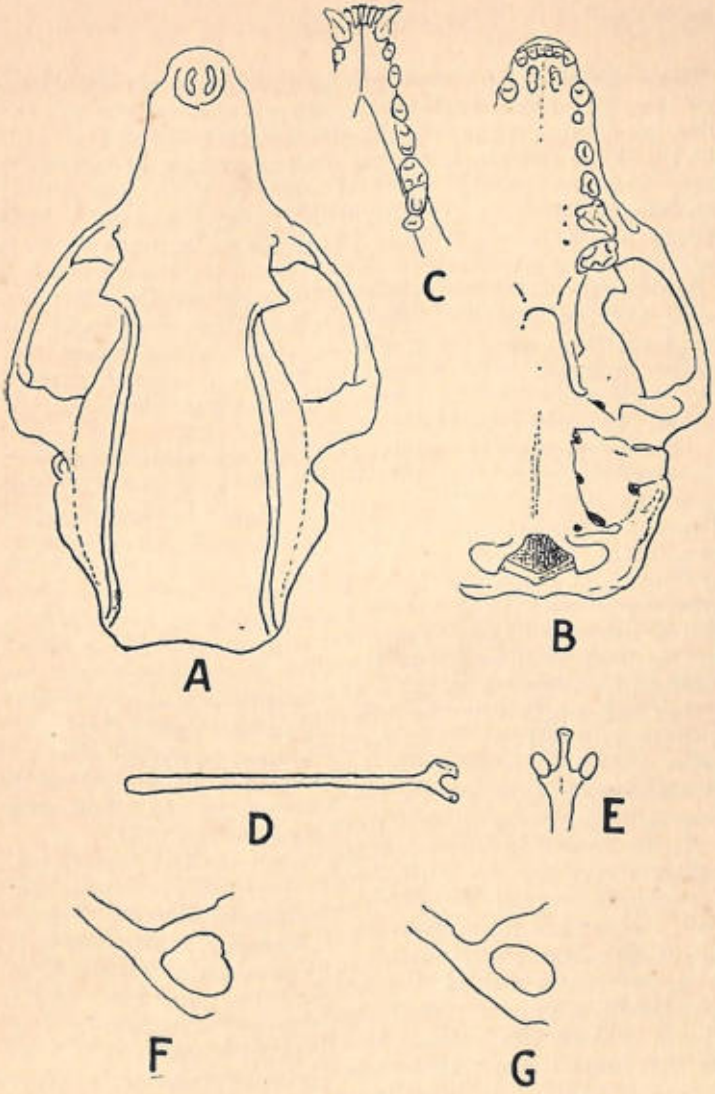


Fig. 100.

A. Upper view of skull of ad. ♂ of *Helictis moschata millsi* from Mokokchung in the Naga Hills. (Nat. size.)
B. Lower view of left side of the same, showing the comparatively weak dentition of the species.
C. Lower teeth of the right side of the same.
D. Right side view of baculum of *H. m. moschata* from Canton.
E. Tip of the same baculum from the front, with the inferior median prong uppermost.
F. Right preorbital foramen of *H. m. moschata* from Canton, much enlarged.
G. The same of *H. m. millsi* from the Naga Hills.

Gray described the type of this species as silvery above, the hairs being ashy at the base, silvery-white at the tip, the silvering dominant towards the sides of the body and towards the tip of the tail, the head and the legs verging to dark ashy-grey, and the throat, belly and inside of the thighs white; the mask consisted of a [white] streak between and one behind the eyes, a white upper lip and chin, a spot between the ears and one on the nape.

Later (Proc. Zool. Soc. 1865, p. 153, and Cat. Carn. Mamm. p. 42, 1869) he described what has been presumed to be the same specimen as brown with a spot on the crown and temple, a broad band across the forehead, a small spot on the cheek and upper lip, and the chin, throat, chest and the rest of the under side white.

The only possible reconciliation of the discrepancies between his descriptions is either that they were based upon different specimens or that the colour altered profoundly in about 30 years. The first is, I believe, the true explanation. The two specimens now in the British Museum collected by Reeve, presumably at Canton, one being marked "type," the other being a topotype, agree with Gray's second description in being brown. But the so-called type, apart from being brown, like a brown rat, instead of silvery, has the pale spot between the eyes reduced to a few white hairs, this area being almost wholly brown and constituting the "broad band across the forehead" mentioned by Gray. This specimen must be discarded as the type. The second specimen, although it has a frontal patch, is also not the type, since it bears the no. 39.7.15.3, indicating that it was received too late to be described in 1831.

These discrepancies have been hitherto overlooked, and authors have for the most part followed Gray's second description and regarded *moschata* as distinguished by its "brown" colour—Swinhoe, for instance (Proc. Zool. Soc. 1867, p. 228), who identified a specimen from Hainan as *moschata*, and G. M. Allen, who, as recently as 1938, also adopted that name for examples from Hainan, and described their colour as "chocolate-brown." But J. A. Allen (Bull. Amer. Mus. Nat. Hist. xxii, p. 480, 1906) had previously shown that these Hainan specimens, which he followed Swinhoe in identifying as *moschata*, differ greatly in colour, and they were all collected in January. A ♂ was dark greyish-brown, with the hairs of the flanks and limbs prominently tipped with whitish, giving a greyish effect; the hairs on the basal portion of the tail had long white tips, those at the distal end being more extensively white; the under side was strong buffy white, and the patch on the crown extended back over the shoulders. A ♀ was like the ♂ but had less white on the tail. Another ♀ was much darker brown above, with shorter, less marked white tips, the tail was brown

nearly to the tip, the hairs of which were apically lighter, the under side was deep rusty-ochraceous ; the white on the crown and shoulders was much reduced in size.

Since individual variations in colour similar to those contained in Gray's descriptions of *moschata* from China and Canton and in J. A. Allen's account of his three Hainan specimens are observable in every good series of skins of *Helictis* from the same locality that I have seen, it is evident that colour is an untrustworthy systematic character ; and in no two skins is the pattern of the " mask " the same.

83 *a*. **Helictis moschata millsi** Thomas.

Helictis millsi, Thomas, Journ. Bomb. Nat. Hist. Soc. xxviii, p. 432, 1922 *.
Helictis moschata millsi, G. M. Allen, Amer. Mus. Novit. no. 358, p. 7, 1929.

Locality of the *type*, Mokokchung in the Naga Hills, Assam, 4,500–5,000 ft.

Distribution.—The Naga Hills ; Nam Tamai Valley and the " Triangle," Upper Burma.

Distinguished apparently from typical *moschata* mainly by the size and shape of the preorbital foramen of the skull, as detected by Thomas †. In the two skulls of typical *moschata* in the British Museum from Canton, this foramen is large, high, and cordate in shape, with its upper bar slender. In the skulls of *millsi* from the Naga Hills it is smaller, lower, and transversely reniform in shape, with its upper bar thicker. The same applies to the skulls from Upper Burma, except that in one of them the foramen is larger, approaching that of typical *moschata*.

There are also some reasons for believing that *millsi* is, on the average, less chocolate-brown, more " purplish " or blackish-grey in tint than typical *moschata*.

Thomas distinguished *millsi* from typical *moschata*, which it resembles in size, by having a shorter, thinner coat and by the colour being dark purplish-grey, very different from the drabby brown of *moschata*. Also in the skull of *millsi*, which

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* The addition of *Helictis moschata* to the fauna of British India, due to Mr. J. P. Mills, was one of the most interesting results achieved by the Bombay Mammal Survey.

† Anderson (Zool. Res. Yunnan, p. 194) was the first to draw attention to the large size of this orifice in *moschata*. Its large size should be correlated with a richer supply of nerves and blood-vessels to the mystacial vibrissæ, which might be expected to be better developed than in *millsi* ; but the two old Cantonese skins of typical *moschata*, all that I have seen of that race, are too badly preserved to show any difference in this respect.

otherwise is the same as in *moschata*, the preorbital foramen is lower and more transverse.

The coat is shorter and thinner, it is true ; but the specimens of *millsi* were collected in October and December before the winter coat had attained full luxuriance. In the October skin the coat is about 13 mm. long, with a comparatively small amount of wool. In the December skin it is about 23 mm. long and furnished with a good deal of wool. No doubt it would have grown longer and thicker by March or April ; and since the date of the killing of the specimens of *moschata* is unknown no great reliance can be placed on the contrast in coat mentioned by Thomas. As for the colour, Thomas overlooked Gray's original description of the type of *moschata*, and judged the colour of this Ferret-Badger from the two almost certainly faded brown skins from Canton in the British Museum described by Gray in 1865.

The three skins of *millsi* seem also to have altered in tint since 1922. The prevailing colour is deep dusky greyish-brown, but they vary individually. The type has the hairs of the upper side of the body tipped with grey, giving a silvery sheen in reflected light, and the under side is faintly buffy-white. In the others there is no grey cast over the dorsal surface and the under side is cleaner white. The individual variations in the pattern of the mask and of the streak on the nape need not be noticed.

In a series of skins procured by R. Kaulback in the Nam Tamai Valley *, 3,000 to 5,000 ft., Upper Burma, the dorsal colour varies from deep blackish-brown, without pale points to the hairs, to much paler, " beaver " brown or dark grey, owing to grizzling of the hair-tips, and the ventral colour from whitish to cream or buff ; the hairs at the end of the tail are always extensively whitish, sometimes at the base as well, although to a less extent, but the base may be like the loins ; the " mask " is very variable, the patch on the crown may be broad or a mere streak, continued over the nape past the shoulder or broken up into a streak on the nape and on the shoulder ; the patch on the forehead is large or small, always separated from the patch on the temple, which is usually continuous with the white of the cheek below, occasionally separated from it ; the inferior dark vibrissal or " rictal " spot is always isolated.

Kaulback also sent skins and skulls from Gam Majaw, 4,000 ft. (26° 45′ N. ; 97° 56′ E.), and from Akhe, 4,500 ft. (26° 55′N. ; 98° 12′ E.), both in the " Triangle," Upper Burma.

* Two skins were previously sent from this locality by Kingdon Ward and Lord Cranbrook, but being without skulls were not certainly identifiable.

The colour is dark brown, varying a little in tint, but intermediate in tint between the darkest and the lightest of the Nam Tamai series. A skin, without skull, from Putao, Upper Burma (Bernard, on loan from Bombay), is referred to this species because the stripe from the crown is interrupted on the nape; its general hue is dark brown, as in some of the Nam Tamai skins.

These Upper Burmese specimens are indistinguishable by any reliable characters from typical *millsi* from the Naga Hills. Some of the winter skins from Nam Tamai have the coat as luxuriant as in the examples of typical *moschata*.

None of the specimens from the Naga Hills was measured in the flesh; but two of R. Kaulback's skins from Upper Burma show the following dimensions, converted from mm. into English inches :—

	Head and body.	Tail.	Hind foot.	Ear.
Gam Majaw, "Triangle" (26° 45′ N., 97° 56′ E.); ad. ♂	13	5½	2½	1½
Akhe, "Triangle" (26° 55′ N., 98° 12′ E.); ad. ♀	13	5½	2½	1½

In Laos and Tong-king *Helictis moschata* is represented by the race *taxilla*, described by Thomas as a distinct species (Proc. Zool. Soc. 1925, p. 500), and based upon specimens from Ngai-Tio, Tong-king. He distinguished it from typical *moschata* by its smaller size, low narrow brain-case, and more slender muzzle. He also declared the skull of *taxilla* to be smaller than that of *millsi*, which he had stated in 1922 to be like that of *moschata* in dimensions. The colour is the same as in *millsi*, varying from very dark blackish-brown, with a grey cast owing to bleaching of the hair-tips, to duller paler brown.

The skull-measurements of the types of *millsi* and *taxilla* and of the example Thomas took to be the type of *moschata*, entered in the table of measurements (p. 402), show that there are no differences between them of any moment. Moreover, the statement about the lowness of the brain-case in *taxilla* was true only of the ♂ skull, not of the ♀ from Ngai Tio.

The British Museum subsequently received from Chapa in Tong-king and from Xien Quang Koo in Laos a number of specimens of *taxilla* (Delacour and Lowe) which also show the unreliability of the height of the brain-case. The largest of these, a ♂ from Xien Quang Koo and a ♀ from Chapa, hava the head and body, measured in the flesh, 13⅝ and 13⅜ in. respectively, over 1 in. longer than the ♂ type of *taxilla* from Ngai Tio, and a trifle larger than Kaulback's examples of *millsi* from Upper Burma. Individual variation in the skulls from Chapa is illustrated by those of the two ♂♂ entered in

Skull-measurements (in mm.) of *Helictis moschata millsi*, *H. m. taxilla*, and of *H. m. moschata*, showing the close similarity between them.

Name, locality, and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary at pm^4.	Maxillary at c^1.	pm^4.	m_1.
H. moschata millsi.									
Mokokchung, Naga Hills (type); ad. ♂ ..	80	—	46	18	20	—	—	6	7
Mokokchung, Naga Hills; ad. ♂	80	—	45	17	20	21	13	6	6
Mokokchung, Naga Hills; ad. ♂	78	72	43	16	18	20	12	6	6½
Mokokchung, Naga Hills; ad. ♀	—	67	40	17	18	19	12	6	6
Gam Majaw, Upper Burma; ad. ♂	77	72	40	17	18	20	12	6½	7—
Gam Majaw, Upper Burma; ad. ♀	78	—	42	17	18	18	12	6	7—
Akhe, Upper Burma; ad. ♀	76	71	39	16+	17	20	11	6	7
Nam Tamai, Upper Burma; ad. ?	—	—	39	19	19	20	12	7	—
H. moschata taxilla.									
Ngai Tio, Tong-king (type); ad. ♂	78	73	40	17	18	19	12	5½	6
Chapa, Tong-king; ad. ♂	76	69	47	17	20	20	14	6	7—
Chapa, Tong-king; ad. ♂	74	68	40	19	18	19	12	6	6
Ngai Tio, Tong-king; ad. ♀	74	68	40	17	17	19	11	5	6
Chapa, Tong-king; ad. ♀	76	70	40	17	18	18	11	5	6
H. moschata moschata.									
Canton (alleged type); ad. ♂	79	—	43	19	19	—	14	6	6½
Canton; ad. ♂	—	—	42	20	20½	22	13	6	7—

the table. The first (no. 1625), oldish and well developed, is very broad across the zygomata and muzzle, and has the cranial ridges strong and only about 10 mm. apart. The second (no. 1251), although of full length, is much younger and consequently narrower at those points, and has weak ridges, nearly 20 mm. apart.

The only character I can find for retaining *taxilla* as a distinct race lies in its slightly smaller teeth. The average length of the upper postcanine teeth in eight specimens is 17½ mm., and of the lower 20½ mm., the same averages in seven skulls of *millsi* being respectively 20 and 23 mm. The teeth are also a little smaller than in typical *moschata*. According to G. M. Allen the upper cheek-teeth, which include the canine, in *moschata* from Hainan vary from 20½ to 25½ mm., and the lower from 25 to 29 mm. In twelve examples of *taxilla* the upper cheek-teeth vary from 19 to 22 mm., the average being less than 20½ mm., and the lower from 23 to 26, with the average 24½.

A more northern Chinese race than typical *H. moschata* is *ferreogrisea* Hilzheimer (Zool. Anz. xxix. p. 298, 1905), based upon a possibly traded skin from Hankau, Hupeh Province; it differs from typical *moschata*, according to G. M. Allen, in being on the average a little larger. The flesh-measurements (in English inches) of three specimens recorded by Allen in millimetres are as follows :—

	Head and body.	Tail.	Hind foot.
E. Szechwan ; ad. ♂	15½	7½	2⅝
Fokien ; ad. ♂.....	14⅝	6	2⅜
Fokien ; ad. ♀.....	13⅜	5⅞	2⅜

Also according to Allen the average total length of the skull is 80 mm. as compared with 77 in *moschata*. In five skulls in the British Museum from Shanghai and Kiukiang (Styan), Foochow in Fukien (♂, Swinhoe; ♀, Rickett), and Nangking (Howell), the total length ranges from 79 to 85 mm., and the condylobase, from 73 to 79, giving averages of 81½ and 75½ respectively. As regards external differences, Allen states that the winter pelage is longer, and the white areas clearer white than in typical *moschata*. Also that the pelage is in general greyer, especially in winter, that the under side is usually without the buffy tint of *moschata*, and that the bases of the hairs above are paler.

The skins in the British Museum confirm this generalization. One from Kiukiang (October), two from Foochow (November), and one from Nangking (January) have the luxuriant wool of the back soiled white and the under side as well as the mask white; the brown tint of the back varies individually in shade, but is mostly greyish-brown, with the flanks especially

showing terminal bleaching of the hairs. The coat is as much as 38 mm. long in the Kiukiang skin, about 30 mm. in the others; but a skin from Chinteh, Anhwei (Styan), dated May, is darker brown in colour above, decidedly buffy below, and has the dorsal underhair a little darker. An undated skin from Chung King (Maw), being in full moult, is largely white above owing to the exposure of the wool by the shedding of most of the brown contour-hairs.

There is a possibility that *ferreogrisea* may prove to be a synonym of the earlier name *subaurantiaca* given to Ferret-Badgers from Formosa.

Two forms have been described from Formosa. *H. subaurantiaca* Swinhoe (Proc. Zool. Soc. 1862, p. 355, pl. 44) was, when fresh, dark greyish-brown above, darker "purplish-brown" round the dorsal pale areas, with a whitish-orange spot on the forehead, a white line from the crown to the withers, and orange below and on the cheeks. It is noticeable that no lower "rictal spot" is shown on the plate. This spot is absent also in the skins in the British Museum. Otherwise these skins have changed a good deal from fading, as pointed out by Garrod. They are dull, palish brown above, with the mask and under side white and the hair on the back whitish, exactly resembling some examples of *ferreogrisea*, apart from the "rictal spot." This spot is also absent in Garrod's coloured plate of the dealer's specimen, dubiously from China, which Sclater identified as *subaurantiaca* on account of its orange-tinted under side. This specimen, a ♀, measured, head and body 14¼ in., tail 7 in., agreeing well with Allen's dimensions of *ferreogrisea* (see Garrod, Proc. Zool. Soc. 1879, p. 305).

The second race, named *H. subaurantiaca modesta* by Thomas (Ann. Mag. Nat. Hist. (9) ix, p. 196, 1922), from Bankoro, Formosa, was distinguished by the smaller white areas of the mask, the interorbital spot being reduced to a few white hairs, the spot on the crown to a narrow line, with the band from the nape to the withers interrupted. Thomas was evidently unaware of the complete unreliability of such variations in the "mask" and nape-stripe; and although the type of *modesta* differs from Swinhoe's specimens of *subaurantiaca* in having the normal "rictal spot," I do not think this feature is sufficient to justify the view that there is more than one race of *H. moschata* in Formosa *. But the material to settle the status, if any, of the Formosan form is at present

* In two skins of *H. orientalis* from Java (p. 414) the rictal spot, with dark vibrissæ, is present on one side, absent on the other where the vibrissæ are white; and out of two skins of *H. everetti*, from Kina Balu (p. 414), one has no trace of the spots, the other has them rather exceptionally large.

inadequate. Thomas, apparently, gave specific rank to it because he claimed it to be smaller than *moschata*, the skulls of the two Formosan races being alike in this respect. But according to Thomas the median length of the typical skull of *modesta*, ♂, was 79½ mm. and the length of the upper cheek-teeth 24 mm.* The median length of ♂ skulls of *millsi* is from 77 to 79 mm., the cheek-teeth up to 24 mm., and the average total length of the skulls, approximately the same as the median, in *moschata* is 77 mm., the cheek-teeth 22½. Clearly, therefore, Formosan specimens, on the evidence, are not smaller, and there is no doubt, I think, that Thomas's estimate of the size of *moschata* was due to his application of that name to the larger Chinese skulls in the British Museum above referred to as *ferreogrisea*.

A small Chinese race was described as *Helictis taxilla sorella* by G. M. Allen, who accepted Thomas's view of *taxilla* being specifically distinct from *moschata* (Amer. Mus. Novit, p. 8, 1929, and Mamm. China & Mongolia, p. 396, 1938). The typical locality is Futsing in N. Fokien.

As regards size, the head and body measure as much as 13 in., the same as in specimens of *millsi* from Upper Burma and about the average of examples of *taxilla* from Tong-king. But this is associated with a very short hind foot, only 1½ in. long as against 2 to 2⅝ in. in *taxilla* and 2⅛ in *millsi*. Allen laid special stress on the shortness of the foot and of its metatarsal pads, and on the absence of the inferior "rictal spot" in all the specimens, and on some differences in the mask-pattern as compared with *moschata* †. The claws of the fore feet also are shorter and less curved than in *moschata*, this feature, associated with the short hind foot, indicating possibly, in his opinion, more arboreal, less terrestrial habits than in typical *moschata*.

The skull is a little shorter than in *taxilla*, its total length varying from 69½ to 72½ mm.; but the upper cheek-teeth, ranging from 22½ to 23 mm., are as long as in typical *moschata*, longer than in *taxilla*, attesting a relatively considerably longer muzzle.

The status of this form is doubtful. Provisionally it is treated here as a subspecies of *moschata*; but some will no doubt hold that it should be given specific rank, since typical *moschata* occurs in the same province of China.

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* Owing to the outbreak of the war the skulls of the types of *moschata*, *subaurantiaca*, and *modesta* have been sent away from London and are now no longer available for my examination.

† For reasons given above no great value is, in my opinion, to be attached either to the incidence of the rictal spot (p. 404, note) or to variations in the mask (p. 395).

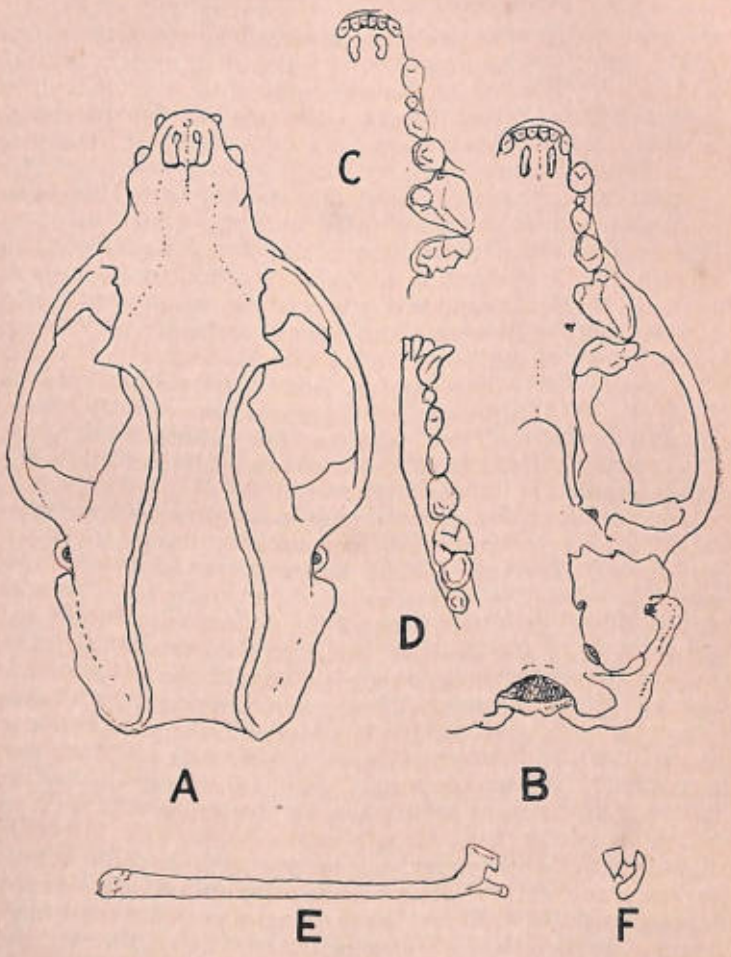


Fig. 101.

A. Upper side of old skull of *Helictis personata personata* from Mt. Popa (Shortridge), showing especially the strong sinuous temporal ridges.
B. Left half of lower side of the same skull, with the teeth worn.
C. Upper unworn teeth of left side of adult ♂ of the same race from Pegu.
D. Lower teeth of the right side of the same skull.
E. Right side of baculum of example of *H. personata pierrei* from Cambodia.
F. Tip of the same baculum from the front.

(All figs. nat. size.)

84. **Helictis personata** Geoffroy.

Melogale personata, Geoffroy, Bélanger, Voy. Zool. p. 137, pl. 5, 1834.

Locality of the *type*, Rangoon.

Distribution.—From NEPAL eastwards to ASSAM, thence southwards through MANIPUR to BURMA, Siam, Tong-king and Cochin China.

Distinguished from *H. moschata* mainly by its more massive dentition, the length of pm^4 being over one-third that of the cheek-teeth, and its outer edge is convex instead of slightly concave, and pm^1 disproportionately smaller than pm^2; and, for the accommodation of the larger teeth, by the wider muzzle, especially above the hinder half of pm^4; better development of the masticatory muscles is also marked on the cranium by the temporal ridges, which in the adult are thicker and, instead of being widely separated and subparallel, are usually closer together and generally sinuously curved, occasionally coalescing on the parietals to form a single low thick crest. The baculum, known in the Cochin China race, also differs in ending in two asymmetrical processes, the right being thick, slightly hooked and abruptly uptilted, the left being also raised but thinner and with its inferior portion projecting below the level of the right and curved inwards.

The larger teeth and stronger masticatory muscles of this species suggest that it feeds mainly on food of a harder kind, requiring more crushing, than is the case in the small-toothed species, *H. moschata*. But there are no records to indicate what the difference in diet may be. The teeth, however, vary in size in different subspecies of *H. personata*, and also individually within subspecific limits. I follow G. M. Allen in thinking Thomas attached too much importance to them when he gave them generic importance. The difference between the bacula of the two species, so far as it is known, is well marked; but this bone has been examined in too few cases to warrant the inference that its shape is constant in all the described races of the species.

84 *a*. **Helictis personata personata** (Geoffroy).

Melogale personata, Geoffroy, Bélanger, Voy. Zool. p. 137, pl. 5, 1834.

Helictis personata, Thomas, Proc. Zool. Soc. 1886, p. 59; Blanford, Mamm. Brit. Ind. p. 174, 1888.

(For additional, more recent, bibliography see the papers quoted in the text, especially those relating to the other described subspecies of *H. personata*.)

Vernacular.—*Kyoung-u-gyi* or *Kyoung-u-Kyin* (Burmese); *Kyoung-pyan* (Arakanese); *Lehning Sátébee* (Manipur).

Locality of the *type*, near Rangoon.

Distribution.—Typically SOUTHERN BURMA: known from Rangoon, Pegu, Prome, Thayetmyo, Arakan, Mt. Popa, near Meiktila, and as far up the Irrawaddy as Sagaing just south of lat. 22° S. Also recorded from ASSAM, Cachar, Manipur, and Tipperah, where it intergrades with the Himalayan race *H. p. nipalensis*.

Colour individually very variable. In four skins from Mt. Popa, about 30 miles west of Meiktila, 4,960 ft. (G. C. Shortridge), September 22, it varies from deep brown with hardly any reddish tint in it to much paler fawn-brown, the whitish dorsal stripe which extends from the crown at least to the middle of the back being set off by darker brown; the hairs of the tail above are extensively white, at least in its distal half, and wholly white below; the mask is tolerably

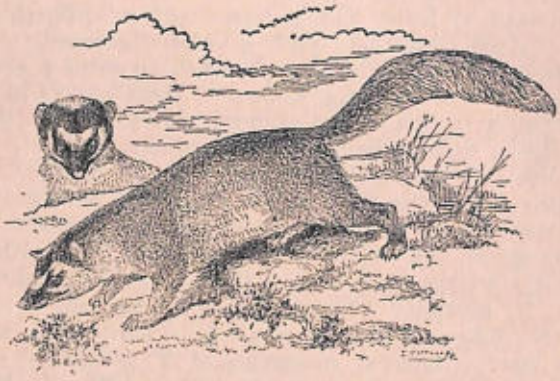


Fig. 102.—The Ferret-Badger (*Helictis personata personata*), copied from an unpublished drawing by Tickell. (From Blanford.)

constant, then iterorbital patch being widely separated from that of the crown, rather narrowly from the patch on the temple, which is widely continuous with the pale hue of the lower cheek, and there are two dark "rictal spots," the upper very narrowly separated from the brown behind the eye. The coat, in accordance with the date, is rather harsh, thin, and short. But in an adult skin from Toungoo (J. M. D. Mackenzie, March 12, the coat is considerably fuller and longer, about 28 mm., and the colour is much paler, being decidedly greyish-brown with a silvery cast due to the bleaching of the hair-tips, which is more marked on the flanks than ormally, hardly at all adjoining the spinal stripe, and is absent on the head. The difference between this skin and those from Mt. Popa is probably seasonal.

These skins agree tolerably well with Geoffroy's description of the type, from Rangoon, which was said to be brown, washed with red above, passing into much clearer brown on the flanks and legs, which were light reddish-grey, the points of the hairs being white. This specimen apparently combined the fawn, *i. e.*, red or reddish, hue of the paler Mt. Popa specimens with the pale hair-tips of the one from Toungoo.

Two skins from Manipur (A. O. Hume), February and March, are also strikingly different from the Mt. Popa series, looking like very dark representatives of the Toungoo colour phase. They are very deep grey-brown, with no trace of fawn or tawny, and show a silvery sheen on the flanks and sides of the shoulders; the white pattern of the head and back is everywhere set off by black or deep brown, and the underwool is whitish. The coat is thick and about 30 mm. long. An undated skin from Dilkonshab, Cachar (J. Inglis and A. O. Hume), is superficially very like the Manipur skins, but the silvery cast is not so conspicuous, the wool has a buffy tinge, and the under side is yellower, not so white.

These specimens from Manipur and Cachar were identified by Blanford as *H. personata*; but, as might be expected from their distribution, they show in some particulars decided resemblances to *H. personata nipalensis*.

An undated skin from Kohima, in the southern part of the Naga Hills, just north of Manipur (J. H. Hutton, on loan from Bombay), has the coat short but thickish, the colour dark brown, with no grey cast, much darker than the brownest skin of typical *personata* from Mt. Popa, but closely matching the skin from Cachar. Another Assamese skin from Laitkynsao, S. Khasi Hills, 2,500 ft. (H. W. Wells, also on loan from Bombay), April 25, is paler than the last, nearly like the darkest of the Mt. Popa series. A specimen from the Khasi Hills (J. La Touche, Indian Museum, Calcutta) is dark brown with the pale areas yellow, and is indistinguishable from the next race, *nipalensis*. In the same collection there is a very faded specimen from Arakan (Major Phayre), no doubt the example from that district mentioned by Blyth.

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

	Head and body.	Tail.	Hind foot.
Rangoon (Cuvier, type)	13	—	—
Pegu (Tickell); ♀	13½	8½	—
Pegu (Mackenzie); ♂	14½	7	2½
Toungoo (Mackenzie); ♂	16½	8½	2⅝
Mt. Popa (Shortridge); ♀	15	9½	2⅝

The weight of the Mt. Popa specimen was 3¾ lb.

84 *b*. **Helictis personata nipalensis** (Hodgson).

Gulo nipalensis, Hodgson, Journ. As. Soc. Beng. v, p. 237, 1836; id., *op. cit.* vi, p. 560, 1837.
Helictis nipalensis, Gray, Proc. Zool. Soc. 1853, p. 191; Jerdon, Mamm. Ind. p. 80, 1867.
Helictis orientalis, Blanford, Mamm. Brit. Ind. p. 173, 1888. (Not *Gulo orientalis*, Horsfield, Zool. Res. Java, unpaged, pl., 1824.)
Melogale nipalensis, Hinton and Fry, Journ. Bomb. Nat. Hist. Soc. xxix, p. 415, 1923.

Vernacular.—Oker (Nepal).

Locality of the *type* of *nipalensis*, Nepal; of *orientalis*, Java.

Distribution.—Nepal and probably Sikkim, but the range unknown elsewhere.

Distinguished provisionally on the evidence of a few specimens from typical *personata*, as represented by the examples from Pegu, Toungoo and Mt. Popa described above, by its prevalently darker colour, slightly more luxuriant winter coat, and smaller skull and teeth.

According to Hodgson the colour of the adult in summer coat is "saturate glossy brown above," with the pale areas of the mask, dorsal stripe, under side, and the terminal third of the tail "brilliant orange-yellow"; but in winter coat adults are "earthy grey-brown above," with the pale areas "canescent," the young being like this at all seasons, he said *.

There are three of Hodgson's Nepalese skins in the British Museum. One is faded from exposure to the light as an exhibited specimen. The others, one of which is marked "type," are dark chocolate-brown in hue. The type, a suckling ♀, judging from the size of the teats, is in summer coat, with scanty underwool, and the contour-hairs about 17 mm. long. The pale areas are yellowish, and the underhair is light brown. The third skin, from the Rapti River, dated December, has a fuller, longer coat, the contour-hairs being over 30 mm.; the pale areas of the head, throat and chest are whiter, the underhair is much paler, buffy white, and the belly is more suffused with brown. The faded skin has the coat a little longer and fuller than in the last.

Two skins from Hasimara, Bhutan Duars, 600 ft. (H. V. O'Donel, on loan from Bombay), are assigned to this race. A ♀, collected in April, is dark, like Hodgson's specimen from the Rapti River, but has the hair-tips bleached, giving a grey cast under reflected light, the wool of the back has a pinkish buffy tinge, and the under side is decidedly buff. A ♂, dated March, has the coat about 28 mm., with a little wool; the

* This very early record of profound seasonal variation in colour in Ferret-Badgers has been ignored by many subsequent authors.

Skull-measurements (in mm.) of the two British Indian and of two described related races of *Helictis personata*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary at pm^4.	Maxillary at c^1.	pm^4.	m_1.
H. personata personata.									
Pegu; ad. ♂	83	80	43	17	18	28	14	9	9
Mt. Popa; ad. ♀	83	80	48	14	18	28	15	9	9
Mt. Popa; young ♂	—	—	—	—	—	—	—	9	—
Mt. Popa; young ♀	72	—	—	—	—	—	—	8½	8
Mt. Popa; young ♀	72	—	—	—	—	—	—	8	8
Manipur; ad. ♂	83	—	47	18+	20	26	15	8	8
Manipur; ad. ♀	—	—	44	17	19	24	14	8	—
Kohima, Naga Hills; ad. ♀?	76	72	41	17	17	24	12	7	7
H. p. nipalensis.									
Nepal (type); yg. ad. ♀	—	74	44	19	19	24	—	8	—
Hasimara, Bhutan; ad. ♂	79	75	41	17	19	24	12	7½	—
H. p. pierrei.									
Saigon, Cochin China (type); ad. ♂	88	—	50	—	—	—	—	—	—
Cochin China; ad. ♂	89	84	50	15	21	28	16	8	8
Hué, Annam; ad. ♂	88	85	50	17	21	28	15	8	8
Djiring, Annam; ad. ♂	86	84	49	16	20	28	16½	9—	9
Kontoum, Annam; ad. ♂	83	81	47	—	—	27	15	8½	8
(*H. p. laotum*).									
Nan, N.E. Siam (type); ad. ♂	80	77·3	46	—	19·3	—	—	—	—
Nan, N.E. Siam; ad. ♀	82	78	48	17	20	26	15	8	8
Nan, N.E. Siam; ad. ♀	79	76	41	17	16½	25	13—	8—	8

general hue is much paler brown than in the ♀, with the hair-tips of the flanks etc. much more extensively silvered, and the under hair and lower side paler buff.

The flesh-measurements (in English inches) of the ♀ from Hasimara are:—Head and body 14; tail 6¾; hind foot 2¼; ear 1. Hodgson gave the dimensions of a ♀ *nipalensis* as head and body 16 in., tail, without hair 7½, with hair 9. These measurements were probably taken from a dried skin.

Other races and Species of Helictis.

Closely related to typical *personata*, but admitted as distinct, on the evidence that it has a larger skull, is *H. personata pierrei* Bonhote (Ann. Mag. Nat. Hist. (7) xii, p. 592, 1903). Its type-locality is near Saigon, and its distribution is Cambodia, Cochin China and Annam.

Three specimens in the British Museum from Cochin China are various shades of darkish brown, one having a yellow wash above and below, the others being white below. They hardly differ from the examples of *personata* from Mt. Popa. A number of skins from Annam (Delacour and Lowe) show great variation in colour. One half-grown from Hué, dated December, closely matches the Cochin China skins, being brown above, yellow below; another, undated, is very like it, but a third adult from the same locality, March, is very different, being blackish-grey with extensively pallid tips to the hairs, but no brown at all. One from Djiring and one from Kontoum, both March skins, are also dark grey, darker than the one from Hué because the hair-tips are much less extensively pallid.

Although the skins differ individually in colour, Bonhote distinguished *pierrei* from *personata* by its slightly larger size, more rufous colouring, and noticeably larger auditory bullæ; but he quoted as representing *personata* a specimen from Nan, Siam, referred to under the next race. At all events the bullæ of Cochin China specimens are not larger than those of the Pegu and Mt. Popa skulls.

On the evidence supplied by its larger skull, as shown in the table of measurements, *pierrei* may, I think, be admitted as a valid race of *personata*. The skull has strong temporal ridges, mostly rather narrowly separated; but the skull from Djiring is in my experience unique in the genus *Helictis* in the fusion of these ridges on the parietals to form a single median, low, double sagittal crest.

A doubtfully distinct race from Nan in N.E. Siam was named *Melogale personata laotum* by Thomas (Ann. Mag. Nat. Hist. (9) ix, p. 194, 1922), and described as a little smaller than true *personata* from Pegu and slightly greyer, less brown, with more grey suffusion on the sides and below. Most of the

specimens, collected at the end of October and in the first week of November, are naturally very much alike, being brown, speckled with grey to a varying extent individually except on the head, alongside the spinal stripe and on the legs, but the greyest hardly surpasses in that respect the skin of *personata* from Toungoo. On the other hand, an example collected in July is decidedly brown, with no grey speckling, and closely matches the darkest example of *personata* from Mt. Popa. Clearly in this, as in many other cases, reliance upon differences in colour has been misplaced, an error which might have been avoided by acquaintance with Hodgson's description of *nipalensis* published nearly a century previously.

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

	Head and body.	Tail.	Hind foot.
Nan, Siam (type, no. 1.11.8.5.) ; ad. ♂	15+	6⅘	2½
Nan, Siam (no. 1.11.8.6) ; ad. ♀	15⅘	8	2⅔
Nan, Siam (no. 98.2.8.15) ; ad. ♀ ...	13⅗	7	2⅔

These dimensions do not attest inferiority in size to typical *personata* ; nor do the skull-measurements of the same three specimens entered in the table (p. 411) justify, in my opinion, the conclusion that the type of *laotum* is subspecifically distinct from the example of *personata* from Pegu, the two, and apparently the only, specimens that Thomas compared, because it is a couple of millimetres or so shorter. Moreover, Thomas subsequently identified as *laotum* the specimens from Hué and Kontoum in Annam, above assigned to *pierrei*, although both are bigger than the Pegu specimen of *personata*. Nevertheless he identified as *pierrei* the specimen from Djiring, Annam.

Thomas also laid stress on the smaller size of the teeth in *laotum*, stating that in three examples of *personata* the greatest diameter of pm^4 was 10·3, 10·2, and 9·3 mm., whereas in five specimens of *laotum* that measurement was 9·2, 9. 9, 9, 8·6. In the ♂ of *personata* from Pegu I make the greatest diameter of pm^4 barely 10, in two ♀♀ from Mt. Popa it is, as nearly as may be, 9·2 and 9, and it is 9 in the quite unworn tooth of a very young specimen from Legyi, 20 miles W. of Sagaing (Owens). In five ♀ specimens of *laotum* from the typical locality the measurement ranges from 9 to slightly less than 8 mm. Thomas relied also on the slightly smaller size of m^1 of *laotum*, especially on the antero-posterior narrowness of its inner portion, due to the less well-developed cingulum in front. The tooth at this point is visibly on the average more sloped, less strongly shouldered in front in the Siamese than in the Burmese skulls ; but the character is somewhat elusive, and

in Annamese skulls of *pierrei* is variable, suggesting similar variation in Burmese and Siamese skulls when more are known. Hence *laotum* can only be tentatively admitted as distinct from *personata*.

Another possibly distinct race is represented by the type and only known example of a Ferret-Badger, from Yen Bay, Sōngkoi River, Tong-king, described as a species, *Melogale tonquinia*, by Thomas (Ann. Mag. Nat. Hist. (9) ix, p. 195, 1922), who relied mainly on its small teeth, pm^4 being a fraction over 7 mm. and m_1 7 mm., both being unworn. He also drew attention to the comparatively large size of the ♀ skull, which, although not quite fully grown, measures 79 mm. in total length.

The Javan species, *H. orientalis* Horsfield (Zool. Res. Java, unpaged, pl., 1824=*Melogale fusca* Guérin, Mag. Zool. 1835, pl. 16), is uniformly dark brown and short-coated at all seasons, judging from specimens collected by Shortridge at Buitenzorg, 855 ft., on 26 August, and at Tassikmalaja, Preanger, 1,145 ft., in January. It is further characterized by having the greater part of the tail like the back, with a comparatively small pale area at the tip, by the spreading of the brown of the flanks over the under side, often reducing the pale hairs to a mere streak on the chest and to a patch, irregular in size and shape, on the abdomen; the "mask" is very variable, the patch between the eyes being sometimes absent and when present, generally broken up, but sometimes extensive and spreading down the muzzle and back on the forehead; and the ears have usually less white in front. The largest specimen, an ad. ♀ from Tassikmalaja, measured: head and body $15\frac{3}{8}$; tail $6\frac{7}{10}$; hind foot $3\frac{1}{2}$; ear $1\frac{1}{8}$ in. Another ♀ from the same locality was $\frac{1}{2}$ in. shorter in the head and body and 1 in. longer in the tail. In five adult skulls the condylo-basal length ranges from 69 to 75 mm., the average length being $72\frac{1}{2}$ mm.; the teeth are rather small for the large-toothed group, pm^4 and m_1 alike being 7 mm. The flesh-measurements indicate that *orientalis* is as large as any species, but the skull is small for a large-toothed form.

Although the differences between *orientalis* and the continental Asiatic Ferret-Badgers, with large teeth, are not very striking, full specific rank has been granted to it as an isolated form without intermediates linking it to *personata*.

The Bornean species *H. everetti* Thomas (Ann. Mag. Nat. Hist. (6) xv, p. 331, 1895), of which the type-locality is Kina Balu, 4,000 ft., is well defined externally by the absence of the white tip to the tail. Otherwise the general colour, with the reduction of the pale hue of the under side, is like that of *H. orientalis*; and likeness to some specimens of the latter

is shown by smallness and irregularity of the interorbital patch ; there is, however, a small streaky patch on the crown and another between the shoulders, unlike the long well-defined stripe in *orientalis*. The type, a ♂, has a good deal of buff on the throat and belly, these areas being white in the ♀. A further difference between them, as stated above (p. 404), is the entire absence in the ♂ of the inferior "rictal spot," its vibrissæ being white, whereas in the ♀ it is rather exceptionally large and has normally dark vibrissæ. The skull is small, with a condylobase of 68 mm. ; the teeth also are small, pm^4 and m_1 being alike 6 mm., and the outer edge of pm^4 and m_1 being alike 6 mm., and the outer edge of pm^4 has a straight outer edge. Thomas's reasons for introducing the generic name *Nesictis* for this species are explained above (p. 393).

Habits.—So far as is known or can be reasonably inferred the Ferret-Badgers are practically alike in habits everywhere, apart perhaps from the race described by G. M. Allen as *H. taxilla sorella* (p. 405). They are nocturnal or crepuscular and mainly terrestrial, lying up during the day in burrows they dig for themselves or in natural shelters like rock-crevices, and are equally at home in woods or more open grassland country. According to Swinhoe the kind found in Formosa "climbs trees with agility and is frequently taken curled up in a corner of some large branch." This arboreal habit he reported on native authority. It has not apparently been observed by any European collector ; but the general build of the animals and the structure of their feet, with striated pads, are quite in keeping with the view that they are good tree-climbers.

Their diet is omnivorous. A specimen Swinhoe kept fed readily on the bodies of birds ; and the natives told him that the species lives much on fruit and berries as well as on birds and small mammals. In Sikkim, according to Anderson, *H. p. nipalensis* not infrequently enters the huts of the Bhotias and Lepchas, where it is welcomed on account of its usefulness in destroying cockroaches and other insect pests. Tickell's example of typical *H. personata* from Thayetmyo greedily ate fruit, insects, lizards, meat and eggs ; and in the stomach of one of the same kind, caught in a garden just outside Pegu, Mackenzie found remains of beetles, flies, some vegetable débris (apparently roots), and five or six earthworms which had been swallowed whole or bitten into two or three pieces. Bones alone, on the other hand, were found by Pope in the stomach of a specimen of typical *moschata* from Hainan as recorded by G. M. Allen in 1938.

The only account of the breeding habits with which I am

acquainted was supplied by H. V. O'Donel, who stated that at Hasimara in Bhutan Duars the young are usually three in number and are born in a burrow generally in June. At birth they resemble their parents in colour and pattern, and are blind, the eyes remaining closed for at least a fortnight, but for how long afterwards was not ascertained. That the young may not be entirely independent of the mother for a considerable time was recorded by Shortridge, who at Mt. Popa in Upper Burma dug out of a burrow two nearly full-grown young ones and an old female which was still suckling them. The skulls show that the tooth-change had just set in.

In a paper entitled "Warning Coloration in Musteline Carnivora" (Proc. Zool. Soc. April 1909, p. 949) I suggested that the coloration of the Ferret-Badger, with its sharply contrasted "mask" and dorsal streak, might have a warning significance, and quoted the suggestion made to me by Mr. Shortridge that the Javan form, *Helictis orientalis*, mimics in Java the Teledu (*Mydaus*), a somewhat badger-like member of the Mustelidæ, known to resemble the skunk in the offensiveness of its discharge. He added that *Helictis* may, however, itself be a protected form, in which case the resemblance between it and *Mydaus* would be an instance of common warning coloration usually called "Müllerian mimicry." In his note on the specimens of typical *personata* he collected at Mt. Popa (Journ. Bomb. Nat. Hist. Soc. xxiii, p. 471, 1915) Shortridge said that "although in habits this animal resembles the skunks it has no offensive smell of its own and apparently mimics no other animal here [in Burma], as its congener, *orientalis*, certainly does in Java." But the negative evidence on this head is not convincing *, because mammals protected by the offensive secretion of the anal glands are frequently reluctant to use that method of defence unless hard pressed.

There is on the contrary, in my opinion, sufficient evidence that the Ferret-Badgers are protected in that way, and that their peculiar coloration acts as a warning, enabling them to be readily recognized. In the first place, the name *moschata* was suggested to Gray as the specific title of the type of the genus on information received, presumably from Reeve, that the examples he collected at Canton had the attribute of "smelling strongly of musk" †; and Garrod, in his account

* It will be remembered that Shortridge declared the Banded Palm Civet, *Hemigalus, derbyanus* to be without smell, whereas dissection of a specimen revealed the existence of enlarged anal glands with secretion recalling in its odour that of a weasel or stoat ('Fauna of British India, Mammalia,' vol. i, p. 458, 1939).

† "Musk" is a conventional term applied to several distinct animal odours; but it is most misleading, because none of them resembles even remotely the perfume of that name.

of the anatomy of an unlocalized specimen, supposed to be from Formosa but probably representing *H. m. ferreogrisea*, reported that it smelt "like a badger" (Proc. Zool. Soc. 1879, p. 305). It is true that he described the anal glands as only about the size of peas; but anal glands of normal size sometimes have offensive secretion, as in weasels and stoats, although the secretion is not so copious as in species, like the ratel (*Mellivora*), in which the glands are enlarged.

In the second place Tickell, in his MS. account of a specimen of typical *H. personata* from Thayetmyo, stated that, although the animal was kept chained to a small tree in his compound, it remained uninjured in spite of the "wolf-like Burmese pariah dogs" which nightly roamed about his grounds. He attributed its safety to "its utter fearlessness and ability to defend itself," but it is clearly ridiculous to suppose that the little creature, hardly as big as a rabbit, could defend itself with its teeth and claws against even one such dog as Tickell described. It is, moreover, to be noted that this author, without being aware that fearlessness is commonly associated with warning coloration and special means of defence, laid stress upon the manifestation of that attribute by his specimen, which, "when excited, erected the hairs on its tail into a brush and fearlessly attacked anything that came near it .... and was seen once or twice to make a stealthy, but swift rush at a native's naked foot, inflicting a severe bite, and so suddenly that the eye could scarcely follow its motions." Three specimens of the same race that Shortridge had were, however, "not aggressively savage, and would allow themselves to be handled, though when irritated they would snap at anything, and hang on to it like a true badger." Toleration of handling was clear evidence of fearlessness; and probably Pope meant fearless when, as recorded by G. M. Allen, he described the Chinese race, *H. moschata moschata*, as apparently "stupid," adding that it is very tenacious of life, as attested by the difficulty of killing it by strangling, the usual method adopted by the Chinese of destroying mammals. Tenacity of life is another familiar attribute of poisonous or nauseous, warningly coloured animals.

Subfamily MELINÆ.

Badgers.

Large, heavily built representatives of the Mustelidæ, with the coat long and harsh and thickened in winter with wool; the body short and broad, the tail short, from less than one-fourth to about one-third the length of the head and body, and usually less than twice that of the hind foot, sometimes a little more; the legs short and stout, the paws broad, fossorial, mostly naked beneath, and armed with long strong claws, especially the fore feet, the pads granular or coriaceous, not striate, the carpal and metatarsal pads separated from the plantar pad; the head with a prominent snout, large, naked rhinarium, with no philtrum, but deep infranarial portions, small eyes, small simple ears, without bursa, and facial vibrissæ comparatively poorly developed; a well-developed glandular pouch just above the anus * and sometimes involving it; the colour very characteristic, the back typically greyish owing to the bold black and white, or buff, banding of the contour-hairs, belly never conspicuously light, the tail like the back or paler, the legs blackish and the face mostly white or buff, with a blackish band extending from the muzzle over the eye to the ear, which has a pale tuft above, the combination making a conspicuous "mask."

The skull, which has a thin-walled bulla, with the cavity undivided and closed behind, as in the Martinæ, varies a good deal in the two genera. In *Meles*, the typical Badger, it is

* In both sexes of the European Badger (*Meles taxus*) there is a tolerably deep sac, glandular but lined with hair, between the anus and the root of the tail. The glands of this pouch copiously secrete a sticky but not particularly foul-smelling fluid, which stains the surrounding integument and hairs black. In the male at least the sides of this pouch are deeper than the middle, which forms a sort of low partition between the two deeper portions; and in both sexes the pouch is defined behind by a flap of skin separating it from the anus, which is itself sunk in a shallower depression, and the anal glands discharge their secretion just within the anal orifice as in other Mustelidæ. There is evidence that the Japanese and Tibetan Badgers (*M. m. anakuma* and *M. m. leucurus*) resemble the typical species in the character described. That the Hog-Badger (*Arctonyx*) is somewhat similarly provided was first recorded by Evans (Journ. As. Soc. Beng. viii, p. 408, 1839), who said "[there] is a caudal pouch directly under the origin of the tail . . . but quite distinct from and wholly unconnected with the anus or genital organs. The sac is formed by duplicate folds of the common integument, having a lining of naked membrane, secreting a brown, unctuous matter, not unlike cerumen or wax of the ear."

tolerably normal, differing mainly from that of the Martinæ in having the muzzle relatively longer and more robust, the anterior nares and infraorbital foramina larger, the orbits smaller, but with the facial portion from the postorbital processes to the tip of the premaxillæ shorter than the cranial portion from those processes to the occipital crest; the zygomatic arches are stouter, less arcuate and less salient in the orbital region; the postdental part of the palate is longer and the occipital region broader and shorter; the mandible has its postdental part more elevated, as indicated

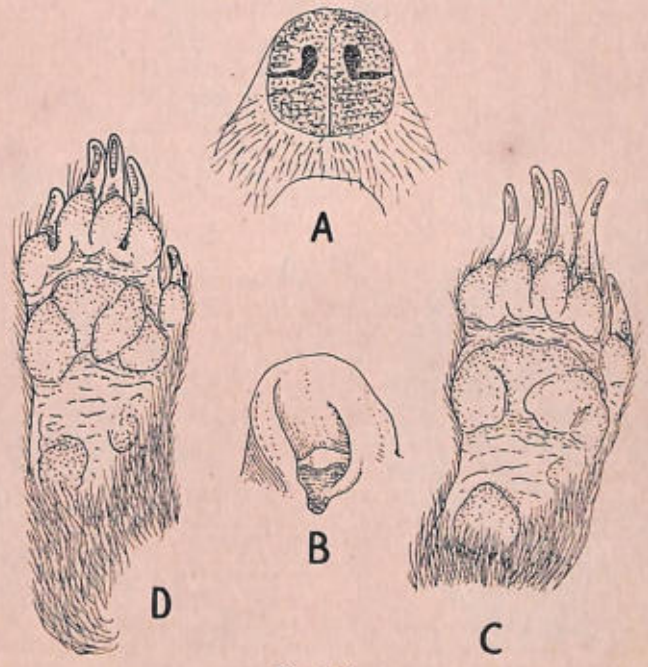


Fig. 103.

A. Rhinarium of the Hog-Badger (*Arctonyx collaris consul*) from the front. (Drawn, like B, C and D, from dried skins.)
B. Right ear of the same.
C. Lower side of right fore foot of the same.
D. Lower side of right hind foot of the same.

by the angular process being raised considerably above the line of the inferior edge of the dental portion.

In *Arctonyx*, the Hog-Badger, the skull presents many peculiarities distinguishing it from that of *Meles*, of which it is a highly specialized type. The facial portion is longer, the distance from the tip of the premaxillæ to the postorbital

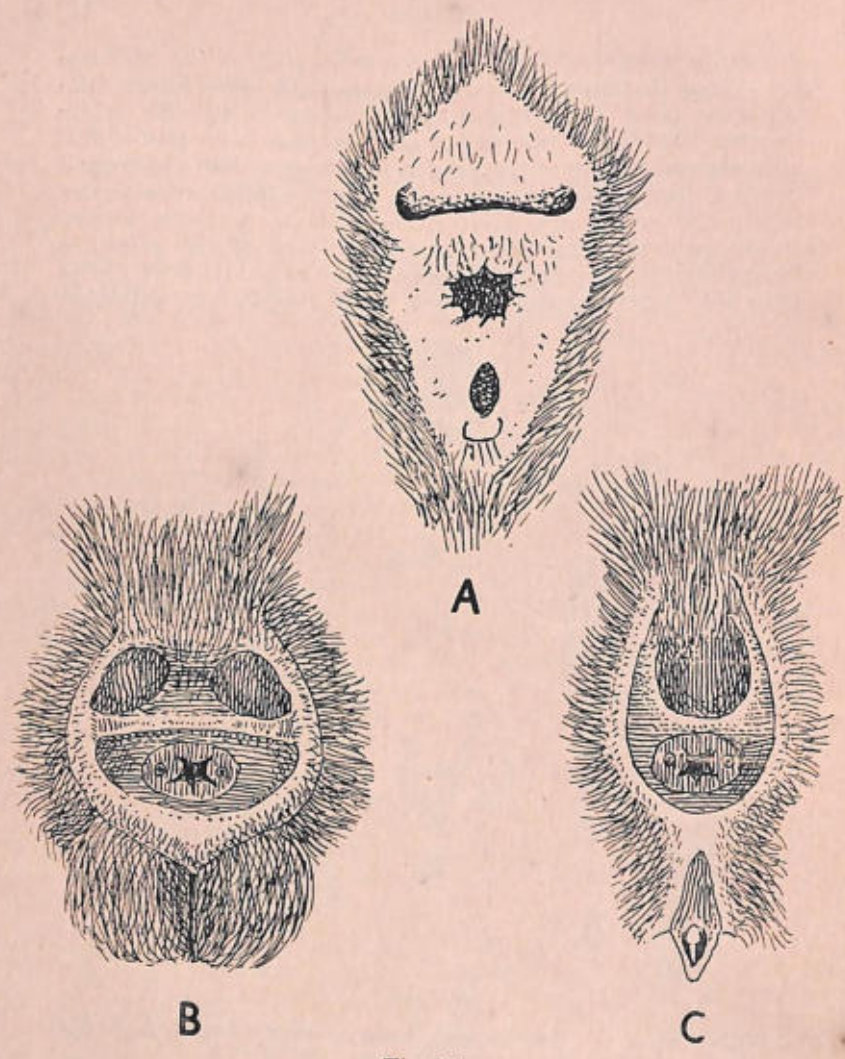


Fig. 104.

A. Anal and genital area of adult ♀ Hog-Badger (*Arctonyx collaris*), showing the orifice of the subcaudal anal sac closed above the anus, with the vulva below the latter. (Drawn from a dried skin.)

B. The same of ♂ Common Badger (*Meles meles*), showing the sac distended above the anal sac, which contains the anus with the apertures of the anal glands on each side of it, the two sacs encircled by a rim of skin capable of closing over both ; the scrotum below the anal sac.

C. The same of ♀ Common Badger (*Meles meles*) with the vulva below the anal sac. (Figs. B and C drawn from fresh British specimens.)

processes exceeding the distance from them to the occipital crest; the forehead is more elevated and often inflated with air-cells; the mesopterygoid fossa is roofed almost to its posterior end by the extension of the postdental part of the palate, so that the posterior nares are only a little in advance

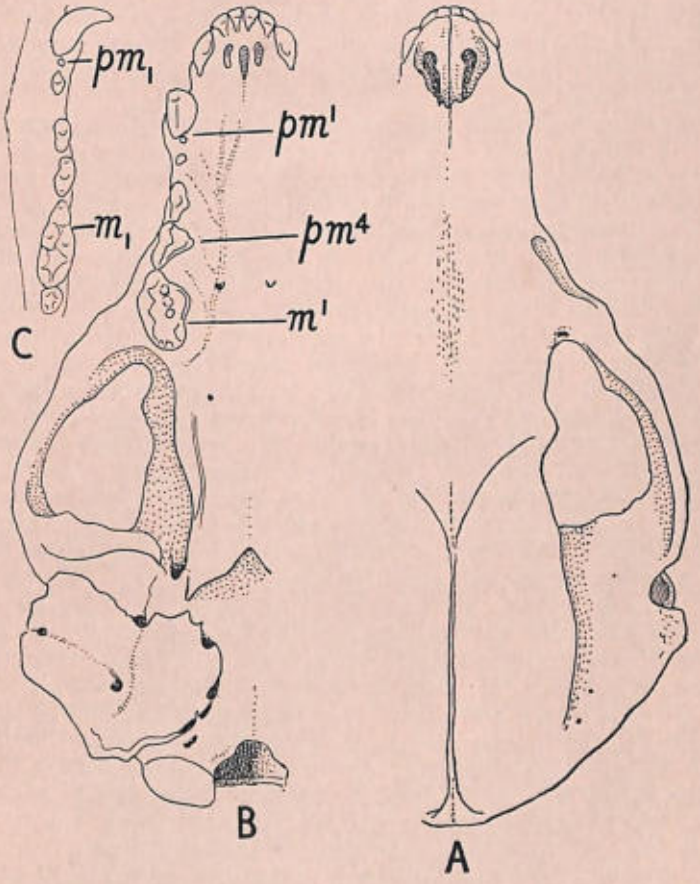


Fig. 105.

A. Right half of upper side of adult ♂ skull of *A. collaris consul* (type) from Toungoo.

B. The same from below, showing especially the greatly extended postdental portion of the palate, the wide mastoid and auditory tube and the teeth (pm^1, first minute premolar, pm^4, fourth premolar or upper carnassial, m^1, the enlarged upper molar).

C. Lower teeth of the right side of the same (pm_1, first minute premolar; m_1, first molar or lower carnassial).

(All figs. $\frac{2}{3}$ nat. size.)

of the auditory bullæ, the pterygoid bones being greatly expanded internally and meeting to form a median notch or angle, also the anterior part of the postdental palate is more or less inflated with air-cells; the mastoid processes are very salient, almost or quite as wide across as the zygomatic arches, and the auditory tube is correspondingly long and wide; the postdental portion of the mandible is much more strongly elevated, the inferior edge being strongly convex posteriorly, and the angular process lifted above the level of the teeth.

The dental formula in both genera is primarily $i.\frac{3}{3}, c.\frac{1}{1}, pm.\frac{4}{4}, m.\frac{1}{2}$, but the minute first upper premolar is often lost in adult skulls; the upper incisors form a strongly curved line, more strongly in *Arctonyx* than in *Meles*; pm^2, pm^3, and pm_2, pm_3, pm_4 are normally trenchant, with a large main cusp, but pm^4, the upper carnassial, has a large triangular, sometimes rounded inner lobe, broad at the base and provided with two or three small cusps, often early obliterated by wear; its outer portion bears a large conical cusp in front joined by a ridge to a lower posterior cusp; m^1 is very large, more than twice the area of pm^4, rhombic or rhomboidal in outline, and, when unworn, showing at least three well-developed outer cusps, a median curved row of about three cusps, and a well-developed inner cuspidate or crenulate rim; m_1, the lower carnassial, is very large, its anterior portion with three large cusps, the postero-internal cusp (metaconid) being about as large as the others, the heel, or talonid, broad, with a cuspidate margin; m_2 much smaller, roundish and cuspidate (fig. 105, p. 421).

Of the other subfamilies of British Indian Mustelidæ, the Melinæ come nearest to the Helictidinæ, which they resemble in their long claws and probing snout, but they are more specialized in characters adapted to fossorial life, such as the heavily built body, short strong legs, broader paws, with granular, not striate, pads, short tail, and the suppression of the bursa on the ear, a further difference being the presence of the glandular pouch associated with the anus at the root of the tail beneath. In the skull the chief difference between the two groups lies in the excessive development in the Melinæ of the upper molar, which greatly exceeds the upper carnassial (pm^4) in size.

The likeness in external form between the Badgers and the Ratel (*Mellivora*), described on p. 454, is striking, but is apparently purely adaptive to similarity in fossorial habits, the dentition of the Ratel being entirely different.

The two genera composing this subfamily may be readily distinguished by the following external features :—

a. The glandular pouch at the base of the tail below involving the anus; the cheek with no dark stripe running from the corner of the mouth to the ear; the throat black..... [p. 450. MELES Briss.,

a'. The glandular pouch not involving the anus; a dark stripe extending from the corner of the mouth to the ear; throat pale..... [p. 423. ARCTONYX F.Cuv.,

The cranial differences are more strongly pronounced, the principal being as follows :—

a. The occipital region not noticeably expanded, the mastoid width much less than the zygomatic width; the tubular auditory meatus comparatively short and narrow; mesopterygoid fossa normal..... [p. 450. MELES Briss.,

a'. The occipital region expanded, the mastoid width nearly equal to the zygomatic width, the auditory meatus long and wide; the mesopterygoid fossa roofed posteriorly by the greatly expanded pterygoid bones..... [p. 423. ARCTONYX F.Cuv.,

Genus **ARCTONYX** F. Cuvier.

Arctonyx, F. Cuvier, Hist. Nat. Mamm. pt. 51, pl., 1825 (and of subsequent authors, including Blanford).
Trichomanis, Hubrecht, Notes Leyd. Mus. xiii, p. 241, 1891.

Type of *Arctonyx*, *collaris* F. Cuv.; of *Trichomanis* *, *hœveni* Hubrecht.

Distribution.—From China, Tibet and the eastern HIMALAYAS through ASSAM, BURMA, Indo-China and Siam into the Malay Peninsula and Sumatra.

The essential characters of this genus are given above under the description of the subfamily, and need not be repeated.

Hog-Badgers are nowhere plentiful in British India. All the specimens available for examination were collected singly in different localities, a considerable number of them being immature. In China they seem to be more abundant, and G. M. Allen, who discussed in 1929 the races occurring in that country, had sufficient material to prove that many of the characters supplied by skins and skulls and relied on by previous authors for distinguishing supposedly different kinds are purely individual variations, without systematic value. The British Museum also has a tolerably good collection from southern China, and my examination of the specimens entirely bears out Allen's conclusions. The data they furnish may reasonably be applied to the Hog-Badgers of British India, which, although represented by fewer skins and skulls, exhibit

* Based upon an imperfect specimen regarded by its describer as related to the Pangolins (*Manis*), but with the scales represented by hairs.

considerable variations in coat and colour and cranial and dental characters. On the upper and outer sides of the body the coat when in good condition consists of long, rather coarse and loose contour-hairs overlying a varying amount of underwool. But it varies considerably with the season. The wool may be entirely absent on the back and flanks, the coat then being thin, sometimes very short and harsh and composed of the contour-hairs alone, which may themselves be scanty when the moult is in progress. On the head and legs the hair is always short and smooth, and the belly is scantily haired, without wool; but the tail varies greatly from being full and bushy, broad at the base but tapering at the end, to very short haired and nearly uniformly cylindrical and slender throughout after the moult.

The colour above is typically a mixture of black and white or buff, yielding a generally greyish appearance due to the contour-hairs being extensively pale, usually white at the base, black or brown in the middle, and whitish or buff at the end; but there is usually a good deal more black or brown in the hairs on the shoulders and fore back than on the hind quarters *. The pale, usually whitish wool may be concealed by the contour-hairs when abundant and lying close and flat; but it is frequently exposed when they are disturbed or scanty. The tail is normally whitish above and below, but its base may be invaded by black to a small extent. The fore legs from above the elbow and the hind from above the hock are black or deep brown and the claws are horn-coloured. The under side from the chest to the inguinal region is brown or blackish in the middle line, but laterally blends with the grizzled flanks. The head-pattern, constituting "the mask," is as shown below on p. 440, but it varies individually a good deal in details. The median pale frontal band may stop short on the crown or may pass back on to the nape and blend with it; the summit of the pale collar is usually sharply defined with black behind the ear, but occasionally in poor-coated skins it blends with the pale nape. Still more variable individually is the stripe that crosses the cheek. At its best it runs as a thick band from the main facial stripe in front of the eye and from the area behind the chin to the ear, forming the lower border of a pale patch of varying size beneath the eye; but it may be thin and separated from the main facial stripe at either or both ends, so that there is no isolated patch below the eye. The rhinarium is generally, perhaps always, pink. A suggested explanation of the main

* Not uncommonly in some skins of the southern Chinese Hog-Badger the contour-hairs of the whole of the back are black at the tip; but this melanic variation is not known to me in British Indian skins.

features in the colouring of the Hog-Badger, namely, that it is for advertisement, is given below (p. 448).

The skull is also individually variable, showing with age the alterations normal in Carnivora, namely, expansion of the mastoid region, of the zygomatic arches and of the interorbita.

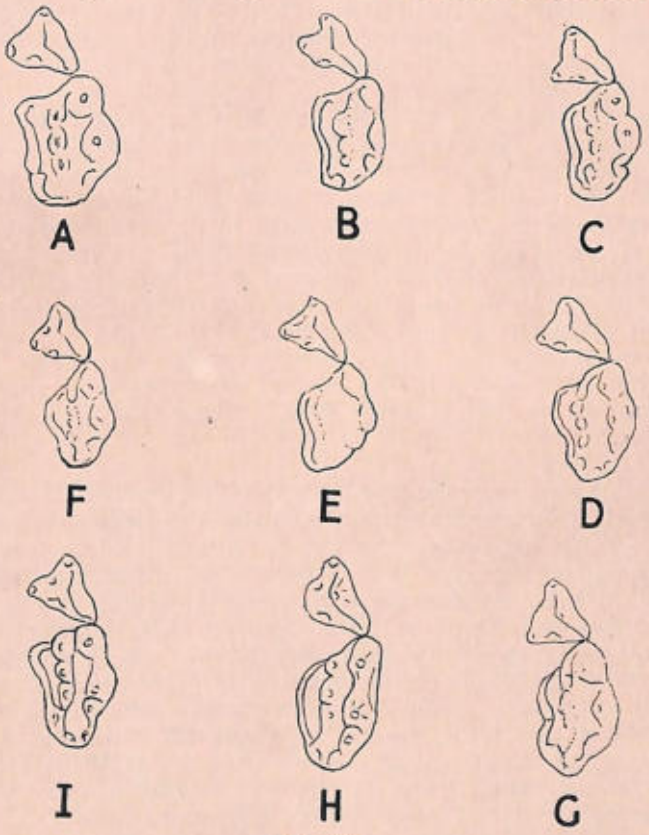


Fig. 106.

Figures illustrating the individual variation, partly due to wear in the size and shape of the upper carnassial and molar of the left side of skulls mostly referred to *A. collaris consul*. (All figures approximately nat. size.)

A. Adult ♂ from Bengal (Hardwicke).
B. Young ♂ from Longpa, Naga Hills, Assam.
C. Young ♂ from the Jaintia Hills, Assam.
D. Young ♂ from N.W. of Kindat, Burma.
E. Old ♂ (type of *A. c. consul*) from Toungoo, Burma.
F. Young ♀ from Lockaw, Karenni, Burma.
G. Young ♂ from Nhatrang, Annam (type of *A. c. nemæus*).
H. Young ♂ from Toungoo, Burma, for special comparison with E.
I. Young ♀ from Falam in the Chin Hills, Burma.

area, and constriction of the postorbital area. In young skulls the temporal ridges are well marked, gradually approaching as age advances, and finally fusing to rise into a sagittal crest which is probably present in old individuals of both sexes. The forehead and the postdental part of the palate are sometimes greatly inflated with air-cells, even in youngish skulls; but the degree of inflation of both regions varies individually, as G. M. Allen has shown in the case of the southern Chinese race.

More remarkable still is the individual variation in the size and shape of the two upper cheek-teeth, pm^4 and m^1. These variations are partly due to wear, but by no means wholly. From the available material it seems that these teeth vary individually in *Arctonyx* more than in any other species of Carnivore, at all events from British India. In most Carnivores they are tolerably constant in form within specific limits; but in the case of *Arctonyx*, if systematic importance were attached to their differences, the number of named forms, already too large, could be greatly increased. The individual variation in the case of the upper molar is well illustrated by the two skulls from Toungoo referred to below (p. 442).

In his account of the Hog-Badgers of British India Blanford, following Blyth and Anderson, admitted two species—a larger, *A. collaris*, extending from the Eastern Himalayas through Burma, and a smaller, *A. taxoides*, which, occurring in Assam and Arakan, invades the area occupied by the larger but does not blend with it. The evidence that there are two kinds distinguished by size is satisfactory; but I am unable to agree with Blanford with regard to their characters, distribution and names. A further point about which there is some doubt is the status, specific or subspecific, that should be assigned to them. Judging solely from the available British Indian specimens, I can find no positive evidence that they intergrade; but I suspect they will prove to do so, and consequently give them the lower rank, thus agreeing with the presumed opinions of G. M. Allen and W. Osgood that the Hog-Badgers of continental south-eastern Asia are referable to a single species, *A. collaris*, which locally varies greatly in size and other characters.

I am unable, however, to accept Allen's subspecific application of the name *collaris* (Amer. Mus. Novit. no. 358, p. 10, 1929; and Mamm. China and Mongolia, p. 404, 1938) *. He

* In his ascription of this name and his citation of *isonyx* as one of its synonyms Allen seems to have been influenced by Anderson's erroneous statement that the type of *isonyx* came from Tibet and by Wroughton's statement (Journ. Bomb. Nat. Hist. Soc. xxvi, p. 347, 1919)



Hog-Badger (*Arctonyx collaris*).



Indian Ratel (*Mellivora capensis indica*).

applied it to a race of Hog-Badger which he thought was found all over Southern China, and spread thence into the Eastern Himalayas, whence the type of *collaris* came—to be precise, from "the hills between Bhutan and India." As its oldest synonyms he cited *albogularis* Blyth (Journ. As. Soc. Beng. xxii, p. 590, 1853); *obscurus* M.-Edwards (Rech. Mamm. p. 388, 1868–1874), both from Eastern Tibet, and *isonyx* Horsfield (Proc. Zool. Soc. 1856, p. 398, pl. 1), given to a specimen from the Sikkim Tarai. Neither the skull- nor the flesh-measurements of typical *collaris* were recorded, and no Hog-Badger seems to have been subsequently received from Bhutan; but racial identity between the Hog-Badgers of the Bhutan Duars and the Sikkim Tarai must be considered so highly probable that no further justification of the conclusion that *isonyx* is a synonym of *collaris* is needed; and since the type of *isonyx* is racially distinguishable by its smaller size and other characters from all the southern Chinese Hog-Badgers I have seen, namely, specimens from Shensi, Szechwan, Yunnan, Ichang, Hong Kong and elsewhere, it follows that *collaris* cannot be applied to them. For this Chinese race the oldest available name appears to be *albogularis* Blyth, with *obscurus* M.-Edw. as a synonym; and after examining the types of *orestes* Thomas (Proc. Zool. Soc. 1911, pp. 27 & 688) from Shensi, and of *incultus* Thomas (Ann. Mag. Nat. Hist. (9) x, p. 31, 1922) from Chinteh near Anhwei, I agree with G. M. Allen that the characters on which those forms were based fall within the limits of individual variation.

85. **Arctonyx collaris** F. Cuvier. The Hog-Badger.

The principal bibliographical references to the species are quoted under the subspecific headings and elsewhere in the text.

Vernacular *:—*Báhla-súr* (bear-pig, sometimes, but probably erroneously, spelt *Bála-súr*, sand-pig), Hindi; *Chomhuvho*, *Thembakso*, Naga; *Nuloang*, Kuki; *No-ok*, Manipuri; *Quado-waildu*, Mug; *Khwe-htu-wet-hti*, Arakan; *Khwe-ta-wek-wek-ta-wek* or *Khwe-tu wet-tu*=dog and pig (Peacock), Burmese.

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that the greatest length of the skull in *collaris* is 135 mm. Wroughton, however, was unacquainted with any skull of *Arctonyx* from the eastern Himalayan area, and seems to have thought the southern Chinese specimens in the British Museum were true *collaris*. He also referred to *collaris* the skull of a young ♀ from Karenni which has the occipital area so smashed that its length can only be very roughly guessed. This I refer to the larger British Indian race.

* The distribution in "Bengal," Assam, Arakan and Chittagong of the two kinds of Hog-Badgers found in British India is not well enough known for me to apply these names with certainty to the particular races.

Since *Arctonyx* is here regarded as monotypical, *i. e.*, represented by a single species, the specific characters are the same as the generic, which have been sufficiently described under the subfamily heading.

Distribution.—The same as for the genus, with the omission of Sumatra.

The two British Indian forms here admitted may be briefly distinguished as follows :—

a. Size small, head and body approximately 2 ft. in length, skull with its condylobase not known to reach 120 mm. (less than 5 in.), and the teeth smaller ..... *collaris* Cuvier, [p. 428.

a'. Size large, head and body about 2½ ft. long, skull with its condylobase over 150 mm. (over 6 in.), teeth larger ..... *consul* Pocock, [p. 436.

85 *a*. **Arctonyx collaris collaris** F. Cuvier.

Arctonyx collaris, F. Cuvier, Hist. Nat. Mamm. pt. 51, pl., 1825 ; and of many subsequent authors, including Gray, Anderson and Blanford, but only in part.

Arctonyx taxoides, Blyth, Journ. As. Soc. Beng. xxii, p. 591, 1853 ; Anderson, Zool. Res. Yunnan, p. 196, 1878 ; Blanford, Mamm. Brit. Ind. p. 180, 1888 ; W. L. Sclater, Cat. Mamm. Ind. Mus. pt. 2, p. 291, 1891.

Arctonyx isonyx (Hodgson MS.), Horsfield, Proc. Zool. Soc. 1856, p. 398, pl. 1.

Arctonyx collaris taraiyensis, Hodgson, Cat. Mamm. etc. ed 2, p. 7, 1863 (no description).

Arctonyx collaris collaris, Pocock, Journ. Bomb. Nat. Hist. Soc. 41, p. 463, 1940.

Not *Arctonyx collaris collaris*, G. M. Allen, Amer. Mus. Novit. no. 358, pp .10–11, 1929 ; and Mamm. China and Mongolia, p. 404, 1938.

Locality of the *type* of *collaris*, Bhutan Duars ; of *taxoides*, Assam ; of *isonyx* and *taraiyensis*, the Sikkim Tarai.

Distribution.—The Sikkim Tarai and Bhutan Duars to Assam.

Notes on the synonymy.—The synonymy of this race is a little doubtful owing to the skull of the type of *collaris* being unknown. Cuvier's account was derived from a description sent to him by Duvaucel, who saw two specimens alive in the menagerie at Barrackpore and reported that they came from the " hills between Bhutan and India." No other specimens seem to have been recorded from that district ; but the locality forcibly suggests racial identity between Cuvier's type and the Hog-Badger which Hodgson in his MS. named *Arctonyx isonyx* vel *taraiyensis* and recorded from the Sikkim Tarai *.

* Not the Nepal Tarai as stated by Horsfield nor Tibet as stated by Anderson (Zool. Res. Yunnan, p. 198, 1879).

The skin of Hodgson's specimen, a ♀, is in the British Museum ; but there is no skull. Fortunately, however, Hodgson gave some figures of the skull in his MS., and these attest the small size of *isonyx* (see fig. 108, A, B, p. 433).

By Blyth, Anderson, Blanford and W. Sclater, *A. taxoides* was regarded as a species distinct from *A. collaris*. But these authors assumed, upon what evidence I cannot ascertain, that *collaris* was the name for the larger British Indian Hog-Badger, the commonest form to the east of the Bay of Bengal (see p. 436). Blyth distinguished *taxoides* from this form by its longer, finer coat, narrower muzzle, smaller ears, shorter tail, much smaller skull and a few other particulars. Anderson confirmed his diagnosis, with some additions ; but both these authors were wrong in claiming the skull to be fully adult. Sclater's verdict rested mainly on some peculiarities in the structure of pm^4 (see p. 431). But in view of the known individual variability in the skull and teeth in Hog-Badgers, I do not think the evidence supplied by single specimens is sufficient to separate even subspecifically the types of *taxoides* and *isonyx*. and the latter, for geographical reasons, is probably *collaris* *.

The smallest of the races of *Arctonyx*, with the head and body probably at most up to about 2 ft. long and the skull up to about 120 mm., and further distinguished from the other British Indian race by the fuller winter coat. From the southern Chinese race *A. c. albogularis* (see p. 427), judging from specimens in the British Museum, it differs by its smaller size, paler colour, on the average, and shorter winter coat. In *albogularis* the contour-hairs are on the average more heavily and extensively pigmented with black and between October and January range from about 80 to over 100 mm. in length. The skull is considerably larger, the total length being about 135 mm., as shown in the table of measurements (p. 435).

The type of *collaris*, according to Cuvier's figure, was in summer coat, judging from its cylindrical, short-haired tail ; the colour was pale, all the contour-hairs of the back and flanks being extensively whitish and yellowish at the tip ; the median facial band spread over the forehead, blending with the pale nape ; the lower cheek-stripe joined the dark lateral facial band in front of the eye but fell far short of it

* I am greatly indebted to Dr. Baini Prashad, the Director of the Zoological Survey of India, Calcutta, for the loan of the type of *taxoides* and other specimens of *Arctonyx*, as well as of *Helictis*. The type of *taxoides*, a mounted specimen, with the skull separate, shows nothing distinctive about the colour or snout, as now preserved ; the tail is imperfect at the tip, which may account for Blyth's statement that it is short ; but the ears admittedly appear a little small on the dried skin.

below the ear. The skin of a young specimen from Darjeeling (Indian Museum, Calcutta) closely resembles the type in general colour, the contour-hairs, about 50 mm. long, being extensively pale tawny at the tip ; the underwool is very scanty ; the tail is thinly haired, but more fully than in the type, and the collar and the pale areas of the mask are deeper and richer yellow in hue, the only very noticeable difference being in the lower cheek-stripe, which fuses with the black below the ear but in front rises from the chin and is separated from the black in front of the eye.

The type of *isonyx*, from practically the same locality as the last, is very different. The winter coat (February) is long and thickened, with abundance of white wool which is exposed owing to the comparative scantiness of the contour-hairs which are for the most part black at the tip * and close on 70 mm. long ; the median facial band extends on to the nape, but the collar is hardly defined above, blending with the nape ; the tail is thickly covered with hairs about 40 mm. long.

The type of *taxoides*, like that of *isonyx*, is a darkish skin with the coat full, soft and long, the wool being abundant and the contour-hairs about 75 mm. on the body and 60 mm. on the tail ; the general colour is brownish with a grey cast, due to the buffy-grey hue of the contour-hairs, and the creamy wool showing in patches ; the dark bands of the mask are brown † ; the cheek-stripe joins the upper dark stripe both in front of the eye and below the ear, circumscribing a large pale patch below the eye ; the pale median band of the mask is scarcely traceable on the crown between the ears (fig. 110 A, p. 440).

A skin ‡, labelled Bengal (? Chittagong), differs principally from Cuvier's type and from the skin from Darjeeling in being in winter coat ; the contour-hairs, nearly 80 mm. long, have extensively silvered tips, but the abundant white wool is exposed to a great extent ; the median white band of the face extends on to the nape and blends with it, but the lower cheek-stripe is comparatively indistinct.

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* This is due in a great measure, I believe, to the breaking off of the pale tips, many of the hairs being blunt-pointed, and all of them are harsh to touch. A few have long, whitish and some darkish tawny tips.

† This tint, like the brown hue of the back, is probably faded from black during the time the specimen has been exhibited in the Indian Museum, Calcutta. The pale areas of the mask, described by Blyth as richer yellow than in the large species he thought was *collaris*, have also no doubt faded.

‡ This skin, received from the East India Co., was entered in the register as from Bengal ; but when it was exhibited in the gallery its stand was marked " Chittagong ". Although Chittagong in those days was part of Bengal, I can find no conclusive evidence that the animal came from Chittagong.

No flesh-measurements have been recorded, but the dimensions (in English inches) of the three available skins are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.
Sikkim Tarai (*isonyx* type) ; ad. ♀....	25	5	3
Assam (*taxoides* type) ; yg. ad. ♀ ...	22¼	5¼	3
" Bengal " (? Chittagong) ; ad. ♀ ...	21½	4½	3

The measurements of the types of *isonyx* and *taxoides* were taken " over the curves," the two specimens having been mounted for exhibition in the gallery. The example from " Bengal," formerly mounted, is now a flat skin. They are probably stretched in the head and body rather than otherwise, and " over the curves " measurements always exceed those taken in a straight line.

The skull of the type of *taxoides* (fig. 107 A, B, p. 432) is not fully adult, although stated to be so by Blyth and Anderson. The basioccipital suture is quite unfused and the maxillary and nasal sutures are still open. It is abnormal in being " undershot," the lower incisors overlapping the upper by 5 mm., and the lower canines are correspondingly in advance of the upper and close on the outer side of the outer incisor, not behind it as in normal skulls. The temporal ridges in the middle of the upper side of the skull are about 15 mm. apart. The postdental part of the palate is moderately well inflated, 21 mm. wide, and the greatest width of the palate outside m^1 is 36 mm. This tooth is normal in form except that the anterior inner shoulder is rather unusually prominent ; but the upper carnassial is abnormal * ; the anterior cusp is at the front of the crown and the inner lobe is widely rounded and has at most a faint trace of the posterior cusp (fig. 108, D, F, p. 433).

The skull from Bengal (Chittagong) is older than that of the type of *taxoides* and is obviously almost full-sized, the basioccipital suture being fused, although visible, and on the face there are only traces of the nasal sutures in front. It is considerably longer in total length than the typical skull of *taxoides*, but the mandibles of the two are very nearly the same length. In accordance with its greater age the occipital crest is better developed, the zygomatic, mastoid and interorbital widths are greater, the postorbital width is the same, the temporal ridges are stronger and closer together, about 9 mm. apart on the middle of the cranium. The maxillary cheek-teeth are longer, 28 mm. as compared with 26 in the typical skull of *taxoides*. The muzzle, however, is narrower, as shown by the measurement of the maxillary width, and the width of the palate outside m^1 is only 33 mm. Also the post-

* As pointed out by Sclater.

dental part of the palate is less inflated, 19 mm. wide, and the entire palate is more hollowed mesially throughout its length. The upper molar is very similar in size and shape in the two skulls, but the inner shoulder is a little less salient in the Bengal (Chittagong) skull. The upper carnassial in the latter is normal in shape ; its outer cusp is not at the anterior end of the crown, as in the type of *taxoides*, and the inner lobe is not so widely rounded and has a well-developed posterior cusp.

In Hodgson's unpublished drawings there are figures of the dorsal and lateral views of the ♀ skull of the type of *isonyx*

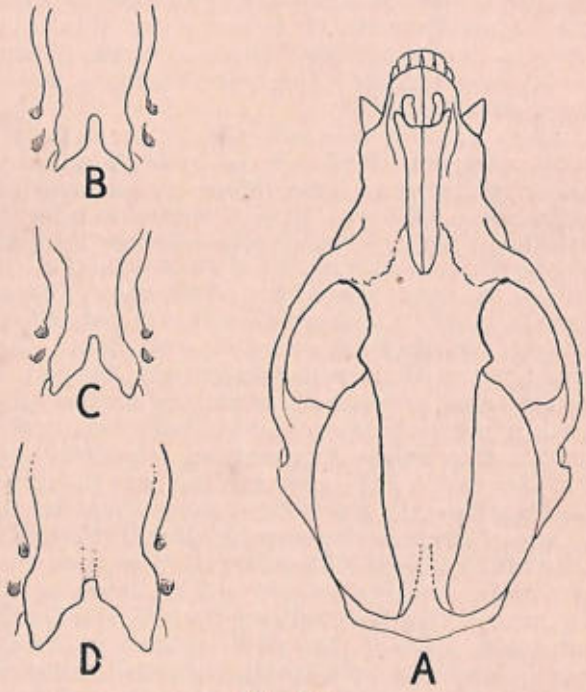


Fig. 107.

A. Upper side of subadult ♀ skull of the type of *taxoides* (=*collaris*).
B. Postdental area of palate of the same.
C. The same of just adult ♀ of *A. c. collaris* from " Bengal " (East Ind. Co.).
D. The same of young ♀ skull of *A. c. consul* from Lockaw, Karenni, showing the great expansion with air-cells.

(All figs. ⅔ nat. size.)

which are evidently fairly accurate and said to be two-thirds natural size. The measurements in the table (p. 435) are taken from these drawings, which show the skull to be about the same size as the skull of the type of *taxoides*. Hodgson

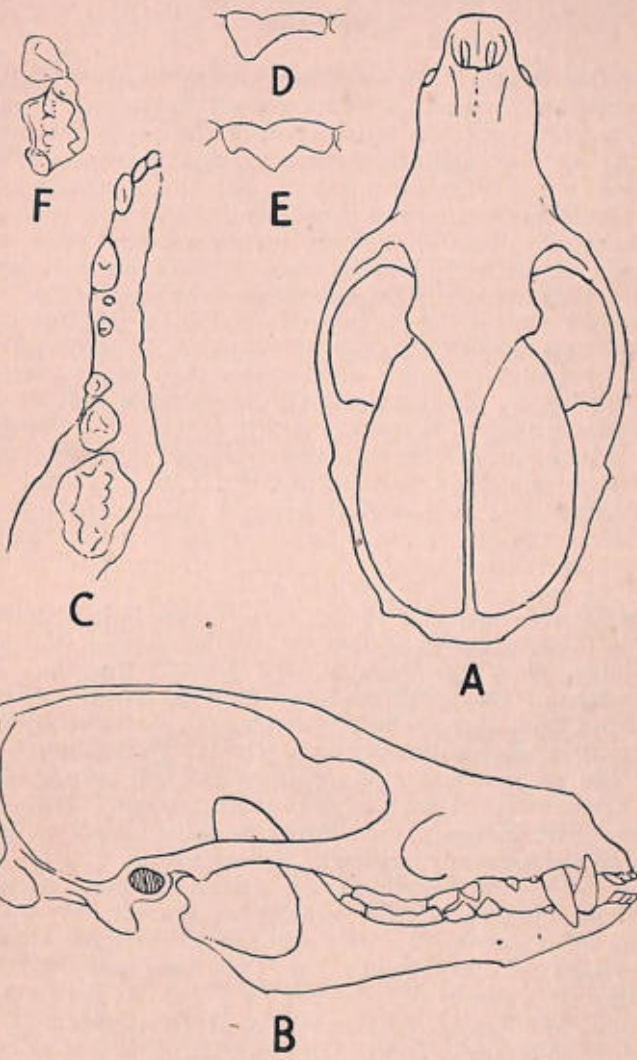


Fig. 108.

A. Upper side of apparently adult ♀ skull of type of *isonyx*, traced from Hodgson's unpublished figure, said to be ⅔ nat. size.
B. Side view of the same, with the same history.
C. Upper teeth of the right side of the same, apparently nat. size, with the same history.
D. Outer view of the worn left upper carnassial (pm^4) of the type of *taxoides*, showing the abnormal anterior position of the main outer cusp. (Twice nat. size.)
E. The same unworn tooth of young specimen of *A. collaris*, showing the normal shape of the tooth. (Twice nat. size.)
F. Upper pm^4 and m^1 of left side of the type of *taxoides*. (Nat. size.)

stated that it was "young"; but it was clearly nearly, if not quite, adult, as indicated by the well-developed occipital and sagittal crests, the constriction of the postorbital area, and the complete absence of sutures, apart from those of the anterior end of the nasal bones. But the zygomatic and mastoid widths are narrow for a skull with these crests so well marked. He also drew figures on a larger scale, presumably meant to be natural size, of the upper and lower teeth. They are nearly the same size as the teeth of the type of *taxoides* and of the specimen from Bengal (Chittagong); but the upper molar, if accurately depicted, is abnormal in shape and position, being rotated so that the anterior external shoulder lies on the inner side of the posterior end of the carnassial instead of in front of it. It is noticeable, however, that this tooth (pm^4) has a widely rounded inner lobe very like that of the type of *taxoides* (fig. 108, A, B, C, p. 433).

To show at a glance the inferiority in the size of the skulls of *collaris*, the dimensions of some of the southern Chinese form, *albogularis*, have been entered in the table on the following page.

The measurements of the skulls of *albogularis* contained in this table, apart from that of the one marked *obscurus*, are taken from specimens in the British Museum. The dimensions of that skull are taken from M.-Edwards's figure of a skull from Shensi which he assigned to *obscurus*, the type of the latter being a skin from S.E. Tibet. This skull was not fully adult, since its occipital suture was still open. When fully grown it might have reached about 140 mm. It may be assumed that the type of *orestes* from the Tsing Ling Mountains, S.W. Shensi, certainly represents the same form.

The teeth of the skulls in the British Museum, which I assign to *albogularis*, differ greatly in shape. The upper molar, for instance, in some skulls from Yunnan has the antero-internal edge oblique, so that the antero-internal shoulder is considerably behind the level of the antero-external shoulder, as in some of the skulls of the Burmese race next described. In the type of *orestes* it is less oblique, in the type of *incultus* still less, and in the skull from Hong Kong the inner shoulder is nearly on a level with the outer, as in the same tooth of the skull from "Bengal" referred to below and illustrated in fig. 106, A, p. 425.

Allen's table of skull-measurements suggests that there may be more than one race of Southern Chinese Hog-Badgers. In a good series from Fukien, for instance, he shows that ♂ skulls range from 138 to 155 mm. in total length, and that a ♀ skull was 139½. The chief interest of these records lies in the evidence supplied of intergradation in size between *albogularis* and the larger, more southern races of continental Asia next considered.

Skull-measurements (in mm.) of *Arctonyx collaris collaris* and of *A. c. albogularis*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Mastoidal width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	pm^4.	m^1.	m_1.
A. c. collaris.											
" Bengal " (E. I. Co.); barely ad. ♀.	122	114	62	58	24	24	22½	80	7	13	14
Assam (*taxoides* type); subad. ♀ .	114	—	57	54	24	21	23	79	7	13	14
Sikkim Tarai (*isonyx* type); ad. ♀..	114½	110½	56	—	22½	22½	21½	(80±)	6	13	14
A. c. albogularis.											
Hong Kong; ad. ♂ ?.....	137	134	84	69	33	31	31	98	9	15	16
Ichang; ad. ♀	136	131	76	65	30	29	25	93	9	15	16
S. Shensi (*orestes* type); ad. ♀.....	133	130	71	70	31	28	28	89	9	16	17
Anhwei (*incultus* type); ad. ♂	132	124	80	—	—	—	—	91	—	15	15
Shensi (*obscurus*); yg. ad. o.....	134	—	74	72	27	—	27	96	8	16	16

85 *b*. Arctonyx collaris consul Pocock.

Mydaus collaris, Gray, in Hardwicke's Illustr. Ind. Zool. i, pls. 6 & 7, 1830.

Arctonyx collaris, Horsfield, Cat. Mamm. E. I. Co. p. 114, 1851; Blyth, Journ. As. Soc. Beng. xxii, p. 591, 1853; Gray, Proc. Zool. Soc. 1865, p. 681, fig. (skull); id., Cat. Carniv. etc. Brit. Mus. p. 124, fig. (skull), 1869 *; Blanford, Mamm. Brit. Ind. p. 178, 1888 (excluding *isonyx* from synonymy); W. Sclater, Cat. Mamm. Ind. Mus. pt. 2, p. 290, 1891. (Not typical *A. collaris*, as identified above, and not *A. collaris collaris*, G. M. Allen, Amer. Mus. Novit. no. 358, p. 10, 1929.)

Arctonyx collaris consul, Pocock, Journ. Bomb. Nat. Hist. Soc. xli, p. 465, 1940.

Locality of the *type*, Thaundaung, near Toungoo, 4,500 ft., in Lower Burma.

Distribution.—Assam, Chittagong, Burma (at least from Mogok to N. Tenasserim).

Distinguished from the foregoing subspecies, *A. collaris collaris*, by the considerably larger size, both of the head and body and of the skull, by its longer tail, which is about one-third the length of the head and body and about twice the length of the hind foot, and at least in its typical form by having the winter coat less thickened with underwool. It is also larger and has the winter coat much thinner than the Southern Chinese and Tibetan race, *A. collaris albogularis* (=*obscurus*); but it is smaller on the average, both in body-dimensions and skull, and has the tail relatively longer than the provisionally admitted Annamese race, *A. collaris annæus*, and still smaller, especially in the skull, than the Malayan race, *A. collaris dictator*.

Notes on the Synonymy.—By Gray, Horsfield, Blyth, Blanford, and Sclater the larger of the two British Indian forms of *Arctonyx* was identified as *collaris*. The skin of Hardwicke's specimen figured in 1830 by Gray and described by Horsfield in 1851 has disappeared; but the skull, labelled "India, Hardwicke," which was described by Horsfield as from "Bengal" † and figured, reduced in size, by Gray in 1865 and

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* In these two publications Gray cited *Mephitis assamensis* McClelland as a synonym of *Arctonyx collaris*; but he misquoted the page and postdated by twenty years the volume in which McClelland published it. The correct reference is: *Mephitis asamensis*, McClelland, Ind. Rev. ii, p. 509, 1838. It is, however, a mere list-name, without description, and consequently unavailable. It seems, moreover, much more probable that the name was given to a Ferret-Badger (*Helictis*) than to a Hog-Badger (*Arctonyx*). McClelland would surely have assigned a specimen of the latter to *Meles*; and the likeness between a Ferret-Badger and a Skunk (*Mephitis*) is obviously much closer than between a Hog-Badger and a Skunk.

† Bengal in those days covered a wide area, including Chittagong. I suspect that Hardwicke's specimen came from some locality to the east of the Ganges and Brahmaputra, possibly from Chittagong.

1869, is still in the British Museum. As the table of measurements shows (p. 445), its condylobasal length exceeds 150 mm. (6 in.), which is approximately the dimension quoted by Blyth, Blanford and Sclater as distinguishing this larger Hog-Badger from the smaller kind *taxoides*, in which the total length of the adult skull is less than 5 in. On the assumption, for the reasons given above, that this application of the name *collaris* was incorrect, this larger Hog-Badger required a new name.

As stated above, the skin of Hardwicke's specimen, labelled "Bengal," has disappeared; but according to the figure it was in summer coat, the tail being short-haired and cylindrical. It was apparently pale in general colour, the frontal band was continued over the crown on to the nape, and the cheek-stripe was well developed and thick, passing from the muzzle and lower jaw to the ear and defining a long, narrow pale patch above it. Another specimen known to me only from the



Fig. 109.

Arctonyx collaris consul; copied from a figure by Tikell of a specimen from Moulmein. (From Blanford.)

figure (unpublished) is the one Tickell described from Moulmein. This also was apparently a pale specimen and had a slender tail. If accurately drawn it was peculiar in two respects. It had no black hair in front of the shoulder forming the hind border of the collar so conspicuous in other skins, and in the mask, although the cheek-stripe was very similar to that of Hardwicke's specimen, there was no dark band encircling the eye below.

In addition to the type, an adult ♂ collected by J. M. D. Mackenzie at Thaundaung, near Toungoo, 4,500 ft., on May 5, I have seen skins which I assign to this race from the following localities:—Lockaw in Karenni, 2,500 ft., March (E. W. Oates); Ruby Mines, Mogok (H. C. Smith); 30 miles north-west of Kindat, May 29 (J. M. D. Mackenzie); Falam in the Chin Hills, 5,000 ft., Dec. 31 (J. M. Wright); Chittagong Hills (J. Jarbo); Hot Springs in the Jaintia Hills, 2,400 ft.,

July (H. W. Wells); Longpa in the Naga Hills, 3,000 ft., Dec. 26 (J. P. Mills), and "Assam" (Capt. Butler). Although seasonal changes in the coat are shown by specimens collected at different months of the year, only one skin was obtained at each locality.

It is unfortunate that the skins labelled Assam, the Nagas and Jaintia Hills are immature, as shown by their skulls, and that the one from the Chittagong Hills has no skull to show its age, because it is in these districts that intermediates between this large race and typical *collaris*, as above defined, may be expected to occur, if they exist. It is a mere inference that the specimens in question belong to this subspecies. All that can be definitely stated about them is that the skulls belonging to the Assamese skins are too large for *collaris*, as shown by the table of measurements (p. 445), and that the skin from the Chittagong Hills, which has no skull, looks too large for that race.

The following notes on the skins illustrate the individual differences in the coat and colour. The one from "Assam," a cub, undated, has the coat harsh, close, curly and very short, hardly surpassing 12 mm. ($\frac{1}{2}$ in.) in length, and the tail is thin and cylindrical. There is hardly any black on the nape or sides of the neck, so that the summit of the collar is undefined. The winter skin from the Naga Hills has the coat over 60 mm. long and thickened with some underwool; the back is grizzled throughout but finely on the shoulders, which are blacker than the loins. The summer skin from the Jaintia Hills has the coat rather shorter, about 50 mm., and thinner, without wool; it is grizzled all over, so extensively on the hind back that the hairs are nearly all pale, the nape and shoulders being darker.

The winter skin from Falam in the Chin Hills, with nearly the same date as the one from the Naga Hills, has the coat woolly and about 63 mm. long, but the contour-hairs have harsh and curled tips and are scanty on the hind back, showing the wool; over the fore back and shoulders they are very dark, with indistinct short paler tips, suggesting breaking off from brittleness as in the skin of the type of *isonyx*. The skin from 30 miles north-west of Kindat, May, has the coat about 65 mm., with a little wool; the general colour is much paler than in the skin from the Chin Hills, the pale speckling being buff on the nape and fading to nearly white on the loins, the underhair being also white. The undated skin from the Mogok Ruby Mines has hardly any underwool, but the coat is full and about 70 mm. long; the general colour is darkish, the hairs of the nape and fore shoulders having tawny tips, those of the fore back brown tips, so that this area is nearly black, and those of the hind back and loins having their tips

extensively buffish-grey; but the hair at the base is sandy, not white. The skin of the type, an adult ♂ from Thaundaung, near Toungoo, 4,500 ft. (J. M. D. Mackenzie), May 5, closely resembles the one from Mogok in coat and colour, except that the base of the hairs is white, as in the skin from north-west of Kindat. The specimen from Lockaw, Karenni, differs strikingly from the last two in its decidedly paler colour, associated apparently with the moult, there being scarcely a trace of the dark band in the contour-hairs of the loins.

To illustrate the variations in the development of the head-pattern or "mask," figures are given (p. 440) of the heads of two skins showing the greatest and the least amount of black. The skin from Longpa in the Naga Hills is exceptional in having the black extending over the muzzle above and below to the rhinarium *. Apart from this the mask seems to resemble tolerably closely that of Hardwicke's "Bengal" skin figured by Gray, except that the pale frontal band narrows rapidly on the crown instead of sweeping broadly over the nape. In the other skins the end of the snout and the lower jaw are pallid. In the skin from Karenni the band over the eyes arises on the side of the muzzle and is exceptionally narrow beneath the eye, almost as in the Moulmein specimen figured by Tickell; the cheek-stripe arises in front behind the chin, but is very narrow and fails to meet the black below the ear, so that the pale patch on the cheek beneath the eye is very extensive and runs from the mouth to join the collar behind. Other skins are intermediate between these in the pattern of the head; but no two are alike.

Two additional large Hog-Badgers have been described from districts to the south and east of Burma; and either or both of them may be found within the limits of British Indian territory.

The first is *A. dictator* Thomas (Ann. Mag. Nat. Hist. (8) v, p. 424, 1910), based upon a huge old ♀ from Lamra, Trang, in the northern part of the Malay Peninsula (Robinson & Kloss). For its specific status Thomas relied mainly upon the large size of the skull, considerably larger than that of adult ♂♂ of the more northern Hog-Badgers he referred to as *collaris* † and *obscurus*. This conclusion was confirmed later by the skull of another example, an adult ♀, from Sai Yoke in Peninsular Siam (Gairdner). The dimensions of these two skulls

* In the sketch I have left the rhinarium pink, as it usually is, but it may have been black also. On the dried skin it is impossible to determine its colour in life.

† I am unable to ascertain what Thomas's conception of *collaris* was, unless he accepted the opinion of Gray, Blyth, Blanford and others on that point.

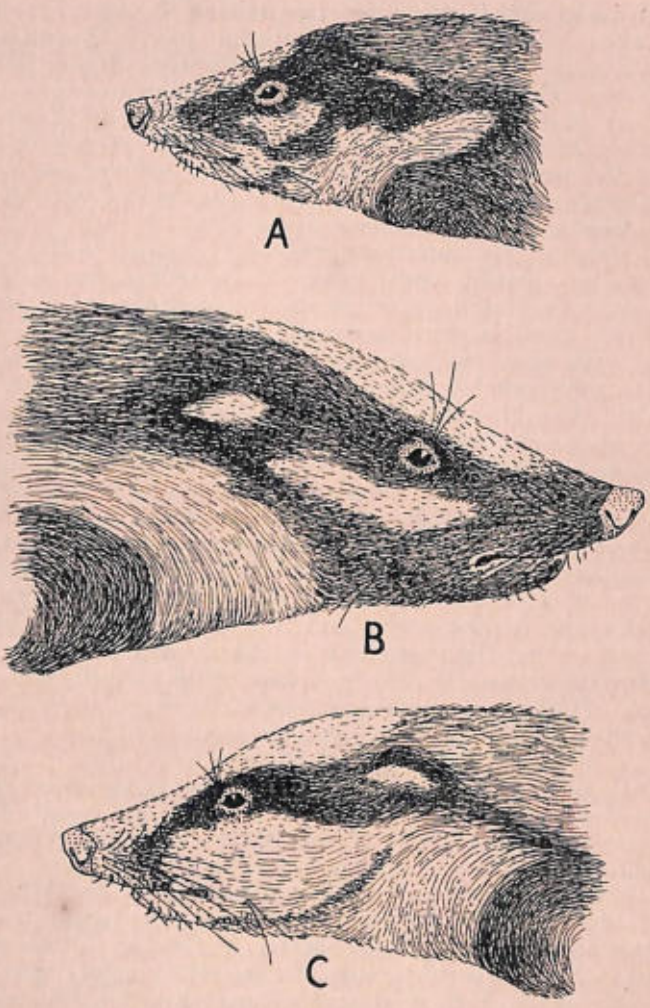


Fig. 110.

A. Head of *Arctonyx collaris collaris*, drawn from the type of *taxoides*.
B. Head of *A. c. consul*, drawn from a young adult ♂ skin from Longpa in the Naga Hills, showing exceptional development of the black pigment of the mask.
C. Head of *A. c. consul*, drawn from young adult ♀ skin from Lockaw, Kerenni, showing the greatest reduction of the black pigmentation of the mask in the available specimens of the race.

(These figures show approximately the relative sizes of the heads in the three specimens, judging from the skulls.)

are given in the table (p. 445). The flesh-measurements of the type also indicate superiority in size (see below, p. 442); and the colour of both the skins is richer than in any Burmese skins I have seen. In the type the collar, throat, and the band on the contour-hairs are ochreous, the underhair of the back is buff, the nape and shoulders are mostly black, and the mid-back and loins comparatively indistinctly speckled, the contour-hairs of the back, with a little wool at the base, being about 70 mm. long The skin from Sai Yoke is even more richly tinted, the underhair of the back being ochreous; but the dorsal surface generally is more speckled and there is less black on the shoulders But a very young specimen from Klong Wang Hip, Peninsular Siam, probably belonging to the same form, is much greyer, fitting in with Burmese skins.

The second large Hog-Badger was named *Arctonyx annæus* by Thomas (Ann. Mag. Nat. Hist. Hist. (9) vii, p. 524, 1921), the type being an immature ♂ from Nhatrang, Annam (Vassall). From its appearance Thomas judged that the undeveloped skull would have reached that of *dictator* in size. On that account he distinguished *annæus* from what he called *collaris* and *obscurus*, and he separated it from *dictator* mainly on account of its smaller and differently shaped upper molar tooth. The status of *annæus* is doubtful. The material I have of it is indistinguishable from that of the Burmese race, the skin of the type closely matching the skin from the Jaintia Hills, another from Phu-Qui, Annam (Delacour & Lowe) similarly resembling the one from the north-west of Kindat. The immature skull supplies no satisfactory data as to its potential size; but there is nothing distinctive about its teeth.

Osgood, however (Field Mus. Nat. Hist., Zool. xviii, p. 263, 1932), who had additional specimens from Laos and Annam, identified them as *A. collaris dictator*, evidently considering the evidence for the distinctness of *annæus* open to question. He published the flesh- and some skull- measurements of an old ♂ from Phong Saly in Laos *. Later he sent me the flesh-measurements and the cranial lengths of three unsexed examples from Thateng in Annam. From these dimensions, published below (p. 442), it will be seen that the average length of the head and body in the four specimens

* Noticing the unusual discrepancy between the total and condylo-basal lengths in this skull, I wrote to Osgood to inquire if both were correct. His answer (*in litt.*) was in the affirmative, with the explanation that the discrepancy was due to the exceptional development of the occipital crest. In the same letter he kindly gave me the particulars about the three specimens from Thateng.

from Laos * and Annam is very nearly the same as in the type of *dictator*, some being larger, others smaller; but that average is 9 in. longer than in the two adult ♂♂ of *consul*, of which the flesh-measurements were taken, and this difference is much too great to be dismissed as due to the "personal equation" of the measurers. It is mainly on this evidence that I regard the Burmese Hog-Badgers as distinct from the Annamese. The differences between the skulls are not so great, a few millimetres only on the average; but since the skulls of the southern race, *dictator*, so far as known, are bigger than those from Annam, I provisionally retain the name *annæus* for the Hog-Badgers of that country.

Only two of the above discussed British Indian examples of this Hog-Badger available for examination were measured in the flesh, namely, those secured by Mackenzie at Thaundaung, near Toungoo. As shown by the subjoined table, the dimensions of the adult are nearly the same as those of the adult ♂ from Moulmein recorded by Tickell; and both are decidedly smaller than the specimens of *annæus* from Laos and Annam and than the type of *dictator* entered with them. Their tails also are relatively longer, being about one-third the length of the head and body and twice the length of the hind foot.

Flesh-measurements (in English inches) of the three largest races of *A. collaris* :—

Name, locality and sex.	Head and body.	Tail.	Hind foot.
A. collaris consul.			
Thaundaung, near Toungoo (type); ad. ♂	31	10½	4⅜
Thaundaung, near Toungoo; yg. ad. ♂	25⅜	9½	4⅜
Moulmein (Tickell); ad. ♂	30	9	4⅜
A. c. annæus.			
hong Saly, Laos; old ♂	36⅜	9⅜	5
hateng, Annam; ad. ♀	37½	8½	5⅜
Thateng, Annam; ad. ♀	43½	8½	5⅛
Thateng, Annam; ad. ♀	44	8⅜	5⅛
A. c. dictator.			
Trang, Malay Peninsula (type); old ♀	41	9⅜	5

The only recorded weight known to me is that of the specimen from north-west of Kindat, a young ♂ with the head and body 24½ in. It was 14 lb.

The differences, largely a matter of age, between the two ♂ skulls from Toungoo (Mackenzie) are notable. The adult

* Osgood tells me (*in litt.*) that he thinks the dimensions of the Laos specimen may be untrustworthy; but I have accepted them as recorded.

skull of the type has no trace of sutures and has a sagittal crest 8 mm. high. The younger skull, which is imperfect but apparently about as long *, has all the sutures open, no sagittal crest, the temporal ridges being 10 mm. apart at their nearest point close to the middle of the crown, and the mastoid and zygomatic widths are considerably narrower. Especially instructive are the differences in the teeth; those of the adult type are, it is true, much worn, but quite clearly, before wear, they were much smaller than those of the young specimen (fig. 106, p. 425).

Hardwicke's skull from "Bengal" is very like the adult ♂ skull from Toungoo, but differs noticeably in having the mastoid processes bent downwards at the tips, which are about 10 mm. below the lower rim of the auditory orifice, whereas in the Toungoo skull they are not bent and project only slightly below that level. A minor difference is the lower sagittal crest, which is only 3 mm. high. The teeth also are very different, as shown in fig. 106 (p. 425). The young ♂ skull from N.W. of Kindat has the facial and basioccipital sutures open and the temporal ridges 22 mm. apart. The skull from the Naga Hills is apparently a little older than the last, but is very like it except that the ridges are better developed and only 10 mm. apart at their nearest point. The upper milk-canines are unshed and lie behind the incompletely erupted permanent canines.

According to Tickell the skull of his adult ♂ from Moulmein was 6¼ in. (158 mm.) in total length and 3¾ in. (95 mm.) across the zygomata. The skull, as depicted, is peculiar in one or two particulars. It is the only adult skull known to me in which the condylobasal length exceeds the length from the occipital crest to the tip of the premaxillæ, indicating a poorly developed crest. Hence Tickell's total length is the condylobasal length, which approximately equals that dimension in the three skulls from Thateng in Annam referred to above. But Tickell's figure is stated to be ⅝ nat. size. According to this indication the condylobasal length is only 153½ mm., about the same as in the adult ♂ skull from Toungoo. The measurements given in my table are computed from that statement. In addition to the poorly developed occipital crest, this skull is remarkable for the exceptional widths of the interorbital area and of the maxillæ, which give an unusually massive look to its facial part. It is possible, perhaps probable, however, that the peculiarities above mentioned are due to

* Its actual length is uncertain, because the beast was killed by a knock on the head which broke the back of the skull. As mended it is a little longer than the adult skull, but in life was no doubt shorter, judging from the mandible, which is 102 mm. as compared with 109 mm. in the type.

this Hog-Badger having been reared in captivity, a condition known to have a profound effect on the skulls of many Carnivores. Tickell stated that he had the animal alive for two years after receiving it from a monastery, where it had been kept as a pet from early cubhood.

The ♀ skulls I have seen are not mature. The largest, from Falam in the Chin Hills, 5,000 ft., entered in the table (p. 445) has the frontal region raised and the postdental area of the palate greatly expanded by air-cells, its width being 31 mm. In other respects, as well as in its teeth, it is normal. The second, from Lockaw, Karenni, has the same regions similarly expanded, but the frontal region is also swollen laterally, the postorbital and interorbital areas being unusually wide compared with the width of the maxillæ. It is also abnormal in being remarkably undershot, more so than in the type of *taxoides*, the lower incisors overlapping the upper by 7 mm. Also its molar teeth are unusually small, the upper molar being rhombic, with its four sides nearly equal, the tooth being very differently shaped from that of the skull from Falam (fig. 106, F, p. 425, and fig. 107, D, p. 432).

The measurements of the very young ♀ skull from the Jaintia Hills, which has all its sutures open and its teeth imperfectly erupted, are inserted for comparison with the measurements of the adult or nearly adult skulls of *A. c. collaris*.

The variations in the size and shape of the upper carnassial and of the upper molar (pm^4 and m^1) in individual skulls need no description, since they are sufficiently shown in fig. 106 (p. 425).

With regard to the skulls of *A. c. annæus*, the skull of the young type is nearly the same in total and condylobasal lengths as that of the young ♂ from N.W. of Kindat, a trifle longer indeed in its condylobase; but it is evidently much younger, the sutures being more open, the temporal ridges 28 mm. apart, the mastoid and zygomatic widths much less, and the postorbital processes less developed. Thomas guessed that when mature it would have equalled the length of the skull of *dictator*. It is, at all events, safe to say that it would have reached at least the length of the skulls from Thateng, which are 6 mm. longer in the condylobase on the average than the three adult ♂ skulls of *A. c. consul*.

The very old skull of the type of *dictator* is much heavier in the bone and broader across the zygomata than the younger, although adult, ♀ from Sai Yoke; but the latter has the frontal bones much more strongly inflated, and this, with a comparatively low sagittal crest, makes the upper surface of the crown nearly horizontal longitudinally, whereas in the skull of the type it is strongly arcuate between the interorbital area and the occipital crest. The teeth also, although much

Skull-measurements (in mm.) of *Arctonyx collaris consul*, *A. c. annæus* and *A. c. dictator*.

Name, 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.	m_1.
A. c. consul.										
Toungoo (type); ad. ♂	158	154	91	37	37	33	109	9½	15	17
Toungoo; yg. ad. ♂	(158±)	—	83	—	37	33	102	10½	18	20
Moulmein (Tickell MS.); ad. ♂	152	153½	94½	35½	41½	40	104	9½	14½	19½
"Bengal" (Hardwicke); ad. ♂ ?	157	152	93	35	36	33	110	10	18½	19
N.W. of Kindat; yg. ♂	144	139	78	37	—	32	101	9½	16	17
Longpa, Naga Hills; yg. ♂	144	—	78	35	29	29	—	10	16	—
Falam, Chin Hills; yg. ♀	145	—	76	36	31	28	98	9	16	18
Karenni, Lower Burma; yg. ♀	—	—	74	41	36	29	93	9	14	14
Jaintia Hills, Assam; very yg. ♀	122	118	57	32	32	24	81	9	15	15
A. c. annæus.										
Nhatrang, Annam (type); yg. ♂	143	141	71	34	—	30	96	10	16½	18
Thateng, Annam (3 specimens); ad. ?	159	159	—	—	—	—	—	—	—	—
Phong Saly, Laos; old ♂	168	155	87	—	34½	- -	—	—	—	—
A. c. dictator.										
Cambodia (Urbain); ad. ? *	172	—	—	—	—	—	—	—	—	—
Trang, Malay Penin. (type); old ♀	168	165	98	35	40	39	112	11	18	20
Sai Yoke, S.W. Siam; ad. ♀	170	164	86	35	36	35	116	10	17	18½
Klong Wang Hip, S.W. Siam; very yg. ♂	120	118	62	33	27	25	82	9	15	16½

* This skull from Cambodia was sent from Paris for determination.

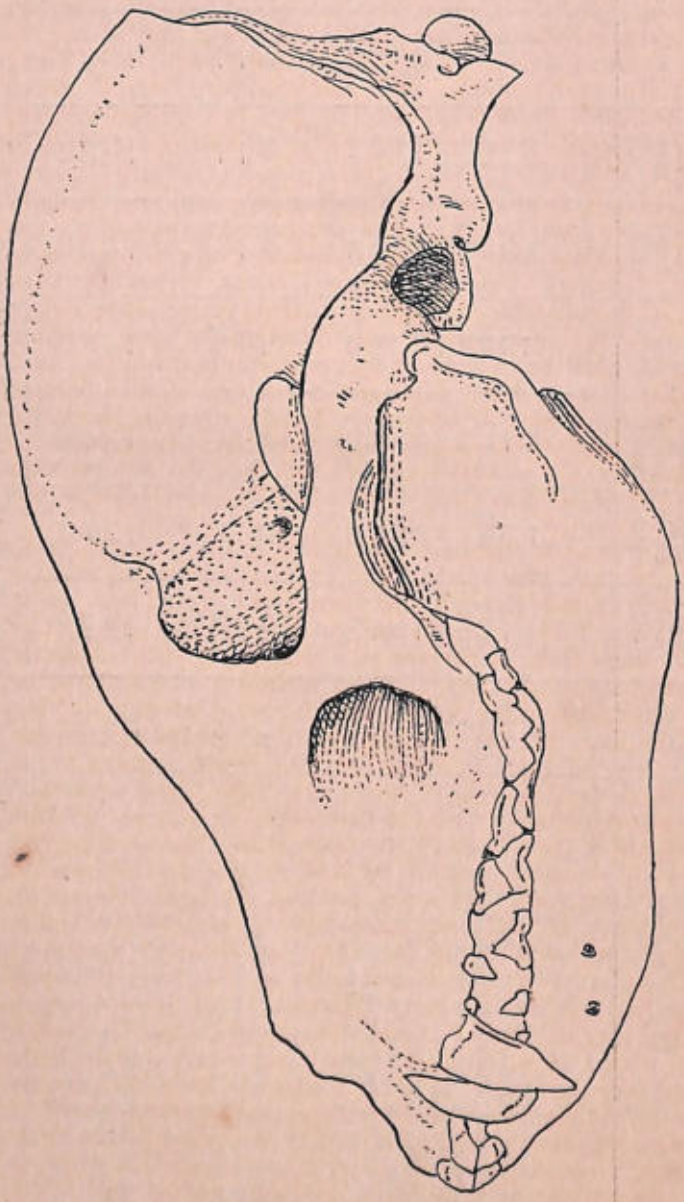


Fig. 111.
Side view of skull of ad. ♂ (type) of *A. c. consul* from Toungoo, Burma.

worn, are bigger in the type. At least 1 mm., perhaps more, has been worn off the posterior end of m^1, and the posterior half of this tooth is 13 mm. wide, exceeding that of the Sai Yoke skull by 2 mm. The very young ♂ skull from Klong Wang Hip in Peninsular Siam has noticeably smaller teeth than the skull from Sai Yoke. It may represent a smaller, different kind of Hog-Badger; but provisionally I refer it to *dictator*.

Habits.—It is known that Hog-Badgers, like true Badgers (*Meles*), are omnivorous in diet and nocturnal, spending the day in burrows they dig for themselves or in convenient natural shelters, like rock-crevices. But owing to their secluded mode of life, coupled with their rarity, apparent or real, very few observations have been made upon them in the wild state by European sportsmen or naturalists; such accounts as have been published have been mostly derived from specimens kept in captivity. Since the precise identification of some of the specimens whose habits have been described is uncertain, the available information may be put together under one heading as applicable to both the species contained in this volume.

In diet Hog-Badgers seem to differ considerably in their liking for particular foods. The typical example of *collaris*, observed in the Barrackpore menagerie, would eat meat, but preferred fruit, bread and milk. Tickell's example of *A. c. consul* from Moulmein ate voraciously meat, entrails, snakes and other reptiles, fish and plantains, but was fondest of earthworms, which it greedily devoured as fast as they could be dug up. On the other hand a specimen, probably of the same kind, from Arakan, kept by Evans, refused to eat meat or flesh of any kind, but would take bread and milk, and was particularly partial to plantains. A cub, of uncertain identification, from Tura in the Garo Hills, kept as a pet by Miss V. A. Jackson, was fed at first on rice and rice-water, which it ate noisily, like a pig, holding the bowl between its paws. Later it had two large tins of earthworms daily, showing the same liking for them as Tickell's specimen, as well as bread and milk and pudding. It also ate small centipedes and the contents presumably of reptiles' eggs, rejecting the "leathery" shells; but, unlike Tickell's animal, it was afraid of snakes and would not touch roots, fruits or vegetables. Under natural conditions Hog-Badgers no doubt use the pig-like snout for rooting, and Anderson observed a captive specimen in Calcutta employ the snout for crushing plantains. Judging too from the worn condition of the grinding teeth, sometimes even in comparatively young wild-killed specimens, hard fibrous vegetable substances most probably form important items in their diet.

Tickell's observation that his specimen had poor sight, and relied upon its scent for the investigation of substances, was confirmed by Miss Jackson in the case of her pet. The latter slept curled up like a hedgehog.

As suggested above (p. 425) no one can doubt that the colour of the body and tail and the bold pattern of the head and neck in Hog-Badgers subserve ready recognition and act as a warning to possible enemies that they are better left unmolested. When claiming, in 1909 (Proc. Zool. Soc. 1909, p. 955), that this interpretation is to be put upon the nearly identical coloration of the Common Badger (*Meles*), I wrote :— " Badgers are slow and leisurely in their movements and have earned a reputation for stupidity by the fearlessness and indifference of their manner to things in general. Their diet is mixed, but they subsist to a very great extent upon vegetable food. In no sense are they dependent for a livelihood upon the capture of wary mammals or birds. When attacked they are notoriously most savage and formidable antagonists, being gifted with exceptionally strong jaws, a thick, highly flexible and loose skin, and wonderful tenacity of life. They also possess stink-glands which exude a powerful and unpleasant odour. The scent of this secretion has given rise to the expression ' stinking brock,' and forms the basis of the well-known simile ' stinks like a badger.' At dusk, when Badgers emerge to feed, they are rendered conspicuous by the whiteness of the head " ; and I was often impressed by the ease with which the whereabouts of the animals, especially when on the move, could be detected late in the evening by the whiteness of the " mask " in the dim light of their cages in the Zoological Gardens.

Evidence that Hog-Badgers have two of the qualities, namely fearlessness and noisiness, that normally accompany poisonous or otherwise obnoxious and conspicuously coloured animals, is supplied by the published accounts of the behaviour of the captive specimens. The one in the Barrackpore Menagerie was very savage and, when irritated, uttered a peculiar growling sound, bristled its coat, and defended itself by squatting on its hind quarters and fighting with claws and teeth. Tickell noticed that his specimen when young was constantly repeating a series of four or five short, rapid, querulous notes, something like the " whinnying " of a colt. Later in life, when angry, it made a loud grunting noise and bit most severely, but it was never seen to raise itself on its hind quarters in self-defence. Miss Jackson's cub arched its back, raised its hair, and made a peculiar " sneezing " noise on the approach of a dog. The raising of the coat, recorded in the first and last cases, must add to the conspicuousness of

the animal by displaying the pale wool and the base of the contour-hairs. Tickell stated that he noticed no disagreeable smell connected with his specimen. This was confirmed by Miss Jackson, who said her cub had no smell at all. This probably only means that the animals did not discharge in the presence of their owners the secretion of the anal glands. I learn, on the contrary, from Mr. Mackenzie and from Mr. Willoughby Lowe that the recently killed specimens brought in to them by natives had a strong unpleasant odour; and Gairdner (Journ. Nat. Hist. Soc. Siam, i, p. 253, 1915) recorded that "two scent-glands were found discharging into the postcaudal [postanal] pocket. The secretion was brownish-yellow and the hind parts were stained by the flow, and the stench so pervaded the beast that the coolies were unable to eat it."

The genus is represented in Sumatra by *Arctonyx hoeveni* Hubrecht*, a small dark-coloured species with a thin short coat. There are two specimens in the British Museum. An adult ♂, from the Nina Estate, Dempoo, 4,000 ft., Aug. 8, is almost entirely black above, with a few inconspicuous white-tipped hairs on the loins and thighs, the hairs on the basal third of the otherwise white tail showing a black band; there is a narrow white stripe on the cheek below the eye; the pale frontal band is white up to the eyes, but on the forehead and crown it is speckled with black and tapers to a point between the ears. There is hardly a trace of wool and the base of the hairs is ashy-grey. An adult ♀ from Sungei Kumbang, Korinchi, 4,500 ft., April 4, differs in having the coat more woolly, the underhair creamy, and the loins and thighs with some of the hairs more conspicuously and extensively white.

The flesh-measurements (in English inches) of these specimens are :—

	Head and body.	Tail.	Hind foot.
♂	26	7½	?
♀	23½	6	3½

The condylobasal length of the skull of the ♂ is 124 mm.

It is curious that this most southern species of *Arctonyx* is almost exactly the same size as the most northern Chinese form, *A. collaris leucolæmus*, and is very much smaller than the giant Hog-Badger, *A. c. dictator*, of the northern part of the Malay Peninsula.

* Described by this author from a skin as *Trichomanis hoeveni* under the belief that it represented a hairy form of the Pangolin. It was later described and figured by Robinson and Kloss (Journ. F.M.S. Mus. viii, pl. 1, and *op. cit.* vii, pl. 5 (photo).

Genus **MELES** Brisson.

The True Badger.

At one or two points true Badgers (*Meles*) occur near the northern confines of British India, and may in the future prove to be an element in the fauna. These I regard as local races of the typical European species (*Meles meles*). The earliest named is *Meles meles leucurus* Hodgson (Journ. As. Soc. Beng. xvi, p. 763, 1847, under *Taxidea*), the type of which was from Lhasa. There are three skins of this in the British Museum, one of which, because it belonged to Hodgson's collection, was labelled "Nepal," perhaps by Gray. There is no reason to believe that any of them came from Nepal. Although there is a good deal of black on the dorsal area, these skins represent a noticeably pale race. The coat is long and full, the contour-hairs being up to about 95 mm. The wool, and at least the base and tip of the contours, are yellow or white; the flanks are mainly white, the frontal band passes over the nape, and the tail is yellow, although stained with pale brown at the sides. Hodgson described the pale hue in his fresh specimen as "yellowish-white." He assigned this Badger to the totally distinct American genus *Taxidea* because of the entire absence above and below of the first premolar, which he erroneously thought was always present in *Meles meles*. He also stated that *leucurus* was distinguished from the European form by its much longer tail, about one-fourth the length of the head and body, and by the hairy clothing of the heel of the hind foot. But in the European form the tail may exceed one-fourth the length of the head and body and the heel may be covered with hair.

In the Museum of the Bombay Natural History Society there is an adult ♂ of this Tibetan badger collected by Col. F. M. Bailey at Gyantse on Jan. 6. The back from the nape to the root of the tail is black and silvery-white, the sides of the neck and flanks are mostly cream-white, with a few dark flecks near the limbs; the wool and the tail are creamy-buff and the head is yellowish. The coat is full and long, about 75 mm.

The flesh-measurements (in English inches) of Hodgson's type and of Bailey's specimen are as follows:—

Locality and sex.	Head and body.	Tail.	Hind foot.
Lhasa (type); ad. ♀	27	7	3¾
Gyantse; ad. ♂	24	8	4½

Despite the differences in the flesh-dimensions, due in part probably to differences in method of measurement, the head and body of Hodgson's specimen being measured possibly "over the curves," the skulls of the two are exactly the same total length, 127 mm., Bailey's example having a condylobase

of 122 mm. The skull of an old ♀ from the "plains to the north of Sikkim" (Mandelli) has the condylobase 113 mm.

The Chinese Badger (*Meles meles leptorhynchus* M.-Edw.* Ann. Sci. Nat. viii, p. 374, 1867, and Rech. Mamm. p. 190, pl. 25) may turn up in Upper Burma. The type came from Pekin, but the race appears to be widely distributed throughout China. There are skins in the British Museum from the following localities:—Yu-lin-fu (Anderson) and Paoclu (Hugh), both in Shensi; Sui-ling (Maw); 30 miles south of Tsinan in Shantung (Hindle); Shanghai (Styan); Amoy (Swinhoe), five, including the type of *chinensis* Gray (Proc. Zool. Soc. 1868, p. 207); Foochow (La Touche); Hong Kong (Harlan); and the promontory north of Hainan (Delacour). The general colour of the upper side is on the average very noticeably darker than in *leucurus*, the facial band is seldom traceable beyond the ears, and the tail is for the most part like the loins, not considerably paler, as in that race, and the coat is not so long, although it varies greatly in luxuriance seasonally. In the series from Amoy, collected in June, August, September and November, the contour-hairs range from about 45 to 50 mm.; there is no underwool in the August and September skins, a moderate amount in the June and November skins. The skin from Shantung, May 5, has a thicker coat than the Amoy skins and the contours are about 55 mm. In the skin from Yu-lin-fu, Shensi, May 11, the coat is still more luxuriant, the wool being thicker and the contours up to 70 mm. long. One of the skins from Shanghai, December, has the contours 60 mm. and plenty of wool; another from the same locality, but undated, has the coat as luxuriant as in the Shensi skin, the wool being quite as thick and the contours 66 mm. These particulars are given because of Gray's claim that the Amoy skins he named *chinensis* were shorter coated than the type of *leptorhynchus*. But his type of *chinensis* was the September skin with a comparatively short coat and no wool, and in the subsequently received November skins the coat has not attained its full winter length and thickness.

The flesh-measurements (in English inches) of the adult ♀ from Yu-lin-fu, Shensi, are :—Head and body 22½; tail 4⅜; hind foot 4, suggesting a shorter tail than in *leucurus*.

The condylobasal length of the skull in an adult ♂ from Amoy is 119 mm., in an adult ♀ from Shantung 116 mm., and in two adult ♀♀ from Amoy 113 and 111 mm. respectively; but in the

* Although Ognev regarded this badger as specifically distinct from *Meles meles*, I agree with G. M. Allen (Amer. Mus. Novit. no. 358, p. 11, 1929) in considering it to be a local race of that species. Allen briefly described it with some synonyms, without mentioning localities. Apparently an example of the same badger from Szechwan was identified by Osgood as *Meles meles leucurus* (Field Mus. Nat. Hist. Zool. xviii. p. 261, 1932).

adult ♀ from Shensi it is 120 mm., indicating considerable variation in size.

A race of doubtful status which may extend into Baluchistan is the Persian Badger, *Meles meles canescens* Blanford (Ann. Mag. Nat. Hist. xvi, p. 310, 1875, and 'Eastern Persia,' ii, p. 44, pl. 3, 1876). The type came from Abadeh, between Shiraz and Ispahan, 7,000 ft., and another specimen from Ispahan, 5,000 ft. I am quite unable to distinguish the skin of a topotype in the British Museum from the skins of the Tibetan race, *Meles meles leucurus*. The resemblance is no doubt due to adaptation to a similar environment. Differences may occur in the skull, which I have not seen, but Blanford's figure and description of it supply no satisfactory diagnostic characters.

A race of badger which may perhaps spread as far south as Chitral was first recorded from Kashgar by Blanford (Second Yarkand Miss., Mamm. p. 25, 1879). He thought the skin represented a new species, but did not name it, contenting himself with the remark that it differed from *taxus* (=typical *meles*), *canescens*, *leucurus* and *leptorhynchus* by the stoppage of the white frontal stripe before reaching the ears. This is not always true of *leptorhynchus*. The skin was probably a representative of the race later described as *tianschanensis* by Hoyningen-Huene (Zur. Biol. Est-landsch. Dachses, pp. 63, 68, 1910) which Ognev (Mamm. East. Eur. & North. Asia, ii, p. 476, 1931) regarded as a race of the Chinese Badger, *M. leptorhynchus*, giving full specific status to this form.

Subfamily MELLIVORINÆ.

The Ratels or Honey-Badgers.

Resembling the Melinæ in the shape of the body, the shortness of the tail and limbs and the fossorial, plantigrade feet with broad, coriaceous plantar pads and long claws, especially on the fore feet, but differing in the following external characters: The muzzle is not produced and snout-like, the rhinarium being unmodified for rooting and having a shallow area beneath the nostrils; the pinna of the ear is reduced to a thickened ridge; the internal carpal pad is greatly enlarged and separated from the plantar pad by a narrow groove, and the two metatarsal pads, also separated from the plantar pad by a narrow groove, are fused and cushion-like; there is no subcaudal pouch, the anus is sunk in a deep pit of thickened, radially grooved, coriaceous skin, and the anal glands are enlarged, their nauseous secretion serving the same defensive purpose as in the Skunks (fig. 112, p. 453, and fig. 115, p. 461).

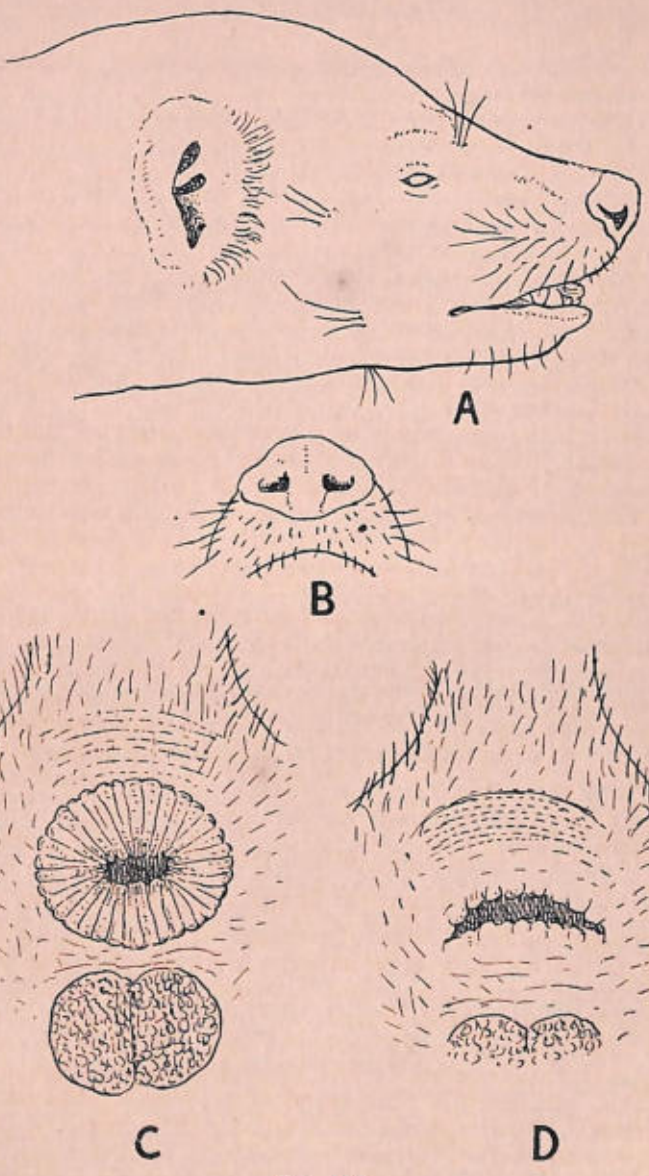


Fig. 112.

A. Side view of head of ♂ Ratel (*Mellivora capensis*).
B. Front view of rhinarium of the same.
C. Anal area of the same showing the anal sac expanded, with the anal orifice in its centre and the naked scrotum beneath.
D. The same with the anal sac nearly closed.

(Figures drawn from an African specimen in the Zoological Gardens.)

The skull in its short, broad muzzle and palate and small infraorbital foramen differs from that of the Melinæ, and resembles the skull of the Mustelinæ; but its cranial portion is higher and shorter than in the latter, and the paroccipital and mastoid processes are much more salient, the mastoid width being approximately equal to the zygomatic width, very much as in *Arctonyx*; but it differs from the skull of both these subfamilies in that the cavity of the long, strongly inflated bullæ open behind into the hollowed mastoid. The teeth, which are of the trenchant, predatory type, are entirely different from those of the Melinæ, resembling in all essentials the teeth of the Mustelinæ in shape and relative size and also in number, except that the second lower molar is usually absent, the dental formula then being *i.* $\frac{3}{3}$, *c.* $\frac{1}{1}$, *pm.* $\frac{3}{3}$, *m.* $\frac{1}{1}$ (fig. 113, p. 455).

Genus **MELLIVORA** Storr.

The Honey-Badger or Ratel.

Mellivora, Storr, Prodr. Meth. Mamm. p. 34, 1780; and of all recent authors.
Ratellus, Gray in Griffiths's Anim. Kingd. v, p. 118, 1827 (subgenus of *Gulo*).
Ratelus, Bennett, Gardens and Menag. Zool. Soc. p. 13, 1830.
Ursitaxus, Hodgson, Asiat. Res. xix, pt. 1, p. 61, 1836.
Melitoryx, Gloger, Gemein. Naturg. i, p. 57, 1841.
Lipotus, Sundevall, K. Sv. Vet.-Akad. Handl. p. 211, 1842 *.

Typical form of *Mellivora, ratel* Sparrman (=*capensis* Schreb.); of *Ratellus, ratel* (=*capensis* Schreb); of *Ratelus, mellivorus* (=*indicus* Kerr); of *Ursitaxus, inauritus* Hodgson; of *Melitoryx, capensis* (here selected); of *Lipotus, mellivorus* (=*capensis*).

Distribution.—Africa, mainly south of the Sahara, but ranging as far north as Suakin on the eastern side; South-western Asia (Arabia, Persia, and, it is alleged, Transcaspia); India at least from the North-western Frontier Province, Nepal, Rohilkund, and the Upper Provinces of Bengal, southward to "Madras"; but absent from Ceylon, Assam, and Burma.

* With the exception of *Ratellus*, which was unaccountably omitted, the names cited in this synonymy were quoted by Gray (Cat. Carn. etc. Brit. Mus. p. 132, 1869). But he claimed to have proposed the name *Ratelus* in the 'Annals of Philosophy,' 1825, without giving the page. I have failed to find it in the two volumes of that work so dated. I have taken *indicus* as the typical form of *Ratelus* because, although Bennett identified his specimen as *mellivorus*, he definitely stated that it was "transmitted to this country from Madras, whither it was brought from the interior"; and his excellent illustration was drawn from it. Gray also misprinted Gloger's name as *Melitonyx*.

The characters of this genus, being those of the subfamily, need no repetition. Its systematic position has been a puzzle to zoologists, most of whom, relying upon its general appearance and habits, assigned it to the Badgers, adopting Gray's classification of 1865 and 1869. This was the view

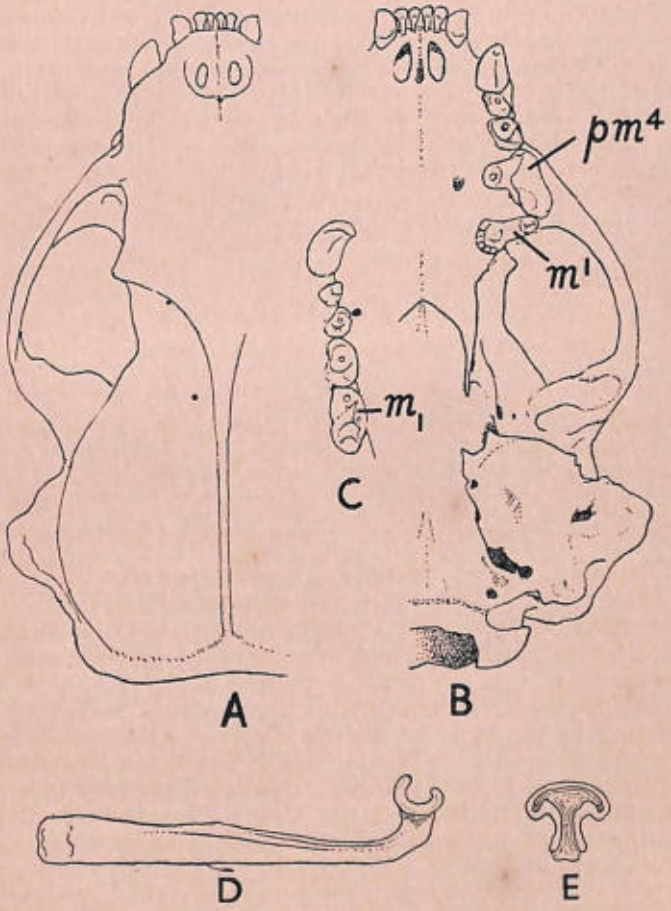


Fig. 113.

A. Upper surface of left half of skull of adult ♂ *Mellivora capensis indica* from Bhuj, Cutch.
B. Lower side of the same, showing the reduced number of teeth, the large trenchant upper carnassial (pm^4) and the smaller, transversely set molar (m^1), like those of the Mustelinæ.
C. Lower cheek-teeth of the right side of the same.
D. Baculum of *M. capensis* from the right side.
E. Tip of the same from the front.

taken by Blanford. But in 1902 de Winton (Zoology of Egypt, Mamm. p. 245), attaching more importance to the teeth, transferred *Mellivora* to the Mustelinæ, and in 1912 Miller suggested its kinship with *Gulo*, the Wolverene, which is an aberrant genus of the Martinæ. Since its inclusion in the Melinæ or in the Mustelinæ makes the definitions of those subfamilies unsatisfactory, the better course is to isolate it in a special subfamily, as was done by Gill in 1872 (Smiths. Misc. Coll. xi, pp. 64–65). The external characters of *Mellivora* were described by myself in 1920 (Proc. Zool. Soc. pp. 179–187).

The shape of the baculum is shown in fig. 113, D, E, p. 455.

86. **Mellivora capensis** (Schreber).

Viverra capensis, Schreber, Säug. iii, p. 125, 1776, text p. 450, 1777.

Upper side from crown of head at least to base of tail typically varying from very dark grey to paler yellowish or ashy-grey or dirty white, and sharply contrasted everywhere with the black of the lower parts, which involves the head from above the eyes and ears, the throat, sides of the neck, limbs, chest, belly and under side of the tail, the contrast sometimes emphasized by the cleaner whiteness of the head and by the extension of a narrower or broader whitish area all along the side of the body just above the black and bordering the grey hue of the back, which is due to a mixture of black and white hairs. Tail always black below and at the tip, its upper side, except the tip, either like the back or blackish almost to the root. Wholly black specimens have been recorded from Africa. The coat is moderately long and abundant or short and sometimes very sparse, and sometimes thickened with underwool. The tail is about one-fourth the length of the head and body.

There are two pairs of mammæ.

Although many different "species" of *Mellivora*, distinguished by slight variations in size and colour, have been described and named from Africa and Asia, they are all, in my opinion, local races of a single species, which takes the oldest name, *capensis*, given to a South African form. In general proportions and appearance and in the structure of the skulls and teeth they are to all intents and purposes alike. Blanford, following Jerdon, admitted one species as occurring in British India. For this he adopted the name *Mellivora indica*, and provisionally distinguished it from the species "found throughout Africa," but made no attempt to define the differences between them. Since *indica* is the earliest name, apart from

capensis, given to a ratel, and connotes a race definable from *capensis*, it is needless to discuss here the characters of the large number of additional "species" that have been described from Asia and Africa to establish the validity of the name for the typical Indian form.

From the somewhat scanty material there is evidence of the occurrence of two races of the Ratel in British India. The name *indica* is here provisionally restricted to a race represented by specimens found south of the Ganges and Indus, the name *inaurita*, regarded by Blanford as a synonym of *indica*, being retained for examples from Nepal. The two may be briefly diagnosed as follows :—

a. Coat comparatively thin and short even in winter; heel of hind foot naked ..... [p. 457. *indica* (Kerr).

a'. Coat much thicker and longer, heel hairy but probably only in winter ..... [p. 461. *inaurita* (Hodgs.).

86 *a*. **Mellivora capensis indica** (Kerr).

Ursus indicus, Kerr, Anim. Kingd. p. 188, 1792 (based on Pennant's "Indian Badger"); Shaw, Zool. i, p. 470, 1800; Hardwicke, Trans. Linn. Soc., Zool. ix, p. 115, pl. 9, 1808

Ratelus mellivorus (Indian var.), Bennett, Gardens and Menag. Zool. Soc. p. 13, fig., 1830.

? *Ratelus indicus*, Burton, Proc. Zool. Soc. p. 113, 1835; Schinz, Syn. Mamm. p. 329, 1844.

Mellivora ratelus (Indian var.), Fraser, Cat. Zool. Gdns. p. 9, 1862 (name only).

Mellivora ratel, Horsfield, Cat. Mamm. E. I. Co. p. 120, 1851; Blyth, Cat. Mamm. As. Soc. p. 69, 1863.

Mellivora indica, Blainville, Osteogr. ii, p. 78, Atlas, pls. 6 and 13 (skull and teeth), 1839–1864 (*Mustela*); Gray, Proc. Zool. Soc. 1865, p. 143; id., Cat. Carn. etc. p. 132, 1869; Jerdon, Mamm. India, p. 78, 1867; Blanford, Mamm. Brit. Ind. p. 176, 1888; and of most later writers on the Indian fauna *.

Vernacular (covering both the races).—*Bharsia* (Nepal); *Bájru Bál* (Bhagalpur); *Gorpat* (Sindh); *Ghurnar* (Cutch); *Beejoo* or *Biju* (Hindi); *Biyu khawar* (Tel.); *Tara Karadi* (Tamil); *Usa banna* (Kol.).

Distribution.—From Sind and Cutch and at least as far east as Hazaribagh, thence southwards, but not found in Malabar, and apparently rare in the Madras Presidency, although, according to Blanford, occurring in the extreme south of Peninsular India.

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* It is curious that Blanford omitted from his references to this ratel the descriptions of it published by Bennett and Burton, especially that of Bennett, who pointed out its most obvious external difference from the South African race, *capensis*, and published a good figure of it. Gray, in his synonymy, 1865 and 1869, quoted "*Mellivora ratelus* Bartlett, Proc. Zool. Soc. 1835 (no page)." This was a mistake due to Schinz's misspelt abbreviation of Burton's name as "Bart."

Distinguished from the typical form, *M. capensis capensis*, from South Africa by having a less distinct lateral white band on the back, emphasizing the black of the lower parts and also, judging from somewhat scanty evidence, by being smaller on the average, as indicated by the length of the skull. The four adult ♂ skulls of *indica* entered in the table (p. 463) have an average condylobasal length of 136 mm., whereas three adult ♂ skulls of *capensis* from Nyasaland, Grahamstown and N.W. Rhodesia are respectively 140, 142 and 144 mm., the average being 142 mm.

The coat varies considerably with the season. In the winter there is very little underwool, but the contour-hairs of the upper surface at least are abundant and longish, usually about 35 mm. With the moult they become gradually thinned



Fig. 114.
Indian Ratel (*Mellivora capensis indica*). From Blanford.

out, the wool disappears so that the skin is to a great extent exposed, and the new coat in autumn may be only about 25 mm. long. The colour of the upper surface is also very variable, the distal ends of the contour-hairs being soiled white, clear grey or tinted to a greater or less extent with yellow or buff, and there is generally a suffusion of blackish-grey, especially on the median dorsal area, and this apparently increases with age, old individuals being darker than young. The blackish hue does not, however, invade the head, and the edges of the dorsal area are not infrequently contrasted by their paler hue, although not to the same extent as in the typical South African race. The claws are usually horn-coloured, sometimes blackish. The fore claws are usually about 1½ inches long, the hind claws ½ in.

The variations above described are illustrated by the

following skins, which, unless otherwise stated, are in the British Museum :—

An adult ♂ from Malakondapenta, Kurnool, 1,030 ft. (Baptista), May, has the coat very sparse, with no wool, and showing the skin ; the head, nape and shoulders are white, the middle of the back dusky grey, mixed black and white. its sides dirty white. Three from the Hazaribagh District, an adult ♀ from the hills east of Paresnath (Westmacott, Calcutta Museum), Feb., has the coat full, with a little wool, the whole of the dorsal area being suffused with yellowish-buff with some dusky grey in the middle of the back and the head brighter. A ♂ from Gajhundi, 1,000 ft. (Crump), May 14, has the coat very thin and sparse and the general colour pale, with scarcely a trace of buff. An unsexed skin from Hazaribagh (O. A. Smith, Calcutta Museum), May 8, is very like the last.

Six skins from the Hoshangabad district vary individually. One from the Bori Forest 1,500 ft. (A. N. Caccia), May, has a good coat, with a little underwool, the general hue of the upper side being whitish, the back having a blackish-grey tinge in the middle. The others in the Bombay Museum, one from Chopin (W. F. Maxwell), April, two from the Dunewa River, January, and one from Sohagpur (Dunbar Brander), March, have a good deal of blackish-grey on the back, the pale areas of the hairs varying from whitish with very little yellow to decidedly buffy-yellow, especially on the head in the Sohagpur skin ; but an immature specimen from Hoshangabad (D. Brander), March, is noticeably paler than the adults. From Goona in Gwalior there is an undated skin (Calcutta Museum) which in its sparse coat and colour is like O. A. Smith's May skin from Hazaribagh. Two from Rajputana show clearly the seasonal change of coat. The general colour is like that of the palest Hoshangabad and the Kurnool skins, but one from Sambhar (Adams and Hume), Jan., has the coat close and long, up to about 35 mm., whereas in the other from Deoli, Ajmer (H. R. Lawrence, Bombay Museum), Sept. 19, the contour-hairs are sparse, showing the skin, and only about 23 mm. long.

Two skins from Cutch (Crump) also differ, an ad. ♂ from Bhuj (July) has a thin, short coat, about 17 mm. long, and tolerably closely resembles the skin from Ajmer in that respect and in colour, whereas a young ♂ from Dhonsa (Bombay Museum), also July, is well covered with hair but is pale pinkish-buff all over the upper side, with hardly any black even on the hind back.

From these skins it appears that the coat of *indica* varies seasonally from about 16 to about 40 mm. long, the underwool is scanty or absent, the dorsal coloration varies from nearly uniform ashy-grey, sometimes with a buff or yellowish tinge,

to considerably whiter grey, indistinctly set off by a still whiter margin; the head and shoulders may be almost the same colour as the mid-back, with the head only slightly paler, or they may be a little or considerably whiter than the back, sometimes tinted with yellow.

Some flesh-measurements (in English inches) and weights (in lb.) are as follows :—

Locality and sex.	Head and body.	Tail.	Hind foot.	Weight.
"Central India" (D. Brander); ad. ♂	29	6	—	23
Hazaribagh; ad. ♂	28½	7	4½	—
Kurnool; ad. ♂	27⅜	7⅜	4⅛	22
S. India (Jerdon); ? ad. ♀	26	6	—	—
"Central India" (D. Brander); ad. ♀	25	7	—	17

Dunbar Brander's ♂ record is taken from his volume quoted below (p. 465); and in the Bombay Museum there is a skin, marked ♂, from the Danewa River, Hoshangabad, with exactly the same particulars. But this skin is ♀ by its manifest teats, and the skull belonging to it is also ♀ by its widely separated temporal ridges. There has probably been misplacement of labels or some error in sexing. Probably, I think, the ♂ measurements of D. Brander's specimen from "Central India" were taken from his ♂ from Sohagpur.

The skull-measurements entered on the table * attest average superiority of the ♂ over the ♀. The ♂ skull also differs in the confluence of the temporal ridges on the crown to form a definite median crest usually low but 5 or 6 mm. high on the posterior part of the crown in the skull from Hazaribagh. In all the crest extends as far forwards as the postorbital constriction. In ♀ skulls the ridges never apparently coalesce even in old individuals †. The area they define varies individually in width. In the skull from Paresnath it is 6 mm. wide just behind the postorbital constriction and 12 mm. posteriorly; in the skull from Sambhar and the larger of the two from the Danewa River it is about 10 mm. wide throughout, and is widest of all in the smaller of the two Danewa skulls, namely, 13 mm. just behind the postorbital constriction and 18 mm. on the crown behind.

* In this table the lengths of the two ♀ skulls from the Danewa River, Hoshangabad, are the total lengths to the occipital crests, the condyles having been cut away. But the matter is of no great moment, since the total and condylobasal lengths of the skull in this genus are always to all intents and purposes the same.

† An apparent exception to this, referred to above, occurs in the case of the smaller of the two skulls from the Danewa River which is marked ♂ and bears the same number as a skin, also marked ♂, which has the manifest teats of a ♀. The wrong sex-mark was no doubt put on skin and skull.

86 *b*. **Mellivora capensis inaurita** (Hodgson).

? *Ratelus indicus*, Burton, Proc. Zool. Soc. 1835, p. 113 *.
Ursitaxus inauritus, Hodgson, As. Res. xix, pt. 1, p. 61, 1836; Journ. As. Soc. Beng. v, p. 671.

Locality of the *type*, Muckwanpúr in the foothills of S. Nepal.

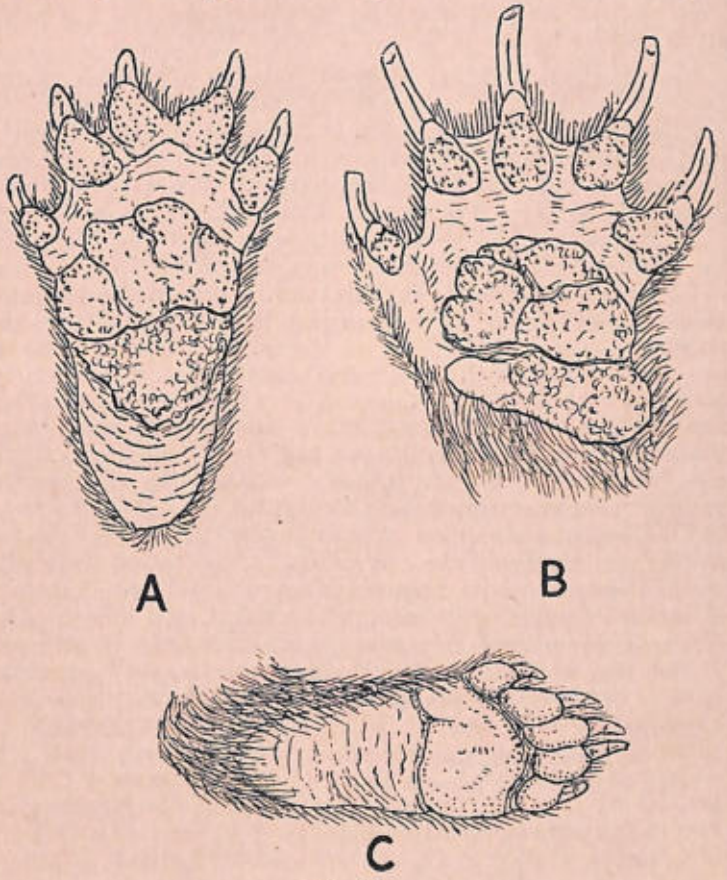


Fig. 115.

A. Lower side of left hind foot of *Mellivora capensis* with the heel naked as in the typical Indian race, *M. c. indica*.
B. The same of the left fore foot. These two figures drawn from same African specimen as illustrated in fig. 112.
C. Lower view of left hind foot of *M. c. inaurita*, from Nepal, showing the hairy heel. Drawn from the dried skin.

* The suggestion that this specimen described by Burton was a representative of this race rests on his statement that it came from "the Upper Provinces of Bengal," probably, that is to say, from some district north of the Ganges to the east of the typical locality of *inaurita*.

Distribution.—Foothills of S. Nepal, so far as recorded, but no doubt from other districts to the north of the Ganges.

Distinguished from the foregoing race by its longer, much more woolly winter coat and by having the heel of the hind foot overgrown with hair, at all events apparently at some seasons of the year.

The colour of the type, according to Hodgson, was dirty yellow and black all over the upper side. The specimen was figured in his unpublished drawings, with a sketch of the sole of the foot showing the heel to be naked. But a skin in the British Museum, collected by Hodgson in Nepal, is faintly yellowish-white and has the heel sparsely hairy. Since this skin has the coat exceedingly thick and long, the hairs being about 50 mm., suggesting winter season, the differences in the heel may be seasonal. The coat is much longer and thicker than in the January skin of the Rajputana example of *indica* and in the February skin from Paresnath. But in the Calcutta Museum there is an unlocalized skin of a ♂ that died in the Calcutta Zoological Gardens on August 31st, and this has at least half an inch of the heel hairy, but the coat, in accordance no doubt with the time of the year, has no underwool, although the contour-hairs are abundant and about 30 mm. long; the general colour of the upper side from the nape backwards is tolerably uniformly whitish-grey, with an ashy tinge on the mid-dorsal area and the head soiled white, paler than the nape.

An immature specimen, still with milk-teeth, from the Bisulpur Forest, Rohilkund, is provisionally assigned to this race on account of its locality. Its coat is as long and thick as in the example of *indica* from Sambhar, and in coloration it is indistinguishable from the series of skins of that race.

The flesh-measurements of two specimens, probably taken "over the curves" (in English inches) are as follows:—

Locality and sex.	Head and body.	Tail.	Hind foot.
Foothills of S. Nepal (Hodgson, type); ? ♂	32	5	4½
Upper Provinces of Bengal (Burton); ? ♂	33	6	—

The suggested superiority in the length of the head and body of these specimens over those assigned to *indica* is not borne out by the skulls.

None of Hodgson's skulls was sexed, but the three from Nepal, entered in the table, are regarded as ♂ owing to the completeness of the low sagittal crest as far forwards as the postorbital constriction. The skull from the Calcutta Museum, marked ♂, is certainly correctly sexed by the skin. On the other hand, the skull from Pilibhit in Rohilkund (B. B. Osmaston), which has no skin but is marked ♂, is probably,

Skull-measurements (in mm.) of the two British Indian races of the Ratel (*Mellivora capensis*) *.

Name, locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
M. capensis indica.							
Kurnool ; ad. ♂	141	78	32	33	33	13	15
Sohagpur, Hoshangabad ; ad. ♂	137	75	26	31	31	13	13
Hazaribagh ; ad. ♂	135	84	27½	35	32	13	13
Bhuj, Cutch ; ad. ♂	131	80	32	35	33	13	14
Danewa River, Hoshangabad ; ad. ♀	(132)	76	32	33	32	13	—
Danewa River, Hoshangabad ; ad. ♀	(128)	72	29	33	30	12	12
Paresnath, Hazaribagh ; ad. ♀	127	71	31	31	30	12	12½
Sambhar, Rajputana ; old ♀	121	—	32	32½	34	—	—
M. c. inaurita.							
(" India," Calcutta Mus.) ; ad. ♂	137	74	29	34	35	14	14
Nepal ; ad. ♂ ?	135	80	30	34	35	13½	13
Nepal ; ad. ♂ ?	—	79	30	36	35	13	14
Nepal ; ad. ♂ ?	—	78	29	32	33	14	14
N.W. Frontier Province (? *inaurita*) ; ad. ♀ ?	127	72	28	30	30	12	13
Pilibhit, Rohilkund (? *inaurita*) ; ad. ♀ ?	125	72	30	32	32	13	13

* Here and elsewhere in this volume figures set in brackets are estimated dimensions.

I think, ♀ because, although fully adult, it has the ridges on the crown 12 mm. apart, and these ridges are separated throughout in both the known ♀ skulls of *indica*. For the same reason the skull from the N.W. Frontier Provinces, which also has no skin, is regarded as ♀. But the reference of these two skulls, in the absence of skins, to *inaurita* is provisional.

Habits.—Although widely distributed in India and adapted to very varied habitats, the Ratel, commonly known to Anglo-Indians as the "Badger," seems to be nowhere plentiful, to judge from the few examples secured by the "Mammal Survey," unless, as is possible, it is exceptionally difficult to trap or capture in other ways. The infrequency with which it is seen has been ascribed to its almost exclusively nocturnal activities and to its custom of lying up by day in a burrow of its own or of some other animal, a rock crevice or the shelter provided by tree-roots. In captivity, however, it is as diurnal as almost any mammal, and in Africa at all events it may be seen not uncommonly prowling about by day.

As suggested by its teeth, the Ratel is to a great extent a flesh-eater, preying on any mammals, birds, reptiles, including poisonous snakes, like cobras, it can catch and kill, and on edible insects, such as locusts, white-ants and bee-grubs, devouring numbers of the last-mentioned when after honey, of which it is inordinately fond. It also eats carrion and a variety of vegetable food, and in captivity seems to thrive well on an almost exclusively vegetarian diet.

The earliest account of the habits of the Indian Ratel with which I am acquainted was published by Hardwicke in 1808*. It is found, he said, along the courses of the Jumna and the Ganges, more particularly where the country is cut into ravines, and in the high banks which in many parts border these rivers. It is rarely seen by day, but at night visits the neighbouring towns and villages inhabited by Mohammedans, and scratches up the recently buried bodies of the dead, unless they are thickly covered with thorn-bushes. It is a bold animal; its hide is remarkably thick, and its strength too much for dogs of common size. From observations on a captive specimen he recorded that the Ratel burrows with great facility. In ten minutes it could work itself under cover even in hard

* Hardwicke was apparently writing to a very large extent from personal experience, and his statements bear the impress of truth. Blanford, however, seems to have discredited them, since he merely mentioned Hardwicke's name in connection with one trivial matter, namely the animal's habit of occasionally rolling head over heels, entirely ignoring the interesting statements about its ability to climb, subsequently confirmed by Dunbar Brander, and the speed with which it can sink into the ground.

ground. Also it showed an inclination to climb up walls, hedges and trees; but although its activities in this respect were clumsy it seldom fell, and would ramble securely along every arm of a branching tree strong enough to support its weight. It fed upon flesh, including fowls and rats, and was particularly partial to rats.

According to Dunbar Brander ('Wild Animals of Central India,' p. 275, 1927) Ratels, although fairly common in Central India, are seldom seen owing to their being exclusively nocturnal. They usually live in pairs, lying up by day in an earth or in thick bush or under a clump of fallen bamboos, and coming out after dusk to hunt for food. By moonlight they can sometimes be seen scraping holes in the sandy beds of rivers, and when going along a river bed they frequently roll head over heels *. Their food consists of small mammals, birds, reptiles, insects and a large variety of fruits and other vegetables; and Dunbar Brander has proved beyond doubt the truth of the belief prevalent in some parts of India that they may dig up and feed upon buried human beings, a belief that is the source of many of the vernacular names of the animal meaning "grave-digger" †. There is also no reason to doubt his statement that they can climb trees, like a bear, although no one, except Hardwicke, had previously recorded this habit. Considering their size, he says, "they are endowed with a courage possessed by no other animal." "When tackled by dogs they put up the most extraordinary fight, and seem to be made of india-rubber, so long is it before the dogs can make any impression on them." On one occasion his pack attacked a Ratel in a bush, whereupon it uttered a number of screams, not unlike those of a bear-cub. In response to the sound its mate appeared on the scene and assaulted Dunbar Brander, who was obliged to kill it with a large hunting-knife. Another specimen when disturbed, while lying up in a bush in the daytime, by a coolie, assailed the man and bit him severely in the leg.

More, however, has been observed of the habits of the Ratel of South Africa than of India; but considering the closeness of the resemblance between the two there is reason to suppose that what is true of one is equally true of the other. It was from South Africa that originally came the report of their fondness for the honey of wild bees, which suggested

* This is evidently a common habit, because it has frequently been observed in specimens kept in captivity. I have often seen it.

† Since the Ratel is eminently well equipped for digging and, like most Carnivores, will eat carrion as well as fresh meat, there was never any sound reason for Blanford's dismissal of this belief as being in all probability without the least foundation or for the recent controversy on the subject in the 'Journal of the Bombay Natural History Society.'

the scientific name "*Mellivora*." According to Major Stevenson Hamilton, late Game Warden of the Transvaal, there are cases, almost incredible as they seem, of the Ratel killing a bull buffalo and a wildebeest, or gnu, the latter being one of the most formidable of the African antelopes. He also describes the animal as "one of the most fearless in the world, fearing nothing that runs, flies or crawls. His whole demeanour is full of the confident assurance of one who alike fears nothing and threatens nobody. Although perfectly inoffensive to human beings unless interfered with, there is no creature alive capable of making a more gallant fight or one which for its size is more difficult to dispose of." He quotes instances of ratels being attacked and smothered by packs of dogs, yet trotting unconcernedly away after a protracted struggle, little the worse themselves, but leaving their assailants more or less lacerated and exhausted.

The secret of the Ratel's success in such encounters lies to a great extent in its extraordinarily tough, untearable skin, impervious to the quills of porcupines and the fangs of poisonous snakes, two types of animals it is known fearlessly to prey upon. The skin, moreover, is so loosely fitted that, if gripped almost anywhere by it, the Ratel can twist round and retaliate by biting its antagonist.

But in addition to its teeth, claws, exceptional strength and loose, leathery hide, the Ratel has a powerful weapon of defence in the suffocating odour of the ejected secretion of the anal glands, which, as I recorded in 1908, can be perceived even by the human nose at a distance of 50 yards and more. This skunk-like attribute, associated with absolute fearlessness and great tenacity of life, explains the peculiar colouring of the Ratel, which in being much paler above than below is the exact opposite of the obliterative countershading style. It renders the Ratel conspicuous and easily recognizable, and stamps him as one of the best examples of "warning coloration" in the Mammalia, as I pointed out some thirty years ago (Proc. Zool. Soc. 1908, pp. 949–951).

Of the breeding of Indian Ratels nothing seems to have been recorded; but, according to Shortridge (Mamm. S.W. Afr. p. 196, 1934), the usual number of young seems to be two to the litter in the South African race. They are born and reared in holes in the ground or in deep crevices between rocks, and the period of gestation is stated by Wilhelm, quoted by Shortridge, to be six months. It may be added that this low grade of fertility is precisely what might be expected in an animal so eminently capable of taking care of itself and provided with means of advertising the fact to the full.

APPENDIX.

[NOTES ON SOME BRITISH INDIAN MAMMALS RECEIVED TOO LATE FOR ENTRY IN VOL. I AND IN THE MAIN TEXT OF VOL. II.]

Order PRIMATES.

THE HOOLOCK GIBBON (*Hylobates hoolock*), vol. i, p. 19.

Three ♂ skins (R. Kaulback) from Htingnan (26° 36′ N. 97° 52′ E.) in the "Triangle," 3,500–4,000 ft., in Upper Burma (nos. 574, 701, 706), collected February, March and April, are normally coloured black or deep blackish-brown, with white brows; there is a rather inconspicuous grey patch on the chin, hardly visible in no. 701, which has the distal half of the hairs of the genital beard brownish-grey. In no. 574 they are clear grey to the base; but in no. 706 they are deep brown with no sign of bleaching. A ♂ (no. 457) from Sumprabum (26° 36′N., 97° 42′ E.), 4,000 ft., December 29, has the genital beard whiter than in the others and the chin-patch white and conspicuous. No doubt this chin-patch and the genital beard gradually bleach as age advances. An adult ♀ skin (no. 419) from Goletu (27° 37′N., 97° 54 E.), 3,500 ft., has the general colour whitish buffy grey from the crown over the nape, shoulders and back, but gradually darkening to brownish-grey on the rump, flanks and down the arms and legs, the tint of the flanks passing into blackish-brown on the hind chest and belly; the hands and the feet are noticeably whiter than the arms and legs, as in typical *H. lar*; there is a rim of clear white hairs all round the eyes and encircling the muzzle to the chin, the cheeks and fore throat being blackish, the hind throat browner, but both sharply contrasted with the pale hue of the crown and nape.

The flesh-measurements (in English inches) of three specimens were as follows :—

	Head and body.	Hind foot.
Goletu (no. 419) ; ad. ♀	20½	6½
Sumprabum (no. 457) ; ad. ♂	19	6
Htingnan (no. 574) ; ad. ♂ ..	18¾	6

The skulls of these are very nearly the same size, namely, just about 110 mm. in total length. The flesh-measurements are decidedly small for the species, the largest being 2½ in. shorter in the head and body than the smallest ♂, from the N. Shan States, recorded on p. 21, vol. i ; and the skulls are the same length as the smallest ♂, from Upper Chindwin, entered on p. 23.

Vernacular.—Woi (Kachin).

A young adult ♂ from Zubza in the Naga Hills, 3,200 ft. (W. Frost), March 5, has a shabby, woolly coat suggesting the moult ; the colour is all black, except for the white brow-band, there being no sign of white on the chin or on the genital area, where the hairs are quite short, showing no trace of elongation into the " beard " present in Kaulback's adult examples. Its flesh-measurements, the head and body 22⅛ in. and the foot 5⅜ in., show the head and body to be noticeably longer than in Kaulback's adult ♂♂, although the skull, with a total length of about 110 mm., is the same length. Nevertheless, the basioccipital suture shows no sign of fusion and the permanent teeth are not all up, the last molar, above and below, being just through the bone but still covered by gum, the upper milk canines still in place, the lower shed, with the points of the permanent canines just appearing at the sockets.

Shortridge's Capped Langur (*Trachypithecus pileatus shortridgei*), vol. i, p. 128.

Three examples, one unsexed (no. 109), from Nogmung (27° 30′ N., 97° 50′ E.), 2,500 ft., July, and two from Htingnan (26° 36′ N., 97° 52′ E.), a ♀ (no. 700), 3,500 ft., March 16, and a ♂ (no. 480), 4,500 ft., January 11 (R. Kaulback). The flesh-measurements (in English inches) of no. 480 were : head and body 22 ; tail 34 ; hind foot 8. The skins collected in January and March are much fuller and longer in the coat than the July skin, more particularly the January skin, which has a very luxuriant " cap." Two adult ♂ skulls (nos. 480 and 641) from the same locality, but without skins, are 108 mm. in total length. In its skull and flesh-measurements no. 480 is decidedly smaller than any of the specimens of this race

of which the measurements are entered in vol. i. This applies also to the second skull; but the difference is probably, I think, only individual.

No. 480 was shot in a tall tree in thick forest; no. 700 was killed in moderate forest, and no. 109 in dense hill jungle.

Vernacular.—Shărala (Kachin).

THE RHESUS MACAQUE (*Macaca mulatta mulatta*), vol. i, p. 45.

An adult ♂ (no. 525) from Htingnan (26° 36′ N., 97° 52′ E.), 3,500 ft. (Kaulback), January 28, has the coat long and streaky, where parted, and the colour normally bright everywhere, with the hind quarters orange, but there is an unusual dark fuscous streak down the distal two-thirds of the tail.

An adult ♀ (no. 604) from Bawmwang (26° 39′ N., 97° 50′ E.), 3,200 ft., has the coat shorter and closer but is similarly brightly coloured and is without the stripe on the tail. The flesh-measurements (in English inches) of these two are as follows :—

	Head and body.	Tail.	Hind foot.
♂	20	11	7
♀	17½	8	5¾

The skull of the ♂ has a total length of 125 mm., of the ♀ 110. The ♂ was shot in a yam-field in the forest.

An old ♀ and a youngish ♂ from Bistenpur, Manipur, 3,000 ft. (W. Frost), February, are typically coloured dark greyish-brown with an ochreous speckle which increases in extent posteriorly, turning to orange on the loins, thighs and base of the tail. Their flesh-measurements (in English inches) are as follows :—

	Head and body.	Tail.	Hind foot
Old ♀	16¾	9½	5½
Young ♂	15	8½	5¾

The total length of the ♀ skull is 111 mm., of the ♂ 103. The ♂ skull is changing its teeth, the last upper and lower molars being just through the bone and still covered with gum, as in the young ♂ Hoolock Gibbon collected by Frost, but the canines are much more advanced than in the ape, the upper and lower projecting respectively 10 and 11 mm. above the socket.

Points to notice in connection with the above recorded examples of *mulatta* are as follows :—The adult ♂ collected by Kaulback has the head and body only one inch longer than in the smallest ♂, from Bhutan Duars, recorded on p. 47 of vol. i; but the total length of the skull is 5 mm. longer than in the longest ♂ skull from the Chittagong Hills recorded on

p. 48, and is as long as the smallest ♂ of *villosa* from Ratighat, Kumaun. The ♀ collected by Kaulback is also small, shorter in the head and body than the smallest ♀ from Sohagpur, Central India, recorded in vol. i, but the skull is as long as the longest there entered.

The old ♀ collected by Frost is also noticeably shorter, nearly two inches, in the head and body than the smallest ♀ recorded in vol. i, but the skull is the same length as the longest from Bengal entered.

The Assamese Macaque (*Macaca assamensis assamensis*), vol. i, p. 53.

Several examples, adult and immature, from various nearby localities in Upper Burma, from 3,000 to 6,000 ft. (R. Kaulback), show a good deal of individual variation in colour and in the incidence of the whorl, or parting, in the hairs on the top of the head. An adult ♂ (no. 467) from Htingnan in the "Triangle," lat. 26° 36′ N., long. 97° 52′ E., 3,500 ft., January 7, is characteristically coloured brown behind, reddish in front, and has no parting in the hairs on the head. A younger ♂ (no. 415) from the Taron Valley, lat. 27° 40′ N., long. 98° 10′ E., 6,000 ft., December 5, is coloured very like the last, the upper side being dark brown, with a reddish ochreous wash on the shoulders, head and arms, and the under side paler, greyer brown; but there is a whorl on the top of the head.

An adult ♂ (no. 422) from Goletu, lat. 27° 37′ N., long. 97° 54′ E., 3,000 ft., December 7, is nearly uniformly dark olive-brown all over, without the brighter tint in front present in the two previously described skins, and there is no whorl on the top of the head.

An immature ♂ from the Nam Tamai Valley, lat. 27° 42′ N., long. 97° 54′ E., 5,000 ft., September 16, is dull dusky greyish-brown and without a whorl.

A ♀ from the same locality and with the same date is also very like it in colour, greyish-brown, but the head, nape and shoulders are extensively grizzled with whitish hairs, and there are a few of these all down the back; on the head there is an indistinct median parting with radiating hairs.

A very young specimen (no. 91) from the same locality, March 28, is tolerably uniformly brown; the forehead is nearly bald half-way to the ears, merely supplied with very short hairs diverging from a median parting.

A still younger one (no. 143) with the same history, is a little darker than the last; the forehead, although not so extensively bald, is otherwise similar.

A young ♂, a little older than the last two, from Adung Long, October 31, is dark grey-brown; the forehead is fully haired but its hairs have a similar median parting.

A good many of these specimens, secured from natives, were unmeasured. Flesh dimensions of only one adult were recorded by Kaulback, but he secured those of the three young ones which were brought in alive. The measurements (in English inches) are as follows :—

	Head and body.	Tail.	Hind foot.
Htingnan ; ad. ♂	23½	8½	7¼
Adung Long ; young	10½	5½	—
Nam Tamai ; young	8⅝	4½	—
Nam Tamai ; young	8½	4⅝	—

The adult ♂ is a little shorter in the head and body than two adult ♂ specimens from the Mishmi Hills entered in vol. i, and the tail is relatively as well as actually slightly longer, but being only a little over one-third the length of the head and body it agrees essentially with other known members of this race and differs from the race *pelops* found farther to the west in the Himalayas from Bhutan to Mussooree, in which the tail is not less than half the head and body and may be considerably more. The interesting point about the measurements of Kaulback's three young specimens of typical *assamensis* is their closer resemblance to *pelops* in having the tail about half the length of the head and body.

Although the ♂ from Htingnan (no. 467) is smaller in its flesh-measurements than the two ♂♂ from the Mishmi Hills, its skull, with a total length of 161 mm., is 6 mm. longer than that of the largest. It has well-developed occipital and sagittal crests. The skull of the ♂ from Goletu, also with these crests prominent, is considerably shorter, its total length being 148 mm., about the same length as the larger of the two ♂ skulls from the Naga Hills entered in vol. i. The ♂ skull from the Taron Valley is not nearly so old, its total length being only 138 mm.; its occipital crest is small and its sagittal crest undeveloped. In the skull of the ♀ from Nam Tamai the total length is 125 mm., very nearly the same as in the ♀ skull from the Naga Hills previously recorded.

According to Kaulback's notes the ♂ from Htingnan was shot on the edge of a clearing in thick forest ; those from Goletu and Nam Tamai in dense hill forest or jungle.

The Slow Loris (*Nycticebus coucang bengalensis*), vol. i, p. 166.

An adult ♀ from the Naga Hills, 4,000 ft. (Frost), February 27. The coat, in good condition, is characteristically coloured for the race ; the head, neck, arms below the elbows, the legs in front and the under side are whitish, but the head has a broad brown rim round the eyes and some buff about the ears ; the spinal stripe is brown on the back, fades away on the rump, becomes gradually thinner and redder in front and

ceases on the crown without branching to the eyes and ears; on the back it is emphasized by some silvery hairs; the flanks are buffy, and this tint becomes more intense and redder on the tops of the thighs; the legs outside and behind, and the shoulders and upper arms outside are buffy grey to the hands and feet, which are white. The tail is absent, the recorded flesh-measurements being: head and body 14½ in., the foot 3 in. These dimensions are the same as those of the only two British Indian examples I was able to record, namely, two adult ♂♂ from Kindat and from 50 miles north of Pegu respectively. In the skull the two strongly curved temporal ridges meet for a short distance in the middle of the crown, forming a low, double crest. In two ♀ skulls I recorded from Lower Pegu and Chittagong the ridges are respectively 4 and 5 mm. apart on the crown; in a ♂ skull from Toungoo they are ½ mm. apart, but in another ♂ from the Naga Hills they meet as in Frost's specimen. The condylobasal length in the latter is 64 mm. and the orbital width 44 mm., slightly bigger than four of the skulls, ♂ and ♀, I recorded, but almost exactly the same as in an adult ♂ from the Naga Hills. This skull conclusively proves that there is no difference either in flesh or cranial measurements between the ♂ and the ♀ of the Slow Loris.

According to Frost's note on the label this animal is considered to be "rare" in the Naga Hills.

Order CARNIVORA.

Family FELIDÆ.

THE TIGER (*Panthera tigris tigris*), vol. i, p 199.

A flat, native skin of a half-grown specimen, procured by R. Kaulback at Sumprabum in Upper Burma, 3,500 ft., is unusually coloured. Although the pale patch on the ears is the normal clear white, the patch over the eyes, the cheeks, chin, the lower side and the inner sides of the limbs are pale buffy and not nearly so sharply contrasted with the bright, normal reddish hue of the upper parts as usual. Possibly the peculiarity referred to is due to artificial discoloration caused by drying the skin over a fire or by some other factor in its preparation; but since the clear whiteness of the ear-patch is not in keeping with that supposition, the coloration is worth putting on record as a possibly natural variation.

The specimen was killed in "moderate forest."

The Kachin name is *Shăraw-Kăba*.

The Indian Lion (*Panthera leo persica*), vol. i, p. 212.

Skin and skull of young lioness, bred in the Gir Forest, which died in the Alipore Gardens, Calcutta (Frost).

The description of the colour of the Indian Lion given in my volume was an epitome of the characters of several skins previously examined and described in my papers (Journ. Bomb. Nat. Hist. Soc. xxxiv, pp. 652–654, 1930, and xxxviii, p. 382, 1935). These skins are not now available for examination, having been sent to the country for safety from air raids. They exhibited great variation in colour from rich ochreous tawny, heavily speckled with black, to pale, sandy or greyish-buff, with the black speckling comparatively slight. The skin sent by Frost belongs to the darker category; the colour is rich and the black speckling profuse, especially on the back, nape and head; the ears are mainly black behind, and the black on the upper side of the tail is everywhere dominant, the organ being noticeably bicolor. The specimen was supposed to be about 1½ years old, and in accordance with its immaturity it still retains brownish spots on the limbs and flanks. It measures: head and body, 3 ft. 9 in., tail 1 ft. 10½ in. The hairs of the characteristically well-developed black tail-tuft are about 2 in. long. The skull, with a condylobasal length of 203 mm. (8 inches), is changing its teeth, and has the incisors and carnassials almost fully erupted. The upper carnassial (pm^4) is 33 mm. and the lower (m_1) 23 mm. long, both a little smaller than the average size of those of the lionesses previously recorded. In this skull two of the features I mentioned as distinctive on the average of Indian as compared with African lions, namely, the flatter bullæ and the division of one or both of the infraorbital foramina by a bar of bone, do not occur, the foramina being entire and the bullæ more inflated. The skull, in short, is indistinguishable from that of an African lion.

The Indian Leopard or Panther (*Panthera pardus fusca*), vol. i, p. 226.

A single adult ♀, skin and skull, from Myitkyina in Upper Burma (R. Kaulback). The skin is rather unusually brightly coloured, partly because the centres of the rosettes are only very slightly darker than the interspaces. This skin is of interest because, owing to the apparently large percentage of black leopards in Burma, next to nothing has been ascertained about the variations in the pattern and tint of normally coloured specimens from that country. On p. 229 of vol. i I recorded having seen only four Burmese skins, one from the Shan States, one from Mt. Popa, and one from Mogaung, which were black, and one from Toungoo which was normally

coloured and described as having a short, thin coat and as being brightly coloured, with medium-sized rosettes, and as inseparable from several of the handsomer skins from India. This description applies closely to Kaulback's skin. The two skins, therefore, one from Upper and one from Lower Burma, suggest the possibility of Burmese leopards being on the average brighter tinted than Indian leopards. But clearly far more specimens for comparison are required before any precise conclusion on the point can be reached.

The skull from Myitkyina is a little larger on the average than ♀ skulls from India and Burma. Although the occipital condyles are cut away, the skull is complete on its lower side as far back as the hinder end of the left bulla. From this I estimate that the condylobasal length was as nearly as may be 178 mm. As I previously recorded (*op. cit.*, p. 231), the average condylobasal length of nine Indian and of three Burmese ♀ skulls was 172 mm. In the largest certainly known Indian ♀ the length was 181 mm., in the next largest it was 174 mm. In two Burmese ♀♀ from Toungoo and Mt. Popa it was 176 mm., whereas in one from the Ruby Mines it was 165. The other dimensions of Kaulback's skull are sufficiently close to those of the Indian skulls entered in my table as to call for no special comment.

The Kachin name is *Shăraw-ningten*.

The Clouded Leopard (*Neofelis nebulosa macrosceloides*), vol. i, p. 250.

Skin and skull of an adult ♂ from the Tista Valley, Sikkim, 3,200 ft. (Frost), April 6. This skin apparently represents the "fulvous" type of the Clouded Leopard referred to by Blyth as occurring in Sikkim, the narrow streaks between the blotches being buff and the dusky blotches themselves have a dull ochreous cast; the tail is irregularly striped and spotted from the base to the tip, the tip not being noticeably blacker than the base. The dimensions of the flat skin are: head and body 36 in., tail 27 in., the size being intermediate between those of an old ♂ from Nepal (Hodgson) and the larger of the two ♀♀ recorded in vol. i.

Two adult native skins, without skulls, from Upper Burma (Kaulback). One of them (no. 638), labelled ♂, Htingnan in the "Triangle," 26° 36′ N., 97° 52′ E., 3,000 ft., is only very slightly brighter on the interspaces and blotches than Frost's skin, but differs noticeably in the colour of the tail, the black gradually increasing in amount towards the end, the terminal fourth being black with faint, spaced, pale greyish patches. An abnormality of the skin is the development of considerably more black pigment on the blotches of the left side than of the

right, especially on the thigh, where some of them are almost wholly black. The second skin has lost its label, but no doubt came from the same or a nearby locality, being similar to the first in its "make-up." It is slightly more buffy and its blotches are similarly pigmented on the two sides, but its tail is like that of the skin from Htingnan. Both these skins are obviously stretched by being pegged out, and their dimensions are not worth recording.

According to Kaulback's notes his specimen from Htingnan was shot in "moderate forest." The Kachin name for the species is *Shăgraw Kăi*.

The skull of Frost's specimen, although adult, is smaller than that of the adult ♂ from Nepal measured in my table, its total and condylobasal lengths being 167 and 153 mm. respectively, instead of 180 and 162 mm.; but it is not so old a skull and is less strongly moulded muscularly, the zygomatic width being 102 instead of 121 mm., with the postorbital width the same, 27 mm. The sagittal crest, however, is complete; the teeth too are a little smaller, pm^4 and m_1 being 1 mm. shorter, and the upper canine is 11 mm. long at the base instead of 12½ mm., exceeding that of the ♀ by 1 mm. only, and showing that this tooth intergrades in basal length in the two sexes.

I also distinguished *macrosceloides* from *diardi*, the southern form inhabiting the Malay Peninsula, Sumatra and Borneo, "by the more extensive blotches of its marbled pattern and possibly larger skull." But the suggestion with regard to the skull has been shown to be untenable by an adult ♂ specimen from Sumatra subsequently sent to the British Museum by Mr. W. J. C. Frost. This Clouded Leopard was imported alive from Sumatra to the Soerabaya Zoological Gardens, Java, where it lived six years. It is a big skull, its total and condylobasal lengths being 190 and 168 mm. respectively, longer than some ♀ skulls of Indian panthers, and exceeding by 10 mm. the total length of Hodgson's ♂ skull of *macrosceloides* from Nepal. It is also 6 mm. wider across the zygomata. But it is an older skull, with pm^4 worn in front and behind, reducing its length to 18 mm.; the upper canine, however, is longer at the base, being 14 mm.

The Marbled Cat (*Pardofelis marmorata charltoni*), vol. i, p. 256.

In the account of this species reference was made to a very richly coloured skin, with the under side buffy and the lips and chin ochreous, obtained by Kingdon Ward in the Nam Tamai Valley. Kaulback secured three skins at the same place (27° 35′ N., 97° 52′ E.). Although differing a little in

their confused pattern, they agree with Kingdon Ward's skin in richness of tint and in the colour of the face, but two of them are whitish below. One was trapped in dense hill jungle at 6,000 ft., another in thick jungle at 4,000 ft., and the third was killed with a poisoned arrow close to the village of Ngawa at 3,500 ft. The flesh-measurements of the last, a ♀, were as follows: head and body 18⅜ in.; tail 18¼ in.; hind foot 4⅛ in.; ear 1⅛ in. This is the only example of this race of which the flesh-measurements have been recorded. They agree very closely, as was surmised, with the flesh-measurements of typical *marmorata* from Sumatra and the Malay Peninsula recorded in vol. i.

The skull of a young adult ♀, with the sutures open, is 85 mm. in total length, with the mandible 55 mm., a little smaller than the type of *charltoni* measured on p. 257, vol. i. Its temporal ridges form a widely lyrate area, 20 mm. wide at the suture, 26 on the parietals, and the postorbital bars are almost complete, the two processes being 1 mm. apart on one side. The teeth are the same size as previously recorded. pm^4 being 11½ and m_1 8 mm. long.

Temminck's Cat (*Profelis temminckii*), vol. i, p. 260.

A very fine series of specimens, collected by R. Kaulback, exhibits nearly all the known colour phases of this variable species, and proves that it is by no means rare in the extreme north of Burma. The following is a list of the skins, arranged according to their colour:—

Glossy black above, deep brown below. A ♂ (no. 466) from Htingnan (26° 36′ N., 97° 52′ E.), 2,800 ft., and a ♀ (no. 540) from the same locality, 3,000 ft.

Red. A ♀ (no. 637) from Htingnan, 3,000 ft., with the ears and facial stripes black, some black on the back, especially over the loins, and soiled white below with some black spots. A ♀ (no. 349) from Nam Tamai Valley, 3,000 ft., is redder than the last, with less black on the back.

Speckled black and white or black and ochreous or buff. A ♂ (no. 636) is dark grey, speckled black and white on the flanks but black and ochreous on the back, where the black is more in evidence, but ochreous is dominant on the nape, the lower side being yellowish-brown and spotted. A ♂ (no. 456) from Shilinghket (36° 45′ N., 97° 38′ E.), 2,500 ft., is generally like the last but paler, owing to the pale speckling being more extensive, and the lower side is nearly orange. Goletu (27° 30′ N., 97° 50′ E.), 2,500 ft.: a ♂ (no. 390) is dark greyish-brown, the pale speckling being buff or ochreous, the spinal area and the upper side of the coat are darker, the head

and nape are deep reddish-brown and the lower side is reddish laterally, white in the middle.

Striped. An unsexed skin (no. 261) from Nam Tamai Valley has the silvery-grey ground colour relieved by a bold pattern of buff-speckled black spots running in obliquely longitudinal lines. A skin similar to this brought by Lord Cranbrook from Nam Tamai was described in vol. i, p. 264, as representing a distinct local race identified as *P. temminckii tristis*; but since the normal red phase of this species also occurs at Nam Tamai, it seems clear that the striped pattern is only another individual variation of the species, as maintained by G. M. Allen (Mamm. China and Mongol. 1938, p. 465).

Only one of the above-described specimens was measured in the flesh, namely, the ad. ♂ from Shilinghket (no. 456). Its dimensions were: head and body 29¼ in.; tail 16¾ in.; hind foot 7 in.; ear 2½ in. These measurements agree tolerably closely with those of three ♂♂ entered on p. 263 of vol. i.

Most of the five preserved skulls have the occipital region smashed. In two adults only is it possible to give the total length, namely of the ♂ from Htingnan (no. 636), in which it is 142 mm. and of a ♀ from Shilinghket (no. 524, without skin), in which it is 126 mm. The last is the same length as a ♀ skull from Pynimana in Upper Burma, and the ♂ is almost exactly the same as that of the type of *moormensis* from Nepal.

All the specimens were killed either in thick, or moderately thick forest or jungle, two of them on the banks of streams. Of particular interest is the record of the shooting of the pair at Shilinghket while they were feeding on a buffalo calf on the edge of a field close to thick jungle. No doubt the two combined to kill their quarry. This is the second record of this species eating a buffalo calf (see vol. i, p. 264).

The Leopard-Cat (*Prionailurus bengalensis horsfieldi*), vol. i, p. 271.

A series of eight skins secured by R. Kaulback at several nearby localities in Upper Burma call for notice in connection with a skin from Nam Tisang, 2,500 ft., in that district collected by Lord Cranbrook and referred to in vol. i, p. 272, as very closely resembling one of these cats from Szechwan, described and figured by Milne-Edwards in 1870 and 1872 as *Felis scripta*, a name about thirty years later than *horsfieldi*.

A ♀ from Gam Majaw, 26° 43′ N., 97° 58′ E., 4,000 ft., April 6, has the general colour rather rich ochreous and the pattern on the flanks consisting of irregular-shaped isolated rosettes, black with deep rusty ochreous centres, and on the tail of broadish stripes on its upper side.

A ♀ (no. 351) from Nam Tamai, 27° 42′ N., 97° 54′ E., 4,000 ft., is also a bright skin, but a little paler than the last, and the rosettes have noticeably thinner black rims and bigger, paler centres, and the pattern on the tail above is more spotty, with the stripes at the end not so wide. This skin is an almost exact match of Lord Cranbrook's from Nam Tisang.

Two additional skins from Nam Tamai, 3,000 ft., November and December, one from Goletu, 27° 37′ N., 97° 54′ E., 2,500 ft., December, one from Mantum, 26° 6′ N., 97° 58′ E., 4,000 ft., September, and one from Tasa Hku, 27° 35′ N., 97° 52′ E., 6,000 ft., December, resemble no. 351, making allowance for slight differences in the tint and in the shape of the rosettes. But a ♂ from Adung Long, 28° 8′ N., 97° 50′ E., 5,500 ft., December, is much greyer in general hue, showing a slight buff wash on the back, and the pattern on the flanks may be described as consisting rather of black lines than of rosettes, the so-called centres of the rosettes being represented by rusty ochreous hairs in front of or below the lines. This skin is clearly only a variety of the brighter-tinted specimens with the pattern consisting typically of definite rosettes; and it may be noted that it is very closely matched by one secured by Kingdon Ward in Nam Tamai which is duller than Kaulback's skins from that locality, has the spots less rosette-like, more solidly black, and invaded by rusty ochreous mostly in front, the general hue being nearly as grey as in the skin from Adung Long.

According to Kaulback's notes his specimens from Gam Majaw and Mantum were killed by natives in "moderate forest," those from Nam Tamai, Goletu and Tasa Hku in "thick forest or dense hill jungle," whereas the "grey" specimen from Adung Long was trapped in "pine and rhododendron forest." Possibly the difference of habitat thus intimated may be associated with the difference in coloration of the specimen.

The Kachin name for this cat is *Nam-lăniao*, the same as for the Civets.

The Leopard-Cat (*Prionailurus bengalensis*, subsp.).

A native skin of a Leopard-Cat from Tibet, purchased by Frost at Kalimpong, Darjiling, differs from *horsfieldi* in the indistinctness of its pattern on the body, which is due partly to the length of the coat, partly to the generally reddish hue of the spots. The coat is very full and soft, about 33 mm. long on the body and tail, and the general hue of the body is rich reddish-ochreous mottled with darker spots; on the head the stripes are black and sharply defined against the white areas; the stripes are also conspicuous on the nape, but disappear on the spinal area, which is blackish from the shoulders to the

root of the tail; on the flanks the normal rosettes are broken up into a mottling of rufous brown and dusky spots, but below and on the thighs and legs the pattern is normally black; the tail is rather indistinctly striped and the under hair is everywhere deep sooty grey. The skin is not definitely referable to any of the described races of this Leopard-Cat known to me.

The Desert-Cat (*Felis constantina ornata*), vol. i, p. 287.

A considerable number of specimens of the Indian Desert-Cat was collected by Frost at Umarkot and Chachro in Thar Parkar, Sind, in December. In all the skins the winter coat is fairly thick with wool and about 30 mm. long, the hairs of the spinal crest being about 36 mm. The general colour of the body varies from sandy to clear stone-grey, the best tinted skins having the tips of the contour hairs buffy, the under hair being rich ochreous buff; in the paler skins the tips are bleached nearly grey and the under hair is paler buff: the ears are like the crown, buffy to greyish and concolorous or a little darkened at the tips; the feet are cream or pale buff and the tail turns white at the end, where it is strongly striped; the pattern on the body varies individually in distinctness, being on the whole better defined in the grey than in the sandy skins.

Most of the skulls, ten in number, are those of young adults. A ♂ just adult, but not apparently quite full-sized, has the condylobasal length 83 mm., very nearly the same as in the adult ♂ from Sind entered in the table (vol. i, p. 289), but it is a little narrower in all its width-measurements. In two adult ♀ skulls the condylobasal length is 81 and 86 mm. respectively, the latter being only 5 mm. shorter than the largest of the four ♂ skulls entered in the table, namely, one from Rhoda Motha, Cutch, and 8 mm. longer than the only adult ♀ skull then available for measurement. The average condylobasal length of 5 adult ♂ skulls is 87 mm.; of 3 adult ♀ skulls 81½ mm. Apart from its smaller size, the skull of this cat differs from that of the next species, notably in the more widely salient orbital portion of the zygomatic arches; but its bullæ are relatively larger, those of the adult ♀, collected by Frost, with a condylobasal length of 86 mm., measuring 21 by 16 mm., almost exactly the same as in several ♂ examples of *F. chaus* from Sind with the condylobasal length from 104 to 106 mm. Adult skulls of *ornata* show a shallow but definite depression on the frontals behind the postorbital processes. This increases with age, being hardly perceptible in young skulls. The teeth are very uniform in size, the upper carnassial being 11 mm. long and the lower 8 mm.

The Jungle-Cat (*Felis chaus prateri*), vol. i, p. 298.

Frost's collection contains over a dozen examples of this Jungle-Cat secured at Pano Aqil, Chachro and Umarkot in Thar Parkar, Sind, in December. The race was based upon about half that number of specimens, mostly collected by Prater at Jacobabad and one or two other places to the west of the Indus, and was distinguished from *F. ch. kutas*, of which the typical locality is Midnapore in Bengal, by its more uniformly tawny or sandy hue and slightly larger size, although the two admittedly intergrade in Rajputana, Cutch, and other places more in the northern central and western parts of Peninsular India south of the Ganges. Frost's series, collected to the south-east of the Indus, confirms the conclusion regarding the distinctness of the race at least from Bengalese examples of typical *kutas*. His skins are all in good winter coat, varying in length from 25 to 33 mm. on the flanks and from 45 to 55 mm. on the spinal crest, as in specimens from Jacobabad ; and the colour is considerably paler and more tawny than in typical examples of *kutas* from Bengal, which are much darker and redder. It varies a good deal individually from dull greyish buffy tawny to richer, more ochreous tawny with the spinal stripe correspondingly rusty or duller ochreous. In paler specimens the black speckling is less conspicuous. The ears vary from rusty ochreous, with the tip extensively black, to much duller, and there may be a median black stripe down the tail.

Two kittens, large enough to be running with the adults, are greyish-brown, with broad ill-defined spinal stripe, rich ochreous legs black-striped above the wrists and hocks, and show spots on the flanks and thighs, fainter on the flanks, where, behind the shoulder, they have a tendency to run in vertical bands ; the ears are black at the base and tip, with a rusty ochreous spot between which clearly represents the white spot present on the ears in many other genera of Felidæ.

The largest ♂ skull, with a condylobasal length of 108 mm., agrees closely in all its dimensions with that of the type of *prateri* from Jacobabad, and the average condylobasal length of seven adult ♂ skulls collected by Frost is 105 mm., the average of three adult ♂ skulls of *kutas* from Bengal being 101½ mm. An adult ♀ skull in Frost's series has the condylobasal length 97 mm., about the same as in a ♀ of Prater's lot from Larkana, which is 96 mm., whereas in two adult ♀ skulls of *kutas* from Hazaribagh and Hoshangabad that dimension is 92 and 90 mm. respectively.

Family VIVERRIDÆ.

The Linsang (*Prionodon pardicolor*), vol. i, p. 337.

Five skins procured from natives by R. Kaulback in Upper Burma at a few nearby localities show considerable individual variation in colour. Two from the Nam Tamai Valley, 3,000 ft., August 26 and September 29, have the ground colour bright buff; one from the same locality, 4,000 ft., September 24, and one from the Taron Valley, 6,000 ft., October 2, are not so bright, the under side in all of these being yellowish-white, cream or paler buff than the upper side; but one from Ratnampti, 27° 25′ N., 97° 47′ E., 2,500 ft., December, has the upper side noticeably duller and paler than in the foregoing and the under side soiled white. These skins seem to be paler than those mainly from Nepal, the type locality, and Sikkim that were described in vol. i; but these, unfortunately, are not now available for comparison. The only previously known localities in Burma whence this Linsang has been recorded were Myitkyina and the Chin Hills, 5,000 ft. Of the skins from these places, together with one from the Mishmi Hills, I remarked, that they appear to connect the typical form with the provisionally admitted Indo-Chinese race. *presina*, which appears to be on the average paler than the race from Nepal and Sikkim. Kaulback's Burmese skins seem to favour *presina* in their pale hue, but, being native-prepared skins, they may be faded.

According to Kaulback's notes his specimens from Nam Tamai and the Taron Valley were killed in "dense hill-jungle," the one from Ratnamhti in "thick hill-forest." The Kachin name is *Nam-laniao*.

The Large Indian Civet (*Viverra zibetha*), vol. i, pp. 346–350.

A skin, with skull, secured by Frost in Sikkim on April 15, carries a thick winter coat, with abundance of wool, but the contour hairs are harsh and "dying," in preparation for the moult, but they are of the length characteristic of the typical race, *V. z. zibetha*, at this season of the year, namely, about 36 mm. on the body and 70 mm. on the black dorsal crest, as recorded in vol. i, p. 349. The general colour is clear grey and the pattern on the sides of the body is merely represented by faint darker mottling.

A native skin from Htingnan, 26° 36′ N., 47° 52′ E., Upper Burma, 3,000 ft., secured by R. Kaulback, January 7, very closely resembles the foregoing except that the winter coat, 40 mm. on the body and 60 on the crest, is much softer owing to its considerably earlier date. The general colour is similarly clear grey and the pattern is very obscure on the flanks, although slightly more visible than in Frost's skin. Kaulbacks's skin represents the rather doubtful race *V. z. picta*, which, as I pointed out, is at most just distinguishable from *V. z. zibetha* by the pattern of the winter coat being a trifle more distinct on the average.

The specimen was killed in "moderate jungle." The Kachin name is *Nam-laniao*.

The Golden Palm-Civet (*Paradoxurus zeylonensis*), vol. i, p. 381.

An adult ♂ brought alive from Ceylon by Dr. Osman Hill, which died in the Zoological Gardens on September 13, 1939, gave me the chance to examine the external characters. which have never been previously described from a fresh specimen. In all essential features connected with the rhinarium; the ear, the feet, and the perfume gland it resembles the common palm-civet (*P. hermaphroditus*), and the penis, as in that species, is beset with recurved spicules and has the orifice at the end of a narrow retractile process. In view of the evidence published on p. 414 of vol. i, that the Palm-civets are protected by nauseous scent, I looked at the anal glands, which I had never before examined in the genus, and found them to be of exceptional size, kidney-shaped, 36 mm. long and 23 mm. across the middle, and provided with a constrictor muscle passing from end to end along the convex curve. Internally they were composed of a mass of glandular tissue obscurely divisible into columns converging from the convex surface to the notch or "umbilicus" of the gland, whence, I believe, the duct arises, although, since the specimen had been gutted, I was unable to trace the duct itself. When the anus was squeezed, secretion, like condensed milk in colour and consistency, was discharged at the tip of two small papillæ situated one on each side of the orifice. The skin surrounding the anus was naked for a considerable distance and apparently also glandular. The secretion from the large pair of anal glands had the usual "civet" smell of these animals and was not objectionable, and not comparable to the "vile" or "fetid" odour described by McMaster and Crump in two races of *P. hermaphroditus*. In this connection it may be noted that *P. zeylonensis* has no pattern or colour to suggest "warning."

The Masked Palm-Civet (*Paguma larvata neglecta*), vol. i, p. 422.

Two adult ♂ specimens from the Naga Hills (Frost), February 8 and 9 (nos. 370, 371), vary individually in colour. No. 370 has the back and nape mixed ochreous and black, the flanks grey, with fine dark speckling, the under side grey without dark speckling; the tail is mainly ochreous at the base, the rest of it to the end grey; the pale areas of the mask are extensively clear grey on the forehead, the top of the muzzle, behind and below the eye. No. 371 has much less black on the back and nape; the tail, on the contrary, is much blacker black above and with the end wholly black.

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

	Head and body.	Tail.	Hind foot.
No. 371; ad. ♂ ..	24	22¼	3⅜
No. 370; ad. ♂ ..	23⅜	23½	3⅜

The skull-measurements are entered in the table, p. 485.

The Masked Palm-Civet (*Paguma larvata nigriceps*), vol. i, p. 424.

A series of eleven skins from Upper Burma (Kaulback), all, except two which came from Adung Long, 6,000 ft., August, and Gam Majaw respectively, collected at Nam Tamai, at altitudes ranging from 4,000 to 9,000 ft., between October and December. The general colour at a little distance is some shade of darkish brown, produced by a blending of black and ochreous speckling in the pelage, the tint darker or lighter in accordance with the dominance of the black or ochreous; the nape and shoulders are commonly blacker than the loins and flanks; the under side grey; the tail varies from mainly grey with some ochreous at the base to largely black above and wholly black at the end; the grey of the mask is occasionally nearly as extensive and pale as in *P. l. neglecta*, but is, on the average, much less in evidence, the head being largely blackish.

The skins were procured from natives and no flesh-measurements were recorded.

This race was established on the evidence of a single skin, without skull, from Nam Tamai, procured from a native by Lord Cranbrook. Hence the value of the series of skins and skulls secured by R. Kaulback, mostly at the type-locality. The type itself was characterized by the almost complete suppression of the pale areas of the mask. Kaulback's series shows that the type was exceptionally black about the face.

In most of them the grey patches are more extensive; but on the average they are decidedly less conspicuous owing to their smaller size and less clear greyness. The series also shows that the colour of the body and of the tail, especially of the tail, is very variable. The race intergrades with *neglecta*, which, although typically from Assam, was recorded also from the Chin Hills and Kindat and possibly from Arakan, localities to the west of the Chindwin and Irrawaddy Rivers. In the average inconspicuousness of the mask *nigriceps* is very sharply distinguished from *P. l. intrudens*, which has been collected at Myitkyina and the Shan States in Upper Burma.

There are no structural peculiarities about the skulls, the dimensions of which are entered in the table, p. 485.

THREE-BANDED PALM-CIVET (*Arctogalidia trivirgata millsi*), vol. i, p. 447.

Of this rare Palm-Civet R. Kaulback secured an old ♂ specimen, skin and skull, at Sumtsangtap in Upper Burma, 27° 40′ N., 97° 54′ E., 4,000 ft. (no. 421). Only one British Indian example was previously known with certainty, namely, the type from Mokokchung in the Naga Hills, although an example of this genus recorded many years ago by Blyth from Sylhet was probably a representative of it. Its occurrence in Burma, now substantiated, was, however, to be inferred from its having been collected by Delacour and Lowe in Laos.

The general colour of the skin is dusky greyish-brown above, darker than in the type but, as in that specimen, the three dorsal stripes are black and strongly emphasized from the nape to the middle of the back, but turning brown on the loins and gradually fading away posteriorly; there is a black stripe down the upper side of the tail, the end of which, like the paws, is black, and the characteristic streak on the muzzle is well pronounced.

Although the skull is 3 mm. shorter than that of the type, and very slightly smaller in most other respects, it bears out the conclusion suggested by the skull, the only one previously known, that *millsi* is larger than *leucotis*, the race occurring in Lower Burma, in which the largest recorded skull is 111 mm. in total length, the average in three adult ♂♂ being about 108 mm. It is an old skull with complete sagittal crest and most of the teeth much worn or lost, and its greater age no doubt accounts for the postorbital area being 3 mm. narrower than in the type. The narrowness of this area emphasizes the length of the postorbital processes, which are 42 mm. from tip to tip, about 10 mm. wider than in the two largest skulls of *Paguma larvata nigriceps*.

Skull-measurements (in mm.) of some of the above-recorded examples of *Paguma* and *Arctogalidia*.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	Mandibular length.	Upper cheek-teeth.	pm^4.	m_1.
Paguma larvata neglecta.										
Naga Hills (no. 371) ; ad. ♂	120	120	65	21	23	23	89	42	8	9½
Naga Hills (no. 370) ; ad. ♂	116	115	66	21	22	22	85	40	8—	9
P. l. nigriceps.										
Nam Tamai (no. 350) ; ad. .	124	—	70	19	22	23	90	(40)	9	10+
Gam Majaw (no. 702) ; ad. . .	121	—	67	22	22	22	—	43	8½	—
Nam Tamai (no. 316) ; ad. .	—	—	68	20	22	22+	82	37	8½	10
Nam Tamai (no. 289) ; yg. ad.	(118)	—	60	18	19	22	86	42	9	10
Arctogalidia trivirgata millsi.										
Sumtsangtap (no. 421) ; ad. ♂	117	—	66	14	19	21	89	41	—	8

Family HERPESTIDÆ.

THE COMMON MONGOOSE (*Herpestes edwardsii ferrugineus*), vol. ii, p. 12.

Ten skins collected in Thar Parkar, Sind, by Frost (December, 1939) show interesting variation in colour. As pointed out at the beginning of this volume, the colour of this race in Sind varies from the pale grey phase exhibited by the type of *pallens*, to the rufous phase exhibited by the type of *ferrugineus*. Most of the skins in Frost's series are of the "*pallens*"-type, speckled black and white, some being much darker, owing to the deep black bands on the hairs, than others in which the same bands are greyish-black: but there is always a varying amount of reddish on the face; the feet are deep brown, with fine pale speckling, and the tip of the tail always has a certain amount of red and is sometimes wholly red. One skin has a reddish cast down the spine, the whole of the head is reddish, the legs are more rusty brown, well up above the hocks and wrists, and the tail dominantly red.

The skull-measurements (in mm.) of 3 ♂♂ and 3 ♀♀ are as follows:—

	Cond.-basal length.	Zygomatic width.	Cranial width.	Post-orbital width.	Inter-orbital width.	Maxillary width.
Ad. ♂.....	78	40	26½	14	15½	14½
Yg. ♂.....	76	37	26	15½	14	14
Ad. ♂.....	75½	37	25	11	13	13
Yg. ♀	74	36½	28	15	14	13
Ad. ♀	72½	35½	25½	12	13	12
Ad. ♀	70	35	25	11	12	12

The third and smallest ♂ is the oldest, has a complete but low sagittal crest, deeply constricted "waist," complete postorbital bars, the frontal region between the postorbital processes noticeably elevated and the post palatine width only 6 mm. The first and largest skull, which is bigger in every way, is not so old, although its dentition is complete, the "waist" is broader, the processes of the postorbital bar are separated by 2 mm., the sagittal does not rise so far forwards and the postpalate is 8 mm. wide. The second skull has the dentition incomplete, the milk-canines being still in place, the sagittal is restricted to the parietals, being represented by two ridges on the frontals, the processes of the postorbital bar are 6 mm. apart, the waist is very wide, and

there is no elevation of the forehead. Similarly, in the ♀ skulls the largest in every way is the youngest, with the milk-canines still in place, the "waist" is broad and the postorbital bar is incomplete by 4 mm. In both the other ♀ skulls the post-orbital bar is complete, and all the second teeth are in place. These skulls testify that the tooth-change in this Mongoose, and probably in all the species, is not finished until the skull has reached its full size.

THE SMALL MONGOOSE (*Herpestes javanicus pallipes*), vol. ii, p. 31.

Although apparently living alongside the preceding species in Thar Parkar, this little Mongoose is apparently less plentiful in that district, only four skins and three skulls being represented in Frost's collection. It may be distinguished at a glance by its small size, close, short winter coat, which is only about 15 mm. long as compared with about 50 mm. in the larger form, by its finely speckled pelage and by the feet being paler than the body. The four skins are very much alike, being pale buffy grey, darkened by black speckling above, especially on the back, which is darker than the flanks.

The skulls are fully adult, with completely ossified orbital ring, a constricted postorbital area and a complete low sagittal crest. Their measurements (in mm.), which are as follows, show that there is very little difference between the sexes :—

	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.
Ad. ♂	64	32	9	11	11
Ad. ♀	61	31	9½	11	11
Ad. ♀	58	29	9	10½	10

THE SMALL MONGOOSE (*Herpestes javanicus auropunctatus*), vol. ii, p. 29.

A single ♀, apparently adult, skin, without skull, collected by Frost at Bistenpur in Manipur on February 24, is assigned to this race. It differs markedly from the Sind specimens by its general colour above being very dark brown, speckled black and ochreous, and correspondingly darker below, the fairly plentiful wool, as in the skins from Sind, being blackish at the base, yellow at the summit.

Its flesh-measurements (in English inches) are : head and body $11\frac{3}{5}$; tail $9\frac{1}{5}$; hind foot $2\frac{1}{5}$.

THE CRAB-EATING MONGOOSE (*Herpestes urva*), vol. ii, p. 51.

An adult ♂ collected by Frost in the Naga Hills, 6,500 ft., February 6, has the winter coat thickened with wool and about 70 mm. long. In the colour above the black is dominant owing to the white tip of the contour-hairs being less than one-third the length of their subterminal black band; these two tints are varied, when the coat is parted, by streaks and patches of the ochreous hue of the under hair; the tail has the hairs about 80 mm., banded ochreous black and white proximally, but distally mainly rusty ochreous.

In its flesh-measurements—head and body 23½ in., tail 16⅝ in., hind foot 4 in.—this specimen is the biggest recorded, the tail especially being from 3 to 4 in. longer, suggesting the inclusion of the hair at the tip, but the collector is not likely to have made that error. The skull, with a condylobasal length of 98 mm., is as large as any I have measured; its postorbital width of 13 mm. is unusually narrow, but this is an age character. It is interesting to record that the total length of the skull, 98½ mm., is exactly the same as the average total length in six adult ♂ skulls from Fokien measured by G. M. Allen.

Family CANIDÆ.

THE ASIATIC JACKAL (*Canis aureus aureus*), vol. ii, p. 96.

A large series of specimens, represented by skins and skulls, collected by Frost in Thar Parkar, Sind, two special localities mentioned being Pano Aqil and Gotke, on November 22 and 24. The early winter coat is about 50 mm. (2 in.) on the back, the wool being about 40 mm. The general colour varies individually; the best tinted skins are heavily pigmented above by the black tips of the contour hairs, varied by the white and buffy subapical band and by a richer cast due to the exposure of the summit of the ochreous wool where the loose contour hairs are parted; on the flanks the black of the back gradually fades away and the silvery is less manifest; the fore legs in front are rusty ochreous to the paws, with a median black streak; the hind legs externally and posteriorly are similarly richly tinted, with the paws pale. These well-coloured skins intergrade with others, exhibiting a paler phase in which the black of the back is less intense and less extensive on the contour-hairs, the pale bands less buffy and the wool grey throughout; the legs also are duller in hue.

Most of the skulls are those of young adults, and all the adult skulls have the condyles cut away. Some dimensions (in mm.) of two ad. ♂ skulls from Gotke and Pano Aqil respectively, those from the latter locality being bracketed, are as follows: Total length 156 (148); mandibular length 111 (108); pm^4 16 (15); m_1 19 (17½). These dimensions agree very closely with those of this race entered on p. 99.

The chief interest of this series is the individual variation in colour exhibited by specimens killed in the same place and at the same time of the year.

The Asiatic Jackal (*Canis aureus indicus*), vol. ii, p. 100.

An adult ♀ collected by Frost in the Naga Hills, 5,000 ft., February 28, has the winter coat about 58 mm. long and the plentiful wool about 40 mm.; the contour-hairs, however, are dead, harsh, and have the pale bands bleached silvery; the fore legs are faded to dull pale yellowish-brown, with the paws whitish, and the hind are dirty whitish down the front. On account of the season, with the moult approaching, the general colour of this skin is not so rich and bright as in Frost's series of the typical race from Sind, although the Himalayan race is better coloured in good coat. The skull, with a condylobasal length of 148 mm., is about the average for this race recorded on p. 101.

There are two points of interest connected with this skin. Its altitude of 5,000 ft. is the highest yet recorded from Assam. In the second place, the presence of seven huge teats, four on the left side, three on the right, with the skin around them naked and the hair of the mammary area pinkish-red, shows that a litter of young was being suckled and fixes February as the breeding season in the Naga Hills.

The White-footed Fox (*Vulpes vulpes pusilla*), vol. ii, p. 123.

A very large series of skins of this fox was collected by Frost in Thar Parkar, Sind, in mid-winter. Although killed at the same season of the year, they exhibit a good deal of individual variation in the colour of the winter coat, but nothing approaching the variation exhibited by the larger, more northern races *montana* and *griffithii*. The coat is about 40 mm. long, loose and thickened with wool. The bright tint of the upper side is rusty or paler ochreous red and the blackness of the hair-tips varies a good deal in extent; the wool is dark grey or brownish-grey, giving a mottled aspect to the pelage when the contour-hairs are parted; the flanks and

thighs may be dark grey owing to the extensive blackening of the hair-tips or white when the tips are not blackened; the under side may be deep sooty black or blackish-grey; the fore legs are blackish down the front to the wrist, but occasionally some black invades the paws; the hind legs are white in front, but sometimes there are small black patches on the paws. The interest of this series lies in the individual variation in colour irrespective of season and coat condition.

In the table of skull-measurements of this fox (p. 128) the condylobasal length varies in the ♂♂ from 127 to 108 mm., the average in twelve skulls, ranging from Baluchistan and the Salt Range to Lower Sind, being as nearly as may be 119 mm. From localities in Sind itself four only were mentioned. In these the condylobasal length varied from 122 to 108 mm., the average being 115 mm. This is the same as the average of the sixteen ♂ skulls collected by Frost in Thar Parkar, Lower Sind, in which the condylobasal length varies from 127 to 105 mm.

In the same table only two probably ♀ skulls from Sind were entered, both from Rohri, Upper Sind, which had the condylobasal length 105 and 102 mm. respectively. In Frost's series of ten ♀ skulls from Thar Parkar that dimension ranges from 115 to 104 mm., giving an average of about 108 mm., as against an average of 112 mm. in nine ♀♀, ranging from Baluchistan, the Salt Range, Rajputana and Sind, in which that dimension varies from 123 to 102 mm.

These data bear out the suggestion (p. 127) that Sind representatives of this fox are on the average a little shorter in the skull than those found farther to the north, *i. e.*, in the Salt Range, the type locality of *pusilla*, and in Baluchistan.

The temporal ridges in Frost's skulls from Thar Parkar vary a good deal in strength and proximity, but never coalesce to form a sagittal crest. In one ♂, with a condylobasal length of 123 mm., they are very strong, only 5 mm. apart at the suture and on the parietals. In another, with the molars worn flat, and presumably a good deal older, although the condylobasal length is only 116 mm., the ridges are 8 mm. apart at the suture and 10 on the parietals. In a third, with the condylobasal length only 108 mm., they form a wide lyrate figure, being 14 mm. apart at the suture and 17 on the parietals. The ridges are similarly variable in the ♀ skulls. In one, with a condylobasal length of 110 mm., they are 8 and 7 mm. apart at the points indicated; in a second, with the condylobase 113 mm., they are 10 and 10 mm. respectively; in a third, with the condylobase 108 mm., they are 13 and 15 mm. respectively; in a fourth, with the condylobase 109 mm., they form a widely lyrate figure, being 17 and 21 mm. apart, whereas in some they are scarcely perceptibly developed.

THE BENGAL FOX (*Vulpes bengalensis*), vol. ii, p. 129.

In Thar Parkar, Sind, Frost secured an example of this fox at once distinguishable from the preceding species by the characters pointed out on p. 129. The coat, although thickened with wool to about the same extent, is much shorter, about 27 mm. long, closer and softer ; the general colour above is nearly the same, but the pale speckling in the pelage is much finer and less extensive ; there is no black below ; the smudge in front of the eye is comparatively inconspicuous ; the ears are sandy grey with the tips blackish ; the fore legs are reddish, not so black down the front ; the hind are only narrowly white in front, and the paws, both front and hind, are tinted with buff and, most noticeable of all, the posterior third of the tail is jet black. Since only one skin was collected, as compared with over a score of *V. v. pusilla*, the species is obviously much less abundant in that district of Sind.

Family MUSTELIDÆ.

THE YELLOW-THROATED MARTEN (*Charronia flavigula flavigula*), vol. ii, p. 331.

The individual variation in colour of a series of skins collected by R. Kaulback at Nam Tamai in Upper Burma, was noted above (p. 333) ; but the adult skulls, five in number, were not referred to. Three of them are ♂♂, varying in total length, the condyles being cut away, from 100 to 105 mm. The largest is smaller than the largest ♂, from Bhamo, entered in the table (p. 341), which has a condylobasal length of 106 mm. It has a complete low, sagittal crest, expanding slightly posteriorly. In the other ♂♂, the temporal ridges are weak, 6 mm. apart in front and expanding behind. In two ♀ skulls the total length is 95 and 92 mm. ; the ridges in the larger are 2 and 11 mm. apart in front and behind, in the smaller 9 and 11 mm. The series suggests that the ridges approach each other as age advances after the skull has reached its full size ; but I have seen no ♀ skull in which they coalesce to form a sagittal crest. The postorbital area is nearly parallel-sided in all Kaulback's skulls, ♂ and ♀, varying from 22 to 25 mm. wide. Their teeth are about the same size as in the measured series.

THE WHITE-FOOTED WEASEL (*Mustela altaica temon*), vol. ii, p. 352.

The history of the specimens of this weasel collected by W. L. Abbott in Ladakh and Baltistan has been told in the

preface to this volume (p. v). They were collected between June 30 and October 25 at various localities ranging from 7,500 ft. to 17,000 ft., the altitudes in several instances being considerably higher than the highest I was able to record. All may be described as in summer coat, but hardly any two skins are exactly alike, there being individual differences between specimens killed at the same spot on practically the same date. The upper side varies from pale brownish-fawn to a much paler, faded, more sandy hue, and the under side from cream-white, or paler, to various shades of sulphur-yellow. On the whole the evidence points to the conclusion that the paler phases, at least so far as the dorsal surface is concerned, occur later in the season, suggesting gradual fading of the coat as autumn advances.

The number of mammæ seems variable. I recorded four pairs in a suckling ♀ collected in September in the Pattan Valley, Lahul; but can find only three pairs in a ♀ from Tivit on the Shyok River, Ladakh, June 30 or July 1, and only two pairs in one from above Tsomorari, Ladakh, 16,500 ft., August 1.

Most of the specimens captured were ♂♂, which, as the following table of measurements (in English inches) shows, are very uniform in size. The variation in the comparatively few ♀♀ is much greater.

	Head and body.	Tail.	Hind foot.
Shyok River, Ladakh (198475); just ad. ♂	10½	5⅛	2+
Durga, Ladakh (198478); ad. ♂	10⅜	6⅜	2—
Sobu, Ladakh (198480); ad. ♂	9⅜	6	1⅝
Shigar Valley, Baltistan (176043); yg. ad. ♂	10⅜	6	2—
Basha Valley, Baltistan (176041); yg. ad. ♂	10⅜	5⅛	1⅝
Basha Valley, Baltistan (176037); ad. ♂	10	5⅛	2—
Shyok River, Ladakh (198473); ad. ♀	10½	6	1⅝
Shyok River, Ladakh (198474); ♀	9⅜	5½	1⅝
Lungma Glacier, Baltistan (176035); ♀	8	4⅜	1⅜
Above Tomorari, Ladakh (84059); ad. ♀	7½	5	—

The sexes overlap in size, but the ♀♀ are, on the average, smaller. The dimensions agree very closely with those recorded on p. 354.

The only weight I was able to record was that of an adult ♀ from the Pattan Valley, Lahul, which was 4 oz. Abbott recorded 7 oz. for a ♂ from below the Sasser Pass, Nubra, Ladakh, 17,000 ft. (no. 198476). In this ♂ the condylobasal length was 50 mm.

The skull-measurements, like the flesh-measurements, show complete overlap in size between the two sexes. The variation in condylobasal length in the ♂♂ is 5 mm.; in the two ♀♀

Skull-measurements (in mm.) of a few of Abbott's specimens of *Mustela altaica temon*.

Locality and sex.	Cond.-basal length.	Zygomatic width.	Post-orbital width.	Inter-orbital width.	Maxillary width.	pm^4.	m_1.
Shyok River, Ladakh (no. 198475); just ad. ♂	52	29	11	10	—	6	6½
Durga, Ladakh (no. 198478); ad. ♂	52	27	9	11	9	6	6½
Sobu, Ladakh (no. 198480); ad. ♂	51	27	10	11	10½	5½	6
Shigar Valley, Baltistan (no. 176043); yg. ad. ♂	50	25	11	10½	10	5½	6
Basha Valley, Baltistan (no. 176041); yg. ad. ♂	49	25	10	10	10	5½	6
Basha Valley, Baltistan (no. 176037); ad. ♂	49	27	10	10½	10½	5½	6
Tomik Valley, Baltistan (no. 176033); ad. ♂	47	26—	9	10½	10	5	5
Shyok River, Ladakh (no. 198473); ad. ♀	49	25	8	9½	9½	5½	6
Above Tsomorari, Ladakh (no. 84059); ad. ♀	43	22+	8	9	8	5—	5

6 mm. In the table (p. 356) the condylobasal length varies in ♂♂ from 49 to 50 mm., in ♀♀ from 42 to 46 mm., the smallest, from Garhwal, being 1 mm. less than the ♀ from above Tsomorari in Ladakh.

An adult ♂ weasel collected by Abbott at Tsagdumbash in the Pamirs, 12,000 ft., in April, I am unable to identify. It differs from all his examples referred to *M. a. temon* in its brighter, more buffy hue, the paler buff of the flanks passing to the middle line of the abdomen without line of demarcation; the throat is also pale buff, with a streak of the same colour running between the fore legs to the abdomen, and the lower side of the tail, which is the same colour throughout in his examples of *M. a. temon*, is white in its proximal half. The head and body are 10¼ in., the tail 6 in., and the skull has the condylobasal length 51 mm., the measurements being the same as in typical *M. a. temon*.

The Yellow-bellied Weasel (*Mustela kathiah*), vol. ii, p. 357.

A couple of young specimens, ♂♀, evidently members of the same litter and probably all that it contained, were collected by Frost in the Naga Hills, 5,000 ft., on January 26. The coat is short, thin and sleek and the tail is equally short-haired and tapering posteriorly. The colour is as in the adults, dark chocolate-brown above, pale creamy-yellow below and on the inner side of the legs to the wrists and hocks. Their flesh-measurements (in English inches) are as follows, those of the ♀ being set in brackets: head and body 6⅜ (6½); tail 3⅛ (2⅜); hind foot 1¼ (1⅛).

According to Frost's note on the label he judged these specimens to be about three weeks old; and he observed that they were "already extremely pungent." Other interesting points connected with them are the evidence they supply of having been born in mid-winter, and of the litter consisting of only two individuals, a number in keeping with the presence of only two pairs of teats in the ♀.

Hodgson's Weasel (*Mustela sibirica hodgsoni*), vol. ii, p. 374.

Abbott collected an ad. ♂ at Kotihar, Kashmir, 7,000 ft., and an ad. ♀ at Dannour, Kashmir, 8,000 ft. I have no notes on the coloration; but the flesh-measurements (in English inches) of the two, those of the ♀ being bracketed, are as follows: head and body 11⅛ (9⅜); tail 7⅜ (7⅜); hind foot 2⅛ (1⅛). The skulls have the condylobasal length 55 mm. in the ♂, 50 in the ♀. The flesh-measurements of the ♂ are exactly intermediate between those of the two from the Gugga Nullah.

Kashmir and Bara Tissa Chamba above recorded (p. 375), whereas the ♀ is 1½ in. shorter than the ♀ from Kaigerskote, Kashmir. The condylobasal length of the skull slightly exceeds the average of the three ♂♂ from Kashmir and Chamba (p. 371); that of the ♀ being a little smaller than those of that sex.

The Back-striped Weasel (*Mustela strigidorsa*), vol. ii, p. 376.

An adult ♂ (no. 251) of this rare species was secured by Frost in the Naga Hills, Assam, 5,000 ft., January 27. The winter coat, thickened with underwool, is about the same length as stated above (p. 376). The colour is normal, dark rufous brown above, with a thinnish but conspicuous white dorsal streak from the crown to the croup, and yellow below. The flesh-measurements are: head and body 12 in., tail 7½ in., hind foot 2 in., ear ⅝ in. These dimensions agree tolerably closely with those of an adult ♀ from Laos recorded by Osgood and entered on p. 377 of this volume. The skull, the measurements of which I was able to enter on the table (p. 361), is of exceptional interest from being the only complete skull of the species I have been able to examine. The figure (fig. 92, A_1, A_2, p. 378) shows it to be much more strongly moulded muscularly than Hodgson's skull from Sikkim, which, although full-sized, has the postorbital area wide and unconstricted and the sagittal crest incompletely developed in front. The bulla in Frost's specimen has a truncated emarginate anterior border.

The Ferret-Badger (*Helictis moschata millsi*), vol. ii, p. 399.

An adult ♂ and ♀ (topotypes), collected by Frost in the Naga Hills, 5,000 ft., February 2 and 3, are practically alike in external characters. The thickish winter coat is about 20 mm. on the body, 30 mm. or a little over on the tail; the general colour is tolerably uniformly darkish brown above, with a slight grey cast owing to obscure pale speckling of the hair-tips, the head being slightly darker brown, emphasizing the mask, which is normal, consisting of a white frontal patch, an isolated streak on the crown between the white-rimmed ears, a postocular patch which, except on one side in the ♂, joins the white of the cheek; there is also an isolated white streak on the hind nape; the base of the tail is like the body, but the hairs become gradually more and more extensively pallid posteriorly, the end being dirty white; the upper lip and chin are white, the throat and the rest of the under side buffy-white. The general colour of these skins is much browner, less grey than in Mills's skins. The difference is probably seasonal,

Frost's being later winter skins. The flesh-measurements (in English inches) are as follows :—

	Head and body.	Tail.	Hind foot.	Ear.
♂	12¾	6¼	2	1¾
♀	12¾	5¾	2	1¼

Mills's specimens from the Naga Hills were unmeasured; but the dimensions of Frost's specimens are in almost precise agreement with those of an adult ♂ and ♀ of this race collected by Kaulback in Upper Burma; and the colour of Frost's specimens fits in with Kaulback's series, being not so dark as his darkest, nor so light a brown as his lightest, not nearly so grizzled as his greyest, and some of the Burmese skins have the tail considerably whiter posteriorly.

The two skulls collected by Frost are shorter than those of *millsi* entered in the table (p. 402). The condylobasal length of the ♂ is 75 mm. as against an average of just over 79 mm. in three ♂♂ from Mokokchung, and that of the ♀ 74 mm. as against 76 and 78 in two ♀♀ from Upper Burma collected by Kaulback. The various width-measurements and the teeth are merely a trifle smaller on the average. In both the skulls the temporal ridges are wide apart and subparallel. In the ♂ skull, which is more strongly developed, they are much more pronounced and 13 mm. apart, the distance in the ♀ being 19 mm.

The Ferret-Badger (*Helictis personata personata*), vol. ii, p. 407.

Three adult specimens, 2 ♂♂, 1 ♀, collected by Frost in the Naga Hills, 5,000 ft., February 4, 8 and 27, are of exceptional interest from their capture in the same hills, at the same altitude and in the same month as Frost's examples of *H. moschata millsi*, attesting the occurrence of the two species side by side in the same locality. Although differing individually in tint, the three collectively may be distinguished at a glance from the examples of *H. m. millsi* by their slightly larger size, by their colour being some shade of greyish-black, without any brown tinge, by the presence of a conspicuous, uninterrupted white stripe extending from between the ears beyond the middle of the back, and emphasized by an entirely black area on each side of it, the white of the face being similarly set off by the otherwise black hue of the rest of the upper side of the head, by the hairs of the distal two-thirds of the tail being much whiter both in extent and clearness, the warning colouring being generally more conspicuously in evidence, and by the longer coat, the hairs of the body being about 30 mm. long and those of the end of the tail from about 60 to 65 mm.

The three vary in greyness. The ♀ (no. 369) collected on February 8 is the darkest, the black setting off the spinal stripe covering the greater part of the dorsal area and the hairs of the fuscous flanks being only very finely speckled with white. The palest, judged to be ♂ from its having the longest flesh-measurements (no. 477), collected on February 27, has the black on the spinal area much narrower and the hairs of the flanks extensively silvery-grey. The other ♂ (no. 327) resembles the ♀ in the extensive blackness of the back, is intermediate between the two in the greyness of the flanks, but has the tail not so clean white as in either.

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

	Head and body.	Tail.	Hind foot.	Ear.
♂ ?	16½	7⅛	2⅜	1¼
♂	15⅜	8	2⅜	1⅛
♀	14⅜	8⅛	2⅛	1⅜

In their greyish hue, without trace of fawn or tawny, these specimens closely resemble two from Manipur mentioned in the main part of the text of this volume. In their flesh-measurements the largest is very slightly longer in the head and body than the ♂ from Toungoo, whereas the ♀ is very slightly shorter than the old ♀ from Mount Popa.

The skulls of Frost's two ♂ specimens are 2 and 3 mm. shorter than three ♂♂ from Pegu, Mt. Popa and Manipur ; but his ♀ is 4 mm. longer than the adult, presumed ♀, specimen from Kohima in the Naga Hills. The temporal ridges are stronger in the two ♂♂ than in the ♀ ; but in all they are wide apart and subparallel. In the ♂ (no. 327) they are 11 mm. apart at the "waist," 9 mm. at the occiput ; in no. 477 the distances at those points are 12 and 15 mm., whereas in the ♀ they are 12 mm. at the waist, 15 on the middle of the crown, 10 at the occiput. They do not exhibit the pronounced sinuous curvature usual in adults of this species and shown in the figure of the ♂ from Mount Popa. This feature is a matter of age.

The table brings out very clearly the main differences in the skull between the two species, especially in the width of the muzzle above pm^4 and c^1 and in the size of the teeth (p. 498).

The Hog-Badger (*Arctonyx collaris consul*), vol. ii, p. 436.

A young adult ♀ of this race collected by Frost in the Naga Hills, 3,500 ft., on February 5, is in full winter coat. Although the contour-hairs are very close and about 80 mm. long on the hind back, there is no appreciable wool. The mask is well defined ; the median stripe, white on the face, extends over

Dimensions (in mm.) of the skulls of the two species of *Helictis* from the Naga Hills collected by Frost.

Name, locality and sex.	Total length.	Cond.-basal length.	Zygo-matic width.	Post-orbital width.	Inter-orbital width.	Max. width at pm^4.	Max. width at c_1.	pm^4.	m_1.
H. moschata millsi.									
Naga Hills (no. 316); ad. ♂	75	70	42	17	17	18	11	5½	6—
Naga Hills (no. 317); ad. ♀	74	69	38	18	17	19	10	6	6
H. personata personata.									
Naga Hills (no. 477); ad. ♂ ?	81	—	45	17	19	26	14	8	8
Naga Hills (no. 327); ad. ♂	80	77	48	17	19	26	16	8	8
Naga Hills (no. 369); ad. ♀	80	76	44	18	20	26	14	8—	7

the forehead to the fore nape, where it turns buffy and dies away ; the black stripe over the eye is broad and reaches the side of the nose, which has the rhinarium pink ; the elongated pale patch below the eye is white and set off below by the broadish black band running from beneath the ear to join the black of the side of the nose ; the fore back is speckled with the narrowly buffy hair-tips ; posteriorly the hair-tips become more extensively pallid and are white on the hind back and rump ; the flanks are grizzled, the mid-line of the belly and chest are black and the hairs of the tail are white throughout ; the bases of the hairs, except on the mask and legs, are everywhere white.

The flesh-measurements (in English inches) are : head and body 29, tail 8 ; hind foot $4\frac{2}{5}$; ear $1\frac{1}{5}$. It is only a little smaller than the type.

The young adult skull of this Hog-Badger, although its basi-occipital and facial sutures are open, showing that growth had not ceased, has a condylobasal length of 151 mm., only a few mm. shorter than that of the adult ♂ type from Toungoo. The latter has a complete sagittal crest, 7 mm. high, which forms a lightly convex curve with the forehead, whereas in Frost's young adult skull the temporal ridges just meet to form a double ridge 2 mm. high, the crown being tolerably flat, forming an abrupt bend downwards where it passes into the frontals. The type skull, on account of its age, is also broader everywhere, the mastoid width in the two being 92 and 76 mm. and the zygomatic width 91 and 80 mm. But the most noticeable difference lies in the mastoid processes, which, in the type, as described, are short, hardly projecting below the lower edge of the auditory orifice, whereas in Frost's skull they project considerably lower, as in the skull of the old ♂ from " Bengal " (Hardwicke), which in this respect is like Frost's skull from the Naga Hills. It remains to be seen if this difference has any systematic value. Another point of interest connected with this skull is the positive evidence it supplies of the occurrence in Assam of this larger race of British Indian Hog-Badger. All the Assamese specimens assigned to it in the main text of this volume were immature ; and their identification was provisional owing to the possibility of their representing a smaller race linking *consul* with typical *collaris*. Frost's specimen negatives this supposition.

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CALCUTTA.

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