a form with unusually short hind feet. Like most widely diffused forms, this species is very variable.

Habits. This rat is found both on the ground, where it burrows, and in trees, where it builds nests amongst the branches. In the Laccadive Islands and other places it inhabits the crowns of cocoa-nut palms, and is said never to descend to the ground, but to live on the nuts and to do great damage by biting them off when unripe. It is common in houses everywhere, often living in the roofs. It feeds chiefly on fruit, grain, and vegetables, but is more or less omnivorous, though less carnivorous than *M. decumanus*. The young, which are produced several times in the year, are usually 7 to 9 in number and are born with the eyes closed.

273. Mus concolor. *The little Burmese Rat.*

Mus concolor, *Blyth, J. A. S. B.* xxviii, p. 295 (1859), xxxii, pp. 73, 344; *id. Cat.* p. 116; *id. Mam. Birds Burma*, p. 40; *Anderson, Fauna Mergui Archip.* i, p. 341; *W. Sclater, P. Z. S.* 1890, p. 526.

Fur harsh, chiefly composed on the back of flattened hairs or fine spines. Tail longer than the head and body. Ears reaching the eye when laid forward. Hindmost metatarsal pad elongate. Mammæ 8: 2 pairs pectoral, 2 inguinal. Skull similar to that of *M. rattus* in shape though much smaller; third upper molar about half the size of the second.

Colour above brown, slightly rufescent, lower parts paler brown; basal half of the dorsal hair grey, which passes gradually into brown, the tips being dark brown (probably black in fresh skins), fur of lower parts grey at the base. Tail brown throughout.

Dimensions of an adult male in spirit: head and body 4 inches, tail 4·35, ear from crown 0·45, hind foot 0·92; in another 4·5, 5·25, 0·55, and 1; in an adult female 4·1, 4·85, 0·55, and 0·85; extreme length of skull 1·1.

Distribution. Hitherto only recorded from Pegu and Tenasserim (Thayet Myo, Schwe Gyeng, the neighbourhood of Moulmein, Mergui and the Mergui Archipelago), but probably found also in Malacca.

A house-rat, inhabiting wooden buildings, and especially the thatch. This species is a small rat rather than a large mouse, and is structurally a miniature of *Mus rattus*.

274. Mus decumanus. *The brown Rat.*

Mus decumanus, *Pallas, Glires*, p. 91 (1779); *Elliot, Mad. Jour. L. S.* x, p. 212; *Kelaart, Prod.* p. 59; *Blyth, J. A. S. B.* xx, p. 167, xxxii, p. 335; *id. Cat.* p. 113; *id. Mam. Birds Burma*, p. 39; *Jerdon Mam.* p. 195; *Thomas, P. Z. S.* 1881, p. 532.

Mus decumanoides, *Hodgson, J. A. S. B.* x, p. 915 (no description).

Mus brunneus, *Hodgson, A. M. N. H.* xv, p. 266 (1845).

Chuha, Ghar-ka-chuha, H.; *Demsa-indur*, Beng.; *Kuté-elli*, Tam. *Manei-ilei*, Can.; *Gaval-Miyo*, Cing.; *Kymeh*, Burmese.

Fur coarse and harsh. Tail shorter than the head and body. Ears short. Feet large. Mammæ 10–12.

Colour above brown, darkest on the back; lower parts white, or whity brown or light brown. Underfur dark-coloured throughout the body, on the back slaty grey; the terminal portion of the dorsal hairs in general light brown, but numerous longer black hairs are intermixed. Tail brown throughout.

Dimensions. An adult male measured: head and body 7 inches, tail 6·25, ear from orifice 0·77, hind foot 1·65; another, head and body 8, tail 6; a third 10·5 and 8·25, and probably even larger specimens might be found. Basal length of an average skull 1·65, extreme length 1·8, zygomatic breadth 0·9. A large Calcutta male skull is 2·15 inches long.

Distribution. This rat is certainly not indigenous in India, though now found in all large towns and villages, along the banks of navigable rivers and on high roads. It is unknown in Persia, and, it is said, in Afghanistan, but will probably be introduced when wheeled carriages take the place of pack animals in those countries. The source whence this rat has been distributed throughout the world is probably Chinese Mongolia.

Habits. As is well known, the brown rat is omnivorous and voracious; it is essentially parasitic, living about human habitations and cultivations, burrowing in houses, banks of fields, drains, &c. It is excessively prolific, breeding several times in the year, and producing from 4 to 12, or at times even more, young at a birth.

The brown rats in Calcutta grow to a large size and are often mistaken for bandicoots. They probably attain similar dimensions in some other Indian towns.

275. **Mus fulvescens.** *The chestnut Rat.*

Mus fulvescens, *Gray, Cat. Mam. &c. Nepal & Thibet B. M.* (1) p. 18 (1846); *Thomas, P. Z. S.* 1881, p. 537; *W. Sclater, P. Z. S.* 1890, p. 524.

Mus caudatior, *Hodgson, A. M. N. H.* (2) iii, p. 203 (1849) (no description); *Jerdon, Mam.* p. 201; ? *Blyth, Mam. Birds Burma,* p. 40.

? Mus cinnamomeus, *Blyth, J. A. S. B.* xxviii, p. 294 (1859), xxxii, p. 341, xxxiv, p. 193; *id. Cat.* p. 115.

Fur soft, generally without spines, but sometimes with flat spines intermixed. Tail longer than the head and body and having the hairs near the end a little longer and thicker than near the base. Teeth small. Anterior edge of zygomatic process of maxillary nearly vertical and but slightly emarginate above, much less so than in other species. Mammæ 8: 2 pairs pectoral and 2 inguinal.

Colour above bright rufous-brown, the back but little darker than the sides, sometimes mixed with grey; below white, and in one skin with a fulvous band down the middle of the breast. The dorsal and ventral colours sharply separated on the sides. Basal ¾ of dorsal hair leaden grey, terminal portion yellowish brown, the

extremities darker, a few longer hairs black-tipped. Spines when present whitish except at the end. Tail dark, the same colour above as below.

Dimensions. Head and body 5·25 to 6, tail 7 to 8·4, ear from outer base 0·9, hind foot 1; total length of skull 1·3, breadth 0·6; weight 2½ oz.

Distribution. Nepal and Sikhim. Several specimens were obtained at Darjiling in houses by Mr. Hodgson.

Mus cinnamomeus, Blyth, was united to *Mus caudatior*, which is the same as *Mus fulvescens*, by Mr. Blyth himself. The colour, however, is much paler, the teeth considerably larger, and the anterior border of the maxillary zygomatic process much more emarginate. The type of *M. cinnamomeus* was from Schwe Gyeng, Burma, and measured, head and body about 6 inches, tail 7·75, hind foot 1·25. Further specimens are required to show whether this is the same as *M. fulvescens* or distinct.

276. **Mus bowersi.** *Anderson's Rat.*

Mus bowersi, *Anderson, An. Zool. Res.* p. 304, pl. xvii (1878); *Thomas, P. Z. S.* 1886, p. 62; *W. Sclater, P. Z. S.* 1890, p. 524, pl. xliv, fig. 2 (skull).

Fur thin, harsh and coarse, without spines, growing from the roots in small tufts of 3 or 4 hairs. Tail exceeding the head and body in length, and but thinly clad with very short hair. Ears large, almost naked. Mammæ 8: pectoral 2 pairs, inguinal 2.

Skull long, fronto-nasal portion elongate, and very straight above. Infraorbital foramen widely open below; the anterior border of the maxillary zygomatic process vertical at the lower base, then rounded, deeply emarginate above.

Colour above dark greyish brown (earthy brown), slightly grizzled, sides paler, lower parts white or pale yellow. No dark grey underfur; dorsal hairs whitish at the base, becoming gradually darker till they are blackish brown near the end, the extreme tip whitish. Longer piles are intermixed having long black points. Tail brown throughout, except the terminal portion, varying from $\frac{1}{6}$ to $\frac{1}{3}$, which is pale with white hair.

Dimensions. Head and body 9 inches, tail 10·25, ear 1·15, hind foot 2·15; basal length of skull 1·9, extreme length 2·1, zygomatic breadth 1·1.

Distribution. Hotha in Yunnan, Machi in Manipur, Karennee, and Tenasserim (*Fea*). Probably a tree-rat. A single specimen from the Andamans in the British Museum belongs either to a variety of *M. bowersi* or to a closely allied form.

277. **Mus berdmorei.** *The grey Rat.*

Mus berdmorei, *Blyth, J. A. S. B.* xx, p. 173, note (1851), ? xxiv, p. 712, xxxii, p. 343; *Thomas, P. Z. S.* 1886, p. 62; *W. Sclater, P. Z. S.* 1890, p. 525.

Fur coarse, moderately long, without spines. Tail about the same length as the head and body. Ears rounded. Nasal portion of skull long; the upper molars proportionally small, very distant from the incisors, which are directed forward. Mammæ 10.

Colour above dark ashy grey, grizzled or speckled, without any rufous or yellow admixture, below white. Dorsal hairs slaty grey from the base to near the tip, then there is a whitish subterminal ring and a blackish tip, the latter often wanting. Tail bicoloured; the upper surface of the basal half brown, the lower surface of the basal and the whole of the terminal half pale, with whitish or white hair. Feet white.

Dimensions taken from skins: head and body 7 inches, tail 6·9, hind foot 1·4, ear from crown 0·65; total length of skull about 1·5, zygomatic breadth 0·8. Some skins may indicate a larger size.

Distribution. The type, of which only the skull is now preserved, came from Mergui; specimens have since been obtained by Mr. Fea east of Moulmein, by Mr. Hume in Manipur, and I have a skin from the Khási hills. From these the above description is taken.

278. Mus blanfordi. *The white-tailed Rat.*

Mus blanfordi, *Thomas, A. M. N. H.* (5) vii, p. 24 (1881); *id. P. Z. S.* 1881, p. 541, pl. l.

Fur long and soft, without spines. Tail longer than the head and body, hair on the terminal portion conspicuously longer and thicker. Feet broad, digits short. Mammæ 6 in the only female examined: 1 pair axillar, 2 inguinal. Fronto-parietal suture of skull forming almost a right angle in the middle. Anterior palatine foramina long.

Colour brown above, white below, the sides paler than the back. Basal three quarters or more of the dorsal fur leaden grey, terminal portion light brown or isabelline, the longer hairs on the back with long black tips. Feet white in old specimens, brownish in younger individuals. Tail brown at the base and for half to three-quarters the length, the terminal portion pale, clothed with longer white hairs.

Dimensions of adult male in spirit: head and body 6 inches, tail 8, hind foot 1·33; extreme length of skull 1·65, basal length 1·6, zygomatic breadth 0·8.

Distribution. Madras Presidency. This species has been found near Cuddapah by Col. Beddome, on the Nilgiri hills by Mr. Davison, and on the Shevaroys by Mr. Daly. It is probably a hill form.

279. Mus jerdoni. *The bicoloured Rat.*

Leggada jerdoni, *Blyth, J. A. S. B.* xxxii, p. 350 (1863); *Jerdon, Mam.* p. 209.

? Mus octomammis, *Hodgson, Cat. Mam. &c. Nepal & Thibet B. M.* 2nd ed. 1863, p. 10 (no description).

Mus jerdoni, *Blyth, Cat.* p. 121; *Thomas, P. Z. S.* 1881, p. 537.

Fur long, usually mixed with flattened spines. Tail considerably

longer than the head and body. Mammæ 8: 2 pairs pectoral, 2 inguinal. Planta short. Ears large. Skull nearly flat above; nose elongate, anterior border of maxillary zygomatic process convex below, concave but not deeply emarginate above; bullæ small.

Colour above bright rufous-brown, darker on the back than on the sides, lower parts white, the colours sharply divided. Basal three-fourths of dorsal hair slaty grey, tips dull orange, the spines whitish with long black tips; ventral hair white throughout. Tail distinctly bicoloured throughout, dusky above, white below, the two colours contrasting strongly. Feet, as a rule, white, but the dark colour of the tarsus sometimes extends to the base of the digits.

Dimensions. Head and body of an adult female 5·5 inches, tail 7, hind foot 1·2, ear from orifice 0·75. Of another the head and body measured 5·4, tail 8·5. Basal length of a skull 1·3, extreme length 1·5.

Distribution. Eastern Himalayas at elevations of from 4000 to 7000 feet, Khási hills, Tenasserim (Fea), Java, and perhaps Formosa (*M. coxingi*); probably a hill-species everywhere. The Western Himalayan specimens mentioned by Jerdon are referred by Thomas, probably with justice, to another species.

280. **Mus niveiventer.** *The white-bellied Rat.*

Mus (Rattus) niviventer, *Hodgson, J. A. S. B.* v, p. 234 (1836); *Blyth, J. A. S. B.* xxviii, p. 295, xxxii, p. 342.

Mus niviventer, *Jerdon, Mam.* p. 200; *Thomas, P. Z. S.* 1881, p. 540.

Fur of moderate length, sometimes thickly mixed with flattened spines, sometimes without spines. Tail a little longer than the head and body, with the hair towards the tip rather longer and thicker than elsewhere. Skull very similar to that of *M. jerdoni*.

Colour dull brown above, with more or less of a greyish tinge, sides a little paler than the back, lower parts white, the colours sharply divided on the sides. Basal two-thirds or more of the dorsal fur leaden grey, spines whitish, terminal portion of hairs isabelline (whity brown), the spines with long black tips. Feet whitish. Tail distinctly bicoloured, the upper surface dark brown, lower whitish or white.

Dimensions. Head and body 5·25 inches, tail 6, hind foot 0·92; extreme length of skull about 1·3. Blyth gives larger dimensions for specimens from Mussooree.

Distribution. Himalayas from Simla to Katmandu in Nepal. Jerdon adds Darjiling, but he possibly mistook spineless specimens of *M. jerdoni* for the present form.

Besides being much greyer in colour, the present species is distinguished from *M. jerdoni* by having a comparatively shorter tail.

281. Mus chiropus. *Fea's Rat.*

Mus chiropus, *Thomas, Ann. Mus. Civ. Gen.* 2 *a*, x (1891).

Similar in size and proportions to *M. jerdoni*, but with the hallux opposable and, like the pollex, furnished with a flat nail in place of a claw. Fur long, not spinous, but with a few flattened bristles intermixed. In the skull the anterior border of the maxillary zygomatic process slopes slightly backward from the lower end, and is nearly straight throughout, being scarcely emarginate above.

Colour above rufous-brown, sides and outer surfaces of limbs bright rufous, lower parts white, the colours sharply defined. Tail dark above, pale below.

Dimensions. Head and body of an adult male in spirit 5 inches, tail 8, hind foot 1·2, ear 0·6; basal length of skull 1·25, extreme length 1·5.

Distribution. Karennee. A single specimen was obtained by Mr. L. Fea at an elevation of about 4500 feet above the sea.

282. Mus musculus. *The common House-Mouse.*

Mus musculus, *Linn. Syst. Nat.* xii, p. 83; *Elliot, Mad. Jour. L. S.* x, p. 214; *Blyth, J. A. S. B.* xxi, p. 351, xxviii, p. 296.
Musculus nipalensis, *Hodgson, J. A. S. B.* x, p. 915 (no description).
Mus manei, *Gray, List Mam. B. M.* p. 111 (1843) (no description); *Kelaart, Prod.* p. 64; *Blyth, J. A. S. B.* xxix, p. 103.
Mus urbanus, *Hodgson, A. M. N. H.* xv, p. 269 (1845); *Blyth, J. A. S. B.* xxxii, p. 345; *id. Cat.* p. 118; *Thomas, P. Z. S.* 1881, p. 544; *W. Sclater, P. Z. S.* 1890, p. 527.
Mus dubius, *Hodgson, ibid.* p. 268.
Mus homourus, *Hodgson, ibid.* p. 268; *Blyth, J. A. S. B.* xxxii, p. 346; *id. Cat.* p. 118.
Mus darjeelingensis, *Hodgson, A. M. N. H.*(2) iii, p. 203 (1849) (no description); *Horsfield, Cat.* p. 143.
? Mus tytleri, *Blyth, J. A. S. B.* xxviii, p. 296, xxxii, p. 346.
Mus rama, *Cantor, Blyth, J. A. S. B.* xxxiv, pt. 2, p. 194.
Mus urbanus, homourus, darjeelingensis, *and* tytleri, *Jerdon, Mam.* pp. 203–205.
Mus kakhyenensis *and* viculorum, *Anderson, An. Zool. Res.* pp. 307, 308.

Músi, Chuhi, Mesuri, H.; *Chutu*, Kol.; *Lengtia indur*, Beng.; *Manei buduga*, Can.; *Kusettamiyo*, Cing.; *Shintad gandu*, Wadári, Ahmednagar.

Fur short, without spines. Tail almost naked, generally longer than the head and body, but sometimes the same or even a little less. Ears rounded, extending to the eye when laid forward. Mammæ 10: 3 pairs pectoral, 2 inguinal. Skull convex above; third molar in both jaws very small, about one third the size of the second.

Colour above varying from dark to light brown, below paler and

greyer, but never white. Underfur dark ashy grey throughout the body; tips on the back light brown, generally but not always mixed with longer black terminations. Tail the same dark colour throughout.

Dimensions. Head and body 2·5 to 3 inches, tail 2·5 to 3·5, ear 0·4 to 0·5 from orifice, hind foot 0·6 to 0·7. The above are from fresh specimens. A skull measures 0·92 in extreme length and 0·43 in breadth.

Distribution. Found in houses everywhere in India except in the Punjab, Sind, Rajputána, and part of the North-West Provinces; also found throughout Ceylon and Burma. It is difficult to say whether this species is indigenous or introduced. *Mus musculus* is of almost world-wide distribution.

Varieties and *Synonymy.* I have followed Mr. Thomas in re-uniting the Indian with the European house-mouse, for after going over the collections in the British Museum, I can find no constant distinctions between them. The differences mentioned by Blyth and quoted by Jerdon are certainly not constant. The Himalayan form *Mus homourus* has in general a shorter tail than the common mouse of the plains (*M. urbanus*), and the fur is longer and softer, in accordance with the colder climate of the Himalayas. It is, I think, probable that *M. tytleri* should be assigned to *M. bactrianus*, but as no type is known this question cannot be determined.

Habits. The common mouse is chiefly found in houses, but sometimes in gardens and fields near villages and towns. It is excessively active, climbing vertical walls of considerable height, and springing farther than most allied species. It is omnivorous, living mainly, however, on grain and the remains of men's food. It breeds from 3 to 5 times in the year and produces at each birth from 4 to 8 young, which are born blind, but attain full growth and are capable of propagation in less than a year.

283. Mus bactrianus. *The Persian House-Mouse.*

Mus bactrianus, *Blyth, J. A. S. B.* xv, p. 140 (1846), xxxii, p. 347, xxxiv, p. 193; *Jerdon, Mam.* p. 205; *Blanford, Eastern Persia,* ii, p. 56, pl. v, fig. 2; *Thomas, P. Z. S.* 1881, p. 546.
Mus gerbillinus *and* theobaldi, *Blyth, J. A. S. B.* xxii, pp. 410, 583.
Mus gerbillinus, *Blyth, Cat.* p. 119.

Structure similar to that of *Mus musculus*, except that the tail is generally rather shorter than the head and body, rarely longer in fresh specimens.

Colour above light sandy brown or fawn-colour, below white, the two colours not sharply separated. Basal three-fourths of dorsal hairs slaty grey, tips light brown; a varying number of black tips intermixed. On the lower parts the fur is sometimes pale grey at the base. Tail dark above, pale beneath.

Dimensions. A good-sized male (fresh) measured: head and body 3·5 inches, tail 3·3, ear from orifice 0·55, hind foot 0·7. Extreme length of a skull 0·88. Some specimens are considerably smaller.

Distribution. Throughout South-western Asia, extending into North-western India and to Egypt. This is the common house-mouse in Sind, the Punjab, and Western Rajputána, and is also found in Kashmir and Ladák.

284. Mus sublimis. *The upland Mouse.*

Mus sublimis, *Blanford, Yark. Miss., Mam.* p. 51; *Scully, A. M. N. H.* (5) viii, p. 99 (1881); *W. Sclater, P. Z. S.* 1890, p. 528.

Fur soft and rather long. Tail exceeding the head and body in length. Ears moderately large. Skull with frontal and nasal portion nearly straight and the zygomatic arches distinctly concave on their outer surfaces.

Colour brown above, whitish below, all the hair except the tips dark slaty grey throughout the body, tips of the dorsal hairs light brown, longer hairs with dark brown or black tips being intermixed in abundance.

Dimensions of a female in spirit: head and body 2·6 inches, tail 3·05, ear from orifice 0·5, hind foot 0·83; length of skull 0·92.

Distribution. The type was obtained by Dr. Stoliczka at Tankse west of Pangong Lake, Ladák, at an elevation of 13,000 feet Another specimen is recorded by Scully from Astor, at 11,000.

This form may turn out to be a variety of *M. musculus.*

285. Mus nitidulus. *Berdmore's Mouse.*

Mus nitidulus, *Blyth, J. A. S. B.* xxviii, p. 294 (1859), xxxii, p. 347; *id. Cat.* p. 119; *id. Mam. Birds Burma,* p. 40; *Thomas, P. Z. S.* 1881, p. 550; *W. Sclater, P. Z. S.* 1890, p. 529.

Fur long, sometimes spiny, sometimes not. Tail equal to the head and body, or longer, uniformly clad with very short hairs. Ears large, rounded. Hind foot longer than in *M. musculus,* hinder metatarsal pad slightly long. Skull elongate, fronto-parietal suture nearly straight instead of deeply concave; anterior border of zygomatic process of maxillary sloping backwards and upwards from the base.

Colour above brown with but little rufous tinge, below white somewhat sullied. Underfur grey throughout the body; tips of the fine hair on the back pale brown, of the spines dark brown, probably black in some specimens. Tail dark above, pale below.

Dimensions of an adult female in spirit: head and body 3·1 inches, tail 3·52, ear 0·48, hind foot 0·77; extreme length of skull 0·93.

Distribution. The type, now lost, was procured at Shwe Gyeng in Burma by Captain Berdmore. Mr. Thomas has identified with this species specimens from Sikhim, Bhámo, and Karennee. One from the Khási hills is referred to *nitidulus* by Mr. W. Sclater with some doubt.

286. **Mus arianus.** *The Persian long-tailed Field-Mouse.*

Mus erythronotus, *Blanford, A. M. N. H.* (4) xvi, p. 311 (1875); *id. Eastern Persia*, ii, p. 54, pl. v, fig. 3; *id. Yark. Miss., Mam.* p. 54; *id. J. A. S. B.* xlviii, pt. 2, p. 97; *nec Temminck.*

Mus arianus, *Blanford, A. M. N. H.* (5) vii, p. 162 (1881); *Scully, P. Z. S.* 1881, p. 205; *Thomas, P. Z. S.* 1881, p. 548; *Buchner, Wiss. Res. Przewalski Reis., Säugth.* p. 90; *W. Sclater, P. Z. S.* 1890, p. 528.

Fur soft, spineless. Tail about equal to the head and body, sometimes a little shorter or longer, thinly clad with hair, which becomes longer towards the extremity. Ear when laid forward reaching the eye, thinly clad. Proximal metatarsal pad small, not elongate. Mammæ 6: 2 pairs inguinal, 1 pectoral. Skull elongate. Third upper molar about half as large as the second. Anterior palatine foramina not extending back as far as the molars.

Colour rufous-brown above, white or pale yellowish grey below, the two colours sharply divided, back darker than sides. Underfur dark grey throughout the body, terminal fourth of the hairs on the back chestnut, mixed with longer black tips. Upper lips white. Tail-hair black or mixed black and white above to the end, white on the sides and below.

Dimensions of a male: head and body 4 (in spirit 3·5), tail 4·2, ear 0·7, hind foot 0·85; length of skull 1·1.

Distribution. This species has a wide range in Central Asia, being found in Persia, Eastern Turkestan, and the Central Tian-shan. It has only occurred within Indian limits in Gilgit, where it is common from 5000 to 10,000 feet elevation.

Habits. Found in cultivated fields and on grassy downs near forests. This mouse enters houses in winter. It has doubtless the same habits as its near European ally *Mus sylvaticus*.

This mouse represents in Central Asia the European *M. sylvaticus* and the Chinese *M. chevrieri*. All the three are closely allied.

287. **Mus buduga.** *The common Indian Field-Mouse.*

Leggada booduga, *Gray, Charlesworth's Mag. Nat. Hist.* i, p. 586 (1837).

Mus lepidus, *Elliot, Mad. Jour. L. S.* x, p. 216 (1839); *Blyth, Cat.* p. 121.

Mus terricolor, *Blyth, J. A. S. B.* xx, p. 172 (1851), xxxii, p. 349; *id. Cat.* p. 119; *Jerdon, Mam.* p. 206.

Mus fulvidiventris *and* albidiventris, *Blyth, J. A. S. B.* xxi, p. 351, xxxii, p. 349.

Mus cervicolor, *Kelaart, Prod.* p. 64, *nec Hodgson.*

Leggada lepida, *Blyth, J. A. S. B.* xxxii, p. 350; *Jerdon, Mam.* p. 209.

Mus beavanii, *Peters, P. Z. S.* 1866, p. 559; *Blyth, Mam. Birds Burma*, p. 40.

Mus (Leggada) buduga, *Thomas, P. Z. S.* 1881, p. 553; *W. Sclater, P. Z. S.* 1890, p. 531.

Shintad-phurka, Shintad-bhurka, Wadári; *Chitta Yelka*, Tel. of Yanadis.

Fur short and close, often but not always spiny. Tail slender,

nearly naked, considerably shorter than the head and body. Ear moderate, rounded, thinly clad. Feet small; planta narrow, the proximal pair of plantar pads small, close together and near the next pair, so that all the pads are more distally situated than in *M. musculus*. Mammæ 10: 3 pairs pectoral, 2 inguinal.

Skull more depressed than in *M. musculus* and occipital region flatter. Lower portion of infraorbital foramen more open, and anterior border of maxillary zygoma-root usually convex to the base. First upper molar sometimes with an additional anterior cusp and often with an elongate anterior spur with or without a cusp. In some cases both cusp and spur are wanting.

Colour above varying from pale sandy to dark greyish brown, below white. Basal half or more of dorsal fur dark grey, tips brown, a few longer hairs with black terminations intermixed on the rump. Underfur on lower parts sometimes grey. Tail paler below.

Dimensions. Head and body 2·4 to about 3 inches, tail 2·1 to 2·7. A male in spirit measured: head and body 2·8, tail 2·45, ear 0·4, hind foot 0·65. Extreme length of a skull 0·75.

Distribution. The Peninsula of India and Ceylon generally. Not recorded from the Indus valley (except from Karáchi) or the Himalayas. I have specimens from Ajmere and from Fatehgarh, N.W.P. Blyth's Burmese locality for *Mus beavani* is, I think, probably due to some mistake, but a specimen was obtained at Bhámo by Mr. Fea.

Habits. Common in fields, living in small burrows, often under roots or stones; found also in gardens, in woods, and sometimes in houses. Jerdon states that a little heap of stones is generally found near the hole of this mouse. Usually only a pair of *M. buduga* are found in one burrow. This species was found in houses by Kelaart and by Jerdon, for the description, under *M. darjilingensis* (Mam. p. 205), of a house-mouse found by the latter at Jalna and Nagpur clearly refers to the present form.

Gray's name *booduga* was perhaps derived by some complicated process from *bhurka*.

288. **Mus cervicolor.** *The fawn-coloured Mouse.*

Mus cervicolor, *Hodgson, A. M. N. H.* xv, p. 268 (1845); *Blyth, J. A. S. B.* xxxii, p. 349; *id. Cat.* p. 119; *Jerdon, Mam.* p. 206; *Thomas, P. Z. S.* 1881, p. 547, 1886, p. 65.
Mus strophiatus, *Hodgson, ibid.*; *Blyth, J. A. S. B.* xxxii, p. 349.
Mus cunicularis, *Blyth, J. A. S. B.* xxiv (1855), p. 721, xxxii, p. 348; *id. Cat.* p. 119.

Fur soft, spineless. Ears large, extending to the eye when laid forward. This mouse is similar in other details of structure to *Mus buduga*.

Colour dark fawn or moderately pale rufescent brown to darker brown above, white below; underfur dark grey throughout, longer black terminations mixed with the light brown tips of the dorsal fur. Tail the same colour throughout.

Dimensions. Head and body 2·9 inches, tail 2·65, ear 0·5, hind foot 0·65 ; skull 0·8.

Distribution. Nepal, Eastern Bengal, Assam, and the Khási hills. Specimens from the neighbourhood of Calcutta, originally described as *M. albidiventris* and subsequently referred to this species by Blyth, are shown by Mr. W. Sclater to belong to *M. buduga*. It is doubtful whether *M. buduga* and *M. cervicolor* should be kept distinct.

289. **Mus platythrix.** *The brown spiny Mouse.*

Mus platythrix, *Bennett, P. Z. S.* 1832, p. 121 ; *Elliot, Mad. Journ. L. S.* x, p. 215 ; *Blyth, Cat.* p. 121.

Leggada platythrix, *Gray, Charlesworth's Mag. N. H.* i, p. 586 ; *Blyth, J. A. S. B.* xxxii, p. 350 ; *Jerdon, Mam.* p. 207.

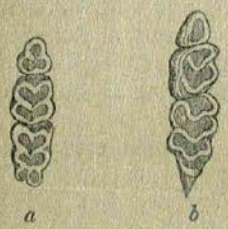
Mus spinulosus, *Blyth, J. A. S. B.* xxiii, p. 734 (1854), xxix, p. 111 ; *id. Cat.* p. 121.

Leggada spinulosa, *Blyth, J. A. S. B.* xxxii, p. 349 ; *Jerdon, Mam.* p. 208.

Mus (Leggada) platythrix, *Thomas, P. Z. S.* 1881, p. 553 ; *W. Sclater, P. Z. S.* 1890, p. 531.

Legyáde, Legadgandu, or *Rále-lagangandu,* Wadári ; *Gijeli-gandu,* Tel. of Yanadis ; *Kal ilei,* Can.

Fur above and below composed almost entirely of flattened spines, those on the back stiff and coarser than those on the lower parts. Tail shorter than the head and body, rather thick at the base, clad with short hair, rather more thickly than in *Mus* generally. Ears short, rounded. Mammæ 10 : 3 pairs pectoral, 2 inguinal. Hind foot small, all the 6 pads near together, the metatarsal pair small, round, and distant from the heel. Anterior palatine foramina long, extending back to the middle of the first molar ; anterior edge of maxillary zygoma-root straight. First upper molar normally very long, with an anterior spur bearing a distinct cusp, but in some skulls the spur is wanting and the cusp rudimentary. Third upper molar about one third the size of the second.



a *b*

Fig. 132.—(*a*) Upper and (*b*) lower right molars of *M. platythrix*, ×5.

Colour above dark brown, occasionally paler, below white, the separation of the two colours well defined. Basal half of dorsal fur grey, terminal half brown, a few longer black points being mixed on the rump. Tail-hairs dark above, white below.

Dimensions. Head and body of an adult male (in spirit) 3·3 inches, tail 3, ear 0·4 (from orifice 0·5), hind foot 0·7. Skull 1 inch long.

Distribution. The peninsula of India and Ceylon. This form has been obtained in the Punjab, in Sind, and in Malabar, but not in Bengal.

Habits. According to Sir W. Elliot, " the Leggyade lives entirely in the red gravelly soil in a burrow of moderate depth, generally

on the side of a bank. When the animal is inside the entrance is closed with small pebbles, a quantity of which are collected outside, by which its retreat may always be known. The burrow leads to a chamber in which is collected a bed of small pebbles on which it sits. Its food appears to be vegetable. In its habits it is monogamous and nocturnal."

The genus *Leggada* of Gray, classed apart from *Mus* by Jerdon and some others, was founded on *Mus buduga*, but the present species, which was included, is more characteristic. The only important distinction is the form of the anterior upper molar, and that is variable, there being, in *Mus buduga*, a complete passage to the ordinary murine form of the tooth.

290. **Mus mettada.** *The metad Rat, or soft-furred Field-Rat.*

Golunda meltada, *Gray, Charlesworth's Mag. N. H.* i, p. 586 (1837) *Blyth, J. A. S. B.* xxxii, p. 352; *Jerdon, Mam.* p. 213.
Mus mettade *and* M. lanuginosus, *Elliot, Mad. Jour. L. S.* x, pp. 208, 212.
Mus mettada, *Blanford, J. A. S. B.* xlvi, pt. 2, p. 290, pl. i; *Thomas, P. Z. S.* 1881, p. 550; *W. Sclater, P. Z. S.* 1890, p. 530.

Mettád, Mettangandu, Wadári.

Fur dense, fine and soft, without spines. Tail about the same length as the head and body or rather less, not pencilled. Ears rounded, moderately large, very thinly clad with short hair. Planta with 4 or 5 pads only. Mammæ 8: 2 pairs pectoral, 2 inguinal. Skull convex above, anterior palatine foramina long.

Colour above dark greyish brown (earthy brown), paler on the sides, and white below. Basal three fourths or more of the dorsal fur leaden black; tips light brown, mixed on the back with numerous rather longer black terminations. Basal portion of fur on lower parts very dark grey. Feet whitish. Hairs on tail dark brown above, white below.

Dimensions of a male in spirit: head and body 5 inches, tail 4·2, ear from orifice 0·75, hind foot 1·05; extreme length of skull 1·38, basal length 1·2, zygomatic breadth 0·63.

Distribution. Found in several parts of the Peninsula of India—Etawah and Banda, Ahmednagar, Dharwar, Cuddapah, Anaimalai hills, and various other parts of the Madras Presidency. Mr. Murray has obtained this species in Sind. The Ceylon specimens mentioned by Blyth (J. A. S. B. xx, p. 167) were, however, wrongly identified.

Habits. These have been described by Sir W. Elliot, who says:—"The Mettade lives entirely in cultivated fields, in pairs or small societies of five or six, making a very slight and rude hole in the root of a bush, or merely harbouring among the heaps of stones thrown together in fields, in the deserted burrow of the kok, or contenting itself with the deep cracks and fissures formed in the black soil during the hot months. Great numbers perish annually, when these collapse and fill up at the commencement of the rains.

"Their flesh is eaten by the tank-diggers. The female produces from 6 to 8 at a birth."

Sir W. Elliot also states that when the rainfall was deficient at the commencement of the season, the metad rats bred in such numbers as to become a perfect plague and to destroy the crops.

291. Mus gleadowi. *The sand-coloured Rat.*

Mus gleadowi, *Murray, P. Z. S.* 1885, p. 809, pl. li; *W. Sclater, P. Z. S.* 1890, p. 531.

Fur soft, without spines. Tail about the same length as the head and body, or shorter, not pencilled. Eyes large. Ears large, reaching the front of the eye when laid forward, thinly clad. Planta narrow, and bearing only four pads. Mammæ 6 : 1 pair pectoral, 2 inguinal. Skull convex above, similar to that of *Mus mettada*.

Colour above sandy (light greyish brown) or sometimes fawn, below and the feet white. Basal three fourths of dorsal fur dark leaden grey, terminal portion pale whitish brown, a few of the hairs tipped dark brown; no black hairs. Underfur of lower parts white. The short hair on the tail is light brown above, white below.

Dimensions in spirit: head and body 3·5 inches, tail 3, ear 0·63, hind foot 0·7; extreme length of skull 1.

Distribution. The types were from Karáchi, Sind. A fawn-coloured specimen in the British Museum was received from Kattiwar. There are other specimens in the Indian Museum from Cutch and from Goona, south of Gwalior.

292. Mus erythrotis. *The hairy-eared Mouse.*

Mus erythrotis, *Blyth, J. A. S. B.* xxiv, p. 721 (1855), xxxii, p. 448; *id. Cat.* p. 120; *W. Sclater, P. Z. S.* 1890, p. 529, pl. xliv, fig. 5 (skull).

Fur long, dense, soft. Tail longer than head and body, clad with hairs rather longer than usual, but no longer at the end of the tail than elsewhere. Ears small, round, hairy, almost concealed by the fur. Mammæ 8. Proximal plantar pad oval. In the skull the anterior border of the maxillary zygomatic process is straight and vertical, the zygoma itself slightly concave.

Colour "rich dark brown, grizzled and brightly tinged with rufous or rufo-ferruginous towards the tail and upon the ears conspicuously; lower parts albescent, tinged with fawn; feet with brown hairs upon their upper surface" (Blyth). Basal portion of hair above and below dark slate-colour.

Dimensions of an adult female in spirit: head and body 2·85 inches, tail 3·25, hind foot without claws 0·68, ear-conch 0·32; length of skull 0·8, greatest breadth 0·42.

Distribution. Cherra Poonjee in the Khási hills, and Manipur. *Mus pygmæus* of A. Milne-Edwards from Moupin is perhaps the same.

293. Mus humei. *Hume's Rat.*

Mus humei, *Thomas, A. M. N. H.* (5) xvii, p. 84 (1886); *id. P. Z. S.* 1886, p. 63, pl. v.

Fur soft, without spines. Tail shorter than the head and body, more hairy than it usually is in *Mus*, but not pencilled at the end. Ears moderately large, rounded, thinly clad. Thumb the merest rudiment; 5th front toe very short, barely reaching the division between the 2nd and 3rd toes; 5th hind toe just reaching the base of the 4th. Mammæ 8 : 2 pairs pectoral, 2 inguinal. Skull convex above, the nasals short, anterior border of maxillary zygomatic process concave below and with a salient angle above. Molars broad, the third as long as the second.

Colour above speckled brown, a mixture of black and isabelline, the anterior portions of the body greyish, the rump and between the thighs rich rufous; underparts pale rufescent or yellowish. Underfur both above and below leaden grey, blackish on the back, where most of the hairs have isabelline tips, but longer hairs are intermixed that are black throughout. Feet brown. Tail particoloured, the short hair black above, white below, but the scaly skin is brown.

Dimensions taken from skins: head and body 5 inches, tail 4·25, hind foot 1, ear 0·5; length of skull about 1·1, zygomatic breadth 0·6.

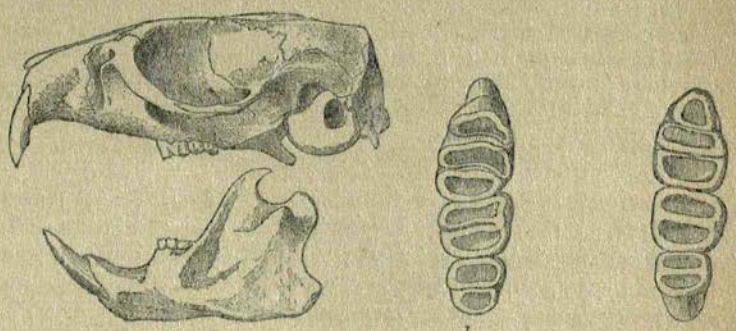
Distribution. The only locality yet known is Moirang, Manipur, where Mr. Hume obtained six specimens.

This species resembles *Golunda ellioti* in coloration and the form of the skull.

Genus **NESOCIA**, Gray (1842).

Syn. *Nesokia*, Gray; *Spalacomys*, Peters (1860).

Form robust; head short, rounded, muzzle short and broad; tail



a *b* *c*

Fig. 133.—*a*. Skull of *N. bengalensis*, nat. size; *b*, upper, *c*, lower right molars, ×3.

long, scaly, ringed, almost naked; ears rounded; feet broad, planta with six pads, the proximal pad elongate; all the toes except the rudimentary pollex with strong, nearly straight claws.

Incisors broader than in *Mus*, the anterior surface of the upper pair minutely sculptured with irregular longitudinal wrinkles. Molars composed of transverse laminæ, straight or slightly curved, 3 in the first molar, 2 in the second and third in both jaws. Pterygoids very thin and high, pterygoid fossa deep. Infraorbital foramen typical; lower portion very narrow, the outer border slanting forward from the base (less in *N. hardwickei*), then broadly rounded and deeply sinuate. Anterior palatine foramina narrow. Fronto-parietal area narrow, bordered by strong lateral crests.

It is doubtful whether this should rank as more than a subgenus of *Mus*. Four species are found within Indian limits; the only other known forms are from Central Asia.

Synopsis of Indian, Ceylonese, and Burmese Species.

a. Tail less than ⅔ head and body; mammæ 8 .. *N. hardwickei*, p. 422.
b. Tail more than ⅔ head and body.
a'. Smaller; hind foot 1″·25–1″·45; mammæ 14–18 ..... *N. bengalensis*, p. 423.
b'. Larger; hind foot 1″·9; mammæ 12 ..... *N. nemorivaga*, p. 426.
c'. Still larger; hind foot 2″·5; mammæ 12 .. *N. bandicota*, p. 425.

294. **Nesocia hardwickei.** *The short-tailed Mole-Rat.*

? Arvicola indica, *Gray & Hardw. Ill. Ind. Zool.* i, pl. xi (1832) (no description, very bad figure); *nec* Mus indicus, *Bechstein, nec idem, Geoffroy.*
Mus hardwickii, *Gray, Charlesworth's Mag. N. H.* i, p. 585 (1837); *Blyth, J. A. S. B.* xxxiv, pt. 2, p. 193.
Nesokia hardwickii, *Gray, A. M. N. H.* x, p. 265 (1842); *Jerdon, Mam.* p. 190; *W. Sclater, P. Z. S.* 1890, p. 522.
Mus pyctorhis, *Hodgson, A. M. N. H.* xv, p. 267 (1845).
Mus huttoni, *Blyth, J. A. S. B.* xv, p. 139 (1846).
Nesokia griffithii, *Horsfield, Cat.* p. 145 (1851).
Spalacomys indica, *Peters, Abhandl. Akad. Berl.* 1860, p. 143, pl. ii, fig. 1.
Nesokia indica, *Blyth, J. A. S. B.* xxxii, p. 328, partim.
Mus (Nesokia) indicus, *Blyth, Cat.* p. 112, partim.
Nesokia huttoni, *Blanford, Eastern Persia*, ii, p. 59, pl. vi, fig. 1.
Mus (Nesokia) hardwickii, *Anderson, J. A. S. B.* xlvii, pt. 2, p. 221; *Thomas, P. Z. S.* 1881, p. 524.
Mus (Nesokia) huttoni, *Anderson, ibid.* p. 223.

Fur varying in texture. Longer hairs on back not conspicuous. Tail half to two thirds the length of the head and body. Ears small. Feet very thinly clad above. Mammæ 8 : 2 pairs inguinal, 2 pectoral. Skull short, muzzle especially so. Anterior palatine foramina very small, shorter than the crowns of the upper molars together. Incisors broad.

Colour above yellowish to rufous-brown, not dark, isabelline or hoary below. The basal two-thirds or more of all hairs, dorsal and ventral, dark leaden grey, terminal portion on back pale yellowish brown or rufescent, a few longer black-tipped hairs scattered over the lower back and rump.

Dimensions. Head and body 5·5 inches to 8·5, tail 3·5 to 5, ear outside 0·5, hind foot 1·25 to 1·5. The above dimensions in an average-sized male were 6·6, 4·4, 0·5, and 1·3. Basal length of skull 1·65, zygomatic breadth 1·15.

Distribution. North-western India (North-West Provinces, Rájputána, Sind, and the Punjab), Afghanistan and Baluchistan, up to 4000 or 5000 feet elevation. A specimen has been obtained as far east as Purneah, Bengal.

Varieties. N. huttoni is distinguished by softer fur, often bright rufous or yellowish brown in colour. The hind feet are longer, 1·4 to 1·5 inches without claws. This form is found at higher elevations in Baluchistan and Afghanistan.

Typical *N. hardwickei* has harsher fur and is duller and browner in colour, the hind foot measuring 1·2 to 1·3. This is found in N.W. India. The two pass into each other.

Habits. The short-tailed mole-rat is found both in cultivated and in waste ground. I have often seen their holes about irrigated wheat-fields, but usually drier situations are preferred. The burrows run irregularly, ramifying frequently, at a depth of 6 inches to 2 feet below the surface. In one series of burrows that I explored I found a nest lined with grass at a depth of 1½ to 2 feet, and I captured 4 *Nesokiæ*, 2 males and 2 females. The entrances to the burrows are covered by small heaps of earth, like mole-hills, thrown out by the rats. This animal feeds on grass, roots, and grain.

N. scullyi from near Yárkand, and *N. brachyura* from Lob-nor, are Central Asiatic forms allied to *N. hardwickei*.

295. Nesocia bengalensis. *The Indian Mole-Rat.*

Arvicola bengalensis, *Gray & Hardw. Ill. Ind. Zool.* ii, pl. 21 (1833–34).
Mus kok, *Gray, Charlesworth's Mag. N. H.* i, p. 585 (1837).
Mus (Neotoma) providens, *Elliot, Mad. Jour. L. S.* x, p. 209 (1839).
Nesokia hardwickii, *Kelaart, Prod.* p. 65, *nec Gray.*
Nesokia kok, *Kelaart, ibid.* p. 66.
Mus daccaensis, *Tytler, A. M. N. H.* (2) xiv, p. 173 (1854).
Mus tarayensis, plurimammis, *and* morungensis, *Hodgson, Horsfield, A. M. N. H.* (2) xvi, p. 112 (1855).
Nesokia indica, *Blyth, J. A. S. B.* xxxii, p. 328; *Jerdon, Mam.* p. 187; *Theobald, P. A. S. B.* 1866, p. 239; *Blyth, Mam. Birds Burma,* p. 38.
Mus (Nesokia) indicus, *Blyth, Cat.* p. 112, partim.
Mus (Nesokia) blythianus, barclayanus, *and* providens, *Anderson, J. A. S. B.* xlvii, pt. 2, pp. 225–231, pl. xiii.
Nesokia barclayana, *Blanford, Yark. Miss., Mam.* p. 46, pl. x *a*, fig. 1 (skull).
Mus (Nesokia) bengalensis, *Thomas, P. Z. S.* 1881, p. 526; *Anderson, Fauna Mergui Archip.* i, p. 341.

Yenkrai, Beng.; *Kok,* Can.; *Golatta koku,* Tel. of Yanádis; ? *Rekywek,* Burmese.

Fur coarse, sometimes with long black-tipped piles throughout

the upper surface. Tail three quarters the length of the head and body or more. Mammæ 7 to 9 pairs. Feet hairy above. Skull longer and muzzle narrower than in *N. hardwickei*; anterior palatine foramina longer than the crowns of all the upper molar teeth. Incisors and molars narrower.

Colour dark brown above, slightly grizzled with yellowish; below hoary grey to isabelline. Basal fur dark ashy or blackish throughout; tips of dorsal hairs brownish yellow or isabelline, and of the longer piles black.

Dimensions. Head and body 6 to 9 inches, tail 5·5 to 7·25, ear about 0·75, hind foot 1·2 to 1·45. A large Calcutta male measured 8·2, 6·45, 0·83, and 1·3. Basal length of skull 1·7, zygomatic breadth 1·1.

Distribution. The greater part of the Indian Peninsula from the base of the Himalayas to Cape Comorin, and from Lower Sind to Cachar and I believe Assam; more common in damp alluvial tracts, but ascending to the tops of the Nilgiris and other hills. Found also in Ceylon and in the valley of Kashmir, and apparently throughout Burma to the Mergui Archipelago.

Varieties. The form from Southern India, *N. kok* v. *providens*, is smaller, usually paler in colour, and the anterior palatine foramina are very narrow. The Bengal variety is larger, and the Burmese form is larger still.

Habits. An excellent account has been given by Elliot, but is too long for extraction. Several details have also been supplied by Jerdon and Anderson.

Nesocia bengalensis lives in cultivated plains, gardens, and pastures, where its presence may be recognized by the piles of earth, resembling large mole-hills, at each opening of its burrow. Often the openings are in the banks of ditches and tanks or the bunds of rice-fields. The burrows, as in the case of *N. hardwickei*, are extensive and of irregular form, often branching, sometimes circular, and leading to a central chamber or nest, in which much grain is occasionally stored by the rat, a pound being sometimes found in a burrow. Jerdon observed burrows occupying an area 15 to 20 yards in diameter. Elliot found only one occupant to each burrow. The food consists chiefly of grass and other roots, and of grain where that is procurable.

This mole-rat is somewhat fierce, and when irritated it erects its long piles and utters a grunting sound. It takes freely to water and swims well. From 8 to 10 young are said to be usually produced at each birth, but 14 have been observed by Sterndale in an individual kept by him, and which he succeeded in taming perfectly, so as to come when called by her name.

Elliot says that the Wadáris or tank-diggers of the Deccan, who eat all rats, capture this species in large numbers for food, and in some favourable localities are able, at particular seasons, to subsist on its hoards of grain.

296. Nesocia bandicota. *The Bandicoot-Rat.*

Mus bandicota *and* indicus, *Bechstein, Allgem. Uebers. d. vierfüs. Thiere*, ii, pp. 713, 714 (1800).
Mus malabaricus *and* perchal, *Shaw, Gen. Zool.* ii, pt. 1, pp. 54, 55 (1801).
Mus giganteus, *Hardwicke, Trans. L. S.* vii, p. 306, pl. 18 (1804); *Kelaart, Prod.* p. 58.
Mus (Neotoma) giganteus, *Elliot, Mad. Jour. L. S.* x, p. 209.
Mus bandicota, *Blyth, J. A. S. B.* xx, p. 167, xxxii, p. 333, partim; *id. Cat.* p. 112; *Jerdon, Mam.* p. 193, partim.
Mus (Nesokia) giganteus, *Anderson, J. A. S. B.* xlvii, pt. 2, p. 232, pl. xiv, figs. *a–d*.
Mus (Nesokia) bandicota, *Thomas, P. Z. S.* 1881, p. 528.

Indúr, Sanscr.; *Ghous* or *Ghus*, H. and Mahr.; *Guru*, Kol.; *Heggin*, Can.; *Pandi koku*, Tel. of tank-diggers (pig-rat, whence the term bandicoot); *Ura-miyo*, Cing.

Size very large. Fur coarse, with long black-tipped piles, some of them often 2 or 3 inches long, on the upper parts. Ears moderate, rounded. Tail a little shorter than the head and body. Mammæ 12: 3 pairs pectoral, 3 pairs inguinal. Skull longer in proportion to the breadth than that of *N. bengalensis*; nasals broad and long, being about $\frac{2}{3}$ the length of the skull. Anterior palatine foramina as long as the row of upper molars or a little longer. Transverse laminæ of molars not straight but slightly wavy.

Colour above blackish brown, sometimes grizzled with pale yellowish or grey, especially on the sides; lower parts greyish brown or brownish grey. Dorsal fur light greyish brown or ashy at the base, then (in some specimens) whitish, the longer hairs with long black terminations. In old animals whitish tips are mixed. Feet above dark brown.

Dimensions. Head and body 12 to 15 inches, tail 11 to 13, hind foot 2·5; weight 2½ to 3 lbs. Basal length of a skull 2·6, zygomatic breadth 1·4.

Distribution. The Peninsula of India and Ceylon; not found in Lower Bengal, nor, I believe, in Sind or the Punjab; common in parts of Rajputana, and said to occur in the N.W. Provinces. Owing to large individuals of *M. decumanus* being mistaken for bandicoots, the present species has been incorrectly reported from several localities, Calcutta especially.

Habits. The bandicoot is, like other *Nesociæ*, a burrower. It is found about cultivated tracts and is common in villages and towns, especially in the south of India. I believe it is also found in forest. It is very destructive to grain, on which it feeds largely; it also consumes fruit, vegetables, &c., and it is said occasionally to kill fowls. When it is attacked (and when running about at night according to McMaster), it grunts like a pig, hence its Telegu name. McMaster has shown that it is sluggish and cowardly, and killed by a dog more easily than would be anticipated from its size. Sterndale succeeded in taming one individual completely.

297. Nesocia nemorivaga. *The smaller Bandicoot-Rat.*

? Mus setifer, *Horsfield, Res. Java* (1824); *Cantor, J. A. S. B.* xv, p. 254; *Blyth, J. A. S. B.* xxiv, p. 712, xxxii, p. 334.
Mus (Rattus) nemorivagus, *Hodgson, J. A. S. B.* v, p. 234 (1836); *id. A. M. N. H.* xv, p. 266 (1845).
? Mus macropus, *Hodgson, A. M. N. H.* xv, p. 268 (1845).
Mus bandicota, *Blyth, J. A. S. B.* xxxii, p. 333, partim; *id. Mam. Birds Burma*, p. 39; *Jerdon, Mam.* p. 193, partim, *nec Bechstein.*
Mus (Nesokia) elliotanus, *Anderson, J. A. S. B.* xlvii, pt. 2, p. 231; pl. xiv, figs. *e–h* (1878).
Mus (Nesokia) nemorivagus, *Thomas, P. Z. S.* 1881, p. 529.
? *Mye-kywek*, Burm.

Fur softer than in *N. bandicota*, the long piles less developed, and the underfur denser and finer. Proportions similar, but size smaller. Mammæ 12. Skull intermediate in form between those of *N. bandicota* and *N. bengalensis*; nasals about ⅓ the length of the skull; anterior palatine foramina shorter than the upper molars together.

Colour. Dark brown above (black and brown mixed), paler or whity brown below. Basal half of fur ash-grey both above and below, tips on back pale brown, those of the longer hairs dark brown or black. Feet above dark brown.

Dimensions. Head and body of an adult female in spirit 9 inches, tail 7·8, hind foot 1·9, length of ear 0·9; basal length of skull 2·1, zygomatic breadth 1·2.

Distribution. Bengal (Purneah, Calcutta, where it is rare), Eastern Himalayas, Assam (Sibságar), and Khási hills; also Formosa. This species probably extends to Burma and the Malay countries.

Genus ACOMYS, Is. Geoffr. (1838).

Syn. *Acanthomys*, auct. *nec* Lesson.

Hinder part of the back covered with coarse, inflexible, flattened and grooved spines, without any hair intermixed. Mammæ 6: 1 pair axillar, 2 inguinal. Otherwise like *Mus*, from which the genus is doubtfully separable. Three or four species inhabit Western Asia and Northern Africa, and of these one has been found in Sind.

298. Acomys dimidiatus. *The pale spiny Mouse.*

Mus dimidiatus, *Rüppell, Atlas*, p. 37, pl. 13, fig. *a* (1826); *Wagner, Schreb. Säugeth. Supp.* iii, p. 440.

Sides, limbs, head, and lower parts covered with coarse hair. Tail about equal to the head and body in length, coarsely ringed, with short hair. Ears large, rounded. Feet short; planta coarsely granular near the toes, pads indistinct. Vibrissæ numerous.

Skull elongate. The mesopterygoid fossa opens about halfway between the molars and the bulla; pterygoids short, meeting

anteriorly in an acute angle, diverging behind. Anterior palatine foramina very long, extending back to opposite the middle of the first molar. Molars broad and short, the first without an additional cusp.

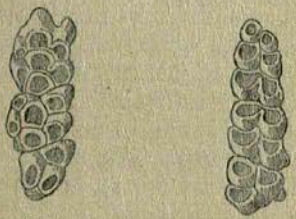
Colour above sandy (very pale yellowish or rufescent brown), below white. No dark underfur. Vibrissæ white, except some of the uppermost.

Dimensions. Head and body 4 inches, tail 4, ear from crown 0·5, hind foot 0·75; length of skull 1·1.

Distribution. Egypt, Northern Arabia, and Palestine. A single specimen was obtained in Sind, at Laki, near Sehwan, by Mr. H. E. Watson.

Genus **GOLUNDA**, Gray (1837).

Syn. *Pelomys*, Peters (1852).



a *b*

Fig. 134.—Upper (*a*) and lower (*b*) right molars of *G. ellioti*, × 3.

Head short and rounded. Ears rounded, tail hairy. Feet as in *Mus*. Molars low, broad, tubercular in the young, the worn surface exhibiting a peculiar pattern composed of semicircular lobes arranged in a triple row in the upper, and a double in the lower jaw. Upper incisors grooved. Bony palate narrow.

This genus occurs in Africa and India, one species being found in each area.

299. **Golunda ellioti.** *The Indian Bush-Rat.*

Golunda ellioti, *Gray, Charlesworth's Mag. N. H.* i, p. 586 (1837); *Kelaart, Prod.* p. 67; *Blyth, J. A. S. B.* xx, p. 167, xxxii, p. 350; *id. Cat.* p. 121; *Kelaart, Prod.* p. 67; *Jerdon, Mam.* p. 212; *Blanford, J. A. S. B.* xlv, pt. 2, p. 165, xlvi, pt. 2, p. 292.

Mus golundi *and* M. hirsutus, *Elliot, Mad. Jour. L. S.* x, pp. 208, 213 (1829).

Mus myothrix, *Hodgson, A. M. N. H.* xv, p. 267 (1845).

Golunda newera, *Kelaart, P. Z. S.* 1850, p. 158; *id. Prod.* p. 67; *Blyth, J. A. S. B.* xxxii, p. 352.

Golunda coffæus, *Kelaart, Blyth, J. A. S. B.* xxxii, p. 351.

Pelomys watsoni, *Blanford, P. A. S. B.* 1876, p. 181.

Gulandi, Can.; *Utu-elli*, Tam.; *Cofee-watte-meyo*, Cing.

Fur coarse, the longer piles much flattened and broadly grooved, but not spiny. Feet small, well clad above; 5 pads on fore foot, 6 on hind. Ears moderate, round, thinly clad with short hair. Tail stout at the base and tapering, shorter than the head and body, and thinly clad throughout with coarse hairs, short but much

longer than in *Mus* generally. Mammæ 8 : 2 pairs pectoral, 2 inguinal. Skull longitudinally convex above, with well-marked temporal crests. Anterior palatine foramina very long.

Colour above yellowish brown, not uniform, but finely speckled black and fulvous ; below brownish white or grey. Basal half to three quarters of dorsal fur ashy grey to leaden black, the coarse hairs paler than the fine short underfur; most of the longer and coarser hairs have whity-brown or brownish-yellow terminations, but the tips of the longest hairs mixed with the others are black throughout. Tail dark brown above, pale below.

Dimensions of an adult female : head and body 4·55 inches, tail 4·1, ear 0·57, hind foot 0·85 ; basal length of skull 1·1, zygomatic breadth 0·55.

Distribution. Throughout the greater part of the Indian Peninsula and Ceylon. Recorded from Sind, Dagshai, Umballa, Satpura Hills, and many parts of the Bombay and Madras Presidencies. I feel some doubt about the Nepalese locality assigned to *Mus myothrix*. *G. ellioti* has not been observed in Bengal.

Habits. According to Sir W. Elliot, the gulandi lives entirely in the jungle, choosing its habitation in a thick bush, among the thorny branches of which, or on the ground, it constructs a nest of elastic stalks and fibres of dry grass, thickly interwoven. The nest is of a round or oblong shape, from 6 to 9 inches in diameter, and encloses a chamber about 3 or 4 inches across. The motions of this animal are somewhat slow, and it does not appear to have the same power of springing or leaping as other rats. Its food seems to be vegetable, the only contents of the stomach observed being roots of the dúb or hariyáli grass (*Cynodon dactylon*). Its habits are solitary (except when the female is bringing up her young) and diurnal, feeding in the mornings and evenings.

In Ceylon this rat has proved very destructive to coffee-trees, on the buds and blossoms of which it feeds. It appears, according to Kelaart, to migrate at times.

Subfamily CRICETINÆ.

Both lower and upper molars exhibiting biserial longitudinal structure, either rooted, with the tubercles on the crown in two longitudinal rows, or rootless, composed of subtriangular prisms arranged in a double line. Tail hairy and in all Indian species very short, less than half the length of the body.

To this subfamily belong the voles, hamsters, and some allied forms. The three genera represented within Indian limits are usually placed in three distinct subfamilies, *Arvicolinæ*, *Siphneinæ*, and *Cricetinæ*. All are Palæarctic, and the first and third Nearctic also. Within our area these rodents are confined to the Himalayas and Afghanistan. The genera may be thus recognized :—

A. Molars rootless, elongate, composed of prisms.
  a. Ear-conch present ..... MICROTUS.
  b. Ear-conch wanting..... ELLOBIUS.
B. Molars rooted, tubercular..... CRICETUS.

Genus **MICROTUS**, Schrank (1798).

Syn. *Arvicola*, Lacépède (1801); *Hypudæus*, Illiger (1811); *Neodon*, Hodgson (1849); *Phaiomys*, Blyth (1863).

Head short, rounded; ears, tail, and limbs short. Fur soft and thick. The thumb (pollex) is short and sometimes clawless, more often it bears a short compressed claw. Nasal portion of skull short; brain-case oval, broad, and depressed; infraorbital foramen of the typical murine form; anterior palatine foramina long; interparietal large, pointed in the middle anteriorly; auditory bullæ moderately large. Incisors orange or yellow, flat in front; molars rootless, formed of subtriangular prisms biserially arranged, with sharp salient angles on each side, the number varying in the different species. The last upper and first lower molars vary more than the others.

The genus is Palæarctic and Nearctic, several species inhabiting the higher Himalayas. Of these I published a detailed account in 1881 (J. A. S. B. 1, pt. 2, p. 88). From that account the following descriptions are abridged.

Synopsis of Indian and Burmese Species.

A. Thumb of fore foot clawless.
  a. Colour light ferruginous brown ..... *M. stoliczkanus*, p. 430.
  b. Colour light brown, with a grey tinge.. *M. stracheyi*, p. 431.
B. Thumb with a small claw.
  a. Ears not projecting beyond the fur.
    a'. Colour dark rich brown above, light brown below..... *M. wynnei*, p. 431.
    b'. Colour rufescent brown, lower parts light brown ..... *M. roylei*, p. 430.
    c'. Colour earthy brown, lower parts whitish ..... *M. blythi*, p. 432.
  b. Ears projecting beyond the fur.
    a'. Colour light greyish rufescent brown; tail ⅓ head and body ..... *M. blanfordi*, p. 432.
    b'. Colour dark yellowish brown; tail ½ head and body
      a''. Ear from orifice 0·5 in.; anterior lower molar with 6 internal angles *M. sikimensis*, p. 433.
      b''. Ear from orifice 0·35 in.; anterior lower molar with 5 internal angles *M. melanogaster*, p. 434.

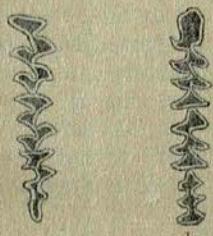
Of these species, *M. blythi*, *M. sikimensis*, and *M. melanogaster* differ from all the others in the form of the molar teeth, and the two last named differ greatly from *M. blythi*. In the remaining five species the posterior upper molar terminates behind in an

elongate lobe. For these species I proposed, in 1881, a subgeneric name *Alticola*. *M. silimensis* and *M. melanogaster* belong to the subgenus *Neodon*.

300. Microtus roylei. *Royle's Vole.*

Arvicola roylei, *Gray, A. M. N. H.* x, p. 265 (1842); ? *Blyth, Cat.* p. 125; ? *Jerdon, Mam.* p. 216; *Blanford, J. A. S. B.* l, pt. 2, p. 102 (1881).

Ears hairy, not projecting beyond the fur. Thumb with a claw. Tail nearly cylindrical, about one third the length of the head and body and covered with short hair. Last upper molar with 3 inner and 3 outer angles and terminating in an elongate lobe; first lower molar with 4 external and 5 internal angles.



a *b*

Fig. 135.—Crowns of (*a*) upper and (*b*) lower molars of *M. roylei*, × 4.

Colour rufous-brown on back, becoming yellower and paler on the sides and pale brown below; tail coloured like the back above, pale beneath. Basal half to two thirds of the fur leaden black, above and below; terminal portion on back light brown, becoming darker at the end, a few black tips intermixed.

Dimensions of dried skin: head and body 3 inches, tail without hair (vertebræ preserved) 1·1, hind foot 0·8.

Distribution. The type was from Kashmir. Jerdon observed voles on the Pir Panjal pass, also on the south side of Barendo pass N.E. of Simla, and near Chini, in Kunawar, at 12,000 feet elevation, but it is improbable that all belonged to the present species. The locality Pind Dadun Khan, given in Blyth's Catalogue, is a mistake. What Adams took for *Arvicolæ* in the Punjab Salt Range ('Wanderings of a Naturalist in India,' p. 152) remains to be ascertained.

Habits unknown. Jerdon found the Barendo pass species in large numbers, burrowing close to the surface in a meadow, and several were caught in digging a light trench round the tent.

301. Microtus stoliczkanus. *Stoliczka's Vole.*

Arvicola stoliczkanus, *Blanford, J. A. S. B.* xliv, pt. 2, p. 107 (1875); l, pt. 2, p. 97; *id. Yark. Miss., Mam.* p. 42, pl. viii, fig. 1, pl. x *b*, fig. 2.

Ears small, completely concealed by the fur, hairy. Thumb rudimentary and clawless. Tail short, about a quarter of the head and body in length, covered with stiff hairs that extend half an inch beyond the end. Last upper molar with 2 strong inner and 4 weak outer angles, two close together near the front end of

one tooth, two also near together farther back on an elongate posterior lobe. First lower molar with 5 angles on each side, the anterior pair very small and blunt.

Colour above bright ferruginous brown, below pure white. Tail and feet white. Basal half to three quarters of the fur leaden black; terminal portion on the back rufous-white, tipped darker rufous, numerous rather longer dark rufous-brown tips intermixed.

Dimensions of dried skins: head and body 4 inches, tail without hair 1, hind foot with claws 0·7; length of skull about 1·15.

Distribution. Plateaus of Northern Ladak. One specimen obtained in the Nubra valley, and one at Aktágh on the Upper Yarkand River.

302. **Microtus stracheyi.** *The Kumaon Vole.*

Cricetus songarus, *Horsfield, Cat.* p. 145, nec *Pallas.*
Arvicola stracheyi, *Thomas, A. M. N. H.* (5) vi, p. 322 (1880); *Blanford, J. A. S. B.* l, pt. 2, p. 98.

Ears small, hairy, not extending beyond the fur. Thumb rudimentary and clawless. Tail short, about one fifth the length of the head and body, covered with short hair, the tip with longer, extending half an inch beyond the end. Last upper molar with 2 strong internal and 4 weak external angles, the latter in pairs, the posterior pair on the long narrow posterior lobe. First lower molar with 5 internal and 5 external angles, the anterior on each side ill-marked.

Colour above rather light brown, below white, tail nearly white. Base of fur blackish grey throughout, with, on the back, in the only specimen examined, a whitish ring in the middle of the dark portion (this may be an individual peculiarity); terminal portion of dorsal hairs whitish, becoming brown at the tips. Some black ends intermixed.

Dimensions of a dried skin: head and body 3·7 inches, tail without hair 0·7, hind foot 0·65.

Distribution. Kumaun. A specimen from Dharmsála is also referred to this species by Mr. W. Sclater.

303. **Microtus wynnei.** *The Murree Vole.*

Arvicola wynnei, *Blanford, J. A. S. B.* xlix, pt. 2, p. 244 (1880); l, pt. 2, p. 99.
Kanis, H.

Ears hairy, not extending beyond the fur. Thumb with a short claw. Tail $\frac{1}{3}$ to $\frac{1}{4}$ the length of the head and body, clothed with long hair at the base, and with short elsewhere. Hinder upper molar with 2 inner and 3 outer angles, the posterior outer angle ill marked, the tooth ends in a long narrow lobe. First lower molar with 5 inner and 4 outer angles.

Colour above varying from dark rich brown with a slight greyish tinge to dark chestnut, lower parts pale brown, tail coloured like the back. Base of fur leaden black throughout.

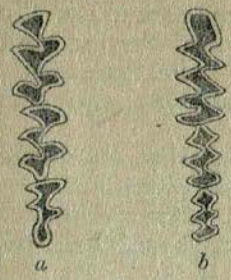


Fig. 136.—Crowns of (*a*) upper and (*b*) lower molars of *M. wynnei*, × 4.

Dimensions of a male in spirit: head and body 4·75 inches, tail 1·35, ear 0·25, hind foot 0·7; extreme length of skull 1·14, zygomatic breadth 0·75. Another male measures only 3 inches from nose to rump, tail 1·2.

Distribution. Murree, obtained by Mr. Wynne in the station.

A specimen with similar dentition to *M. wynnei*, but brown (not rufous) above, whitish below, with ears projecting considerably beyond the fur, was received without trustworthy locality, but associated with Kashmir specimens, at the British Museum.

304. **Microtus blanfordi.** *The Gilgit Vole.*

Arvicola blanfordi, *Scully, A. M. N. H.* (5) vi, p. 399 (1880); *id. P. Z. S.* 1881, p. 206; *Blanford, J. A. S. B.* l, pt. 2, p. 104.

Ears projecting beyond the fur, rounded, covered with short hair. Thumb very small, but with a small claw. Tail nearly half the length of the head and body, well clad with short hair. Hinder upper molar with 3 inner and 3 outer angles and terminating in a short longitudinal lobe. First lower molar with 5 inner and 4 outer angles.

Colour greyish brown above, white below; tail light brown above, sullied white beneath. Base of fur leaden black throughout, terminations on back pale brown, the tips darker, some longer black tips intermixed, especially on the rump.

Dimensions of a male fresh: head and body 4·55, tail 2·05, ear 0·7, hind foot 0·75.

Distribution. Gilgit, 9000 to 10,000 feet.

305. **Microtus blythi.** *Blyth's Vole.*

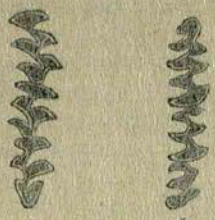
Phaiomys leucurus, *Blyth, J. A. S. B.* xxxii, p. 89 (1863); *id. Cat.* p. 125; *Theobald, J. A. S. B.* xxxi, p. 519; *Stoliczka, J. A. S. B.* xxxiv, p. 110, nec Arvicola leucurus, *Gerbe* (1862).

Arvicola blythi, *Blanford, J. A. S. B.* xliv, pt. 2, p. 107 (1875), l, pt. 2, p. 106; *id. Yark. Miss., Mam.* p. 39, pl. viii, fig. 2, pl. x *b*, fig. 1.

Phise, Ladak.

Ears hairy, not extending beyond the fur. Thumb with a short claw. Tail ¼ to ⅓ the length of the head and body, covered with short hair. Last upper molar with 3 internal and 3 external

angles and without any narrow posterior lobe. First lower molar with 5 inner and 4 outer angles, third with 3 inner but only 2 outer angles, other species having 3.



a *b*

Fig. 137.—Crowns of (*a*) upper and (*b*) lower teeth of *M. blythi*, × 4.

Colour above earthy brown, not dark (yellowish brown with a greyish tinge); below brownish white; tail light brown. Base of fur above and below dark ashy grey, terminations on back grey-brown, with dark brown or black ends intermixed.

Dimensions of a fresh specimen: head and body 4 inches, tail 1·35; of another, a large female, 4·9 and 1·25. A skull is 1·03 in extreme length, and 0·67 in zygomatic breadth.

Distribution. Banks of Tsho Morari and Pankong lakes, Western Tibet, also between Leh and the Pankong lake at elevations above 13,000 feet. According to Stoliczka this vole is also found in Spiti, Lahul, and Kulu.

Habits. This vole was found by Mr. Theobald to make deep

Fig. 138.—*Microtus blythi.*

burrows on the banks of the Tsomoriri. In a female he found 6 young.

Two species of vole, *M. mandarinus* and *M. guentheri* (the former related to *M. blythi*), have been obtained in Afghanistan.

306. Microtus sikimensis. *The Sikhim Vole.*

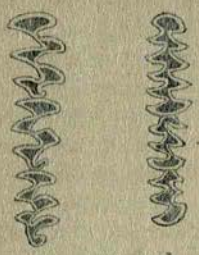
Neodon sikimensis, *Hodgson, Horsfield, A. M. N. H.* (2) iii, p. 203 (1849) (no description); *id. Cat.* p. 146; *Blyth, Cat.* p. 125; *Jerdon, Mam.* p. 217; *Blanford, Yark. Miss., Mam.* p. 41; *id. J. A. S. B.* l, pt. 2, p. 110.

Arvicola thricolis (thricotis), *Hodgson, Cat. Mam. &c., Nepal & Tibet, B. M.* 2nd ed. 1863, p. 10 (no description).

Phalchua, Nipalese; *Chik yu*, Karanti; *Sing phuchi*, Tibetan.

Ears thinly clad, projecting beyond the fur, which is of moderate

length. Whiskers moderate. Tail thinly clad, tapering, one third the length of the head and body, or rather more. Mammæ 8: 2 pairs pectoral, 2 inguinal. Last upper molar with 4 internal and 3 external angles; no posterior lobe. First lower molar with 6 inner and 5 outer angles.



a *b*

Fig. 139.—Crowns of (*a*) upper and (*b*) lower molars of *M. sikimensis*, × 4.

Colour dark brown, with a yellowish tinge above, below pale brown. Base of fur leaden black above, dark ashy below, tips on back light brown mixed with numerous black ends.

Dimensions of a fresh specimen: head and body 4·75 inches, tail 1·75, hind foot 0·75. In a female in spirit the ear from the orifice measures 0·5.

Distribution. Sikhim, between 7000 and 10,000 feet elevation.

Habits. This vole inhabits forests and, according to Hodgson, breeds in hollow decayed trees or amongst the roots of trees, making a nest of moss or soft grass. The female has 3 or 4 young at a time.

307. **Microtus melanogaster**. *Père David's Vole.*

Arvicola melanogaster, *M.-Edw. Nouv. Arch. Mus.* vii, *Bull.* p. 93 (1871); *id. Rech. Mam.* p. 284, pls. xliv, xlvi *a*; *Blanford, J. A. S. B.* l, pt. 2, p. 114.

Ears thinly clad, shorter than in *M. sikimensis*, projecting beyond the fur by one third of their length. Feet small. Last upper molar with 3 or 4 angles on each side, usually 3 well-marked and a fourth weak external angle on the U-shaped posterior termination of the tooth. Anterior lower molar with 5 external and 5 or 6 internal angles, the angles inside and outside sometimes nearly opposite to each other, not alternating.

Colour as in *M. sikimensis*. Some specimens are more rufous.

Dimensions of a male in spirit: head and body 3·7 inches, ear from orifice 0·37, tail 1·4, hind foot 0·6 (in a Bhámo specimen 3, 0·3, 1·4, and 0·65).

Distribution. South-western China (Fokien, Sechuen) and Moupin in Eastern Tibet. Mr. Thomas has identified this species amongst Mr. Fea's collections from the Kakhyen hills, near Bhámo.

Genus **ELLOBIUS**, Fischer (1814).

Syn. *Myospalax*, Blyth, 1846, nec Brandt, 1855.

No distinct ear-conch. Head very blunt and rounded. Body subcylindrical, feet broad. Claws 5—5, straight, compressed.

Tail very short, hairy. Skull very different from that of *Microtus*, the facial portion, zygomatic arches, and occipital crest being much more developed, and the brain-case rounded, not depressed, conoidal not oval in front, and with the occipital surface sloping backwards from above. Infraorbital foramen subtriangular, less narrowed below than in *Microtus*. Anterior palatine foramina very small, nearer to the molars than to the incisors; palate between molars hollowed out on each side. Bullæ small, depressed. Incisors white, protruding greatly forwards. Molars similar to those of *Microtus*.

One species occurs in Afghanistan, extending to Quetta. The only other clearly known form, *E. talpinus*, inhabits Central and Western Asia and Eastern Europe. *E. intermedius*, lately described by Scully from near Herat (J. A. S. B. lvi, pt. 2, p. 73), is referred to *E. talpinus* by Büchner (Mam. Przewalsk. p. 137) and to *E. fuscicapillus* by Thomas, with whom I agree. It is possible, as Büchner suggests, that *E. fuscicapillus* may be only a variety of *E. talpinus*, but the cranial distinctions are considerable.

308. Ellobius fuscicapillus. *The Quetta Vole.*

Georychus fuscocapillus, *Blyth, J. A. S. B.* x, p. 928 (1841) (no description), xi, p. 887 (1842).
Myospalax fuscocapillus, *Blyth, J. A. S. B.* xv, p. 141; *id. Cat.* p. 126.
Ellobius fuscicapillus, *Blanford, J. A. S. B.* l, pt. 2, p. 119; *O. Thomas, Tr. L. S.* (2), *Zool.* v, p. 59.

Fur soft and long. Tail very short, thinly clad with moderately long hair. Six pads on each hind foot, all elongate. In the zygomatic arch the malar does not extend to the lower edge, where the maxillary and squamosal processes meet. The first and second upper molars have each 3 inner and 3 outer angles, the third 2 inner and 3 outer and the tooth is but little shorter than the second. The first lower molar has 5 inner and 4 outer angles (the anterior angle on each side ill-developed), the second and third 3 on each side.

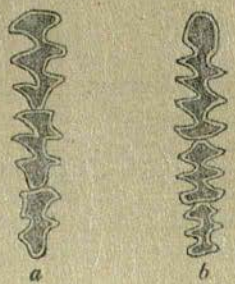


Fig. 140.—Crowns of (*a*) upper and (*b*) lower molars of *E. fuscicapillus*, × 4.

Colour pale rufescent sandy (brownish white) above, except the head, which is dark greyish brown. Lower parts, feet, and tail white. Basal three quarters or more of the fur above and below dark leaden grey. No black-tipped hairs on the back.

Dimensions. An adult female in spirit measures: head and body 4·7 inches, tail 0·5, hind foot 0·8; basal length of skull 1·3, zygomatic breadth 1.

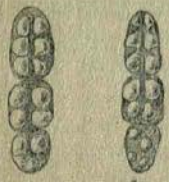
Distribution. Originally obtained by Hutton at an elevation of

5500 feet around Quetta, where, however, it has not since been found. Specimens were brought by Dr. Aitchison from Northern Afghanistan.

Habits. This mole-like rodent was said by Hutton to make long horizontal galleries, marked by earth-heaps thrown out at intervals.

Genus **CRICETUS**, Cuv. (1800).

Internal cheek-pouches present. Form stout, head blunt; tail short, not scaly, sparsely haired. Incisors not grooved. Molars in both jaws with the tubercles arranged longitudinally in pairs, 3 pairs in the anterior molar, 2 in the second and third. The tubercles are worn down in old animals. Vertebræ: C. 7, D. 13, L. 6, S. 3, C. 17.



a *b*

Fig. 141.—Crowns of (*a*) upper and (*b*) lower molars of *C. phæus*, × 5.

The hamsters are Palæarctic, but Thomas and others have shown (P. Z. S. 1888, p. 133) that the American genus *Hesperomys* must be united. The grey Central Asiatic forms, distinguished by A. Milne-Edwards as *Cricetulus*, have three representatives in Gilgit, but have hitherto not been found elsewhere within our limits.

Synopsis of Indian Species.

A. Head and body 3″·5 to 4″ long ..... *C. phæus*, p. 436.
B. Head and body about 4″·5 long ..... *C. fulvus*, p. 437.
C. Head and body about 5″·3 long ..... *C. isabellinus*, p. 437.

309. **Cricetus phæus.** *The little grey Hamster.*

Mus phæus, *Pallas, Glires*, pp. 86, 261, pl. xv *a* (1784).
Cricetus (Cricetulus) phæus, *Blanford, York. Miss., Mam.* p. 44; *id. J. A. S. B.* xlviii, pt. 2, p. 96; *Scully, P. Z. S.* 1881, p. 205.

Tail cylindrical, about one fourth the head and body in length. Feet short. Planta hairy, with 6 tubercles, all on the distal half. Ears rounded, thinly clad. Fur soft.

Colour ashy grey above, sometimes with a fulvous tinge, the back with a blackish wash. Lower parts white. Basal two-thirds of dorsal fur leaden black, tips of some hairs blackish.

Dimensions. Head and body 3·7 inches, tail 1, ear 0·75, hind foot 0·6; basal length of skull 0·95, zygomatic breadth 0·5.

Distribution. Widely spread in Central Asia; common in Persia, Turkestan, &c. Found in Gilgit by Biddulph and Scully from 5000 to 9000 feet elevation.

Habits. This hamster frequents cultivated lands and pastures and is frequently found in houses.

310. Cricetus fulvus. *The fulvous-grey Hamster.*

Cricetus (Cricetulus) fulvus, *Blanford, J. A. S. B.* xliv, pt. 2, p. 108 (1875), xlviii, pt. 2, p. 96; *id. Yark. Miss., Mam.* p. 45, pl. ix, fig. 1, pl. x *b*, fig. 3; *Scully, P. Z. S.* 1881, p. 205.

Precisely similar to the last in structure but larger.

Colour fulvous grey above, white below. More rufous or isabelline than *C. phæus*, but otherwise similar.

Dimensions. Head and body about 4·5 inches, tail 1·45, ear 0·6, hind foot 0·7; skull 1·17 long (total length), 0·64 broad.

Distribution. Káshghar, Yárkand, and the Pámir, extending to Gilgit, where it occurs with the last.

311. Cricetus isabellinus. *The large grey Hamster.*

Cricetus isabellinus, *De Filippi, Viaggio in Persia*, p. 344; *Scully, P. Z. S.* 1881, p. 205.

Precisely similar to *C. phæus* but much larger.

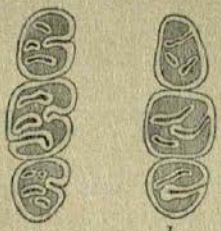
Colour greyish isabelline above, white below.

Dimensions. Head and body 5·35 inches, tail 1·1.

Distribution. Found by De Filippi at Tehrán, Northern Persia, and by Scully in Gilgit.

It is somewhat doubtful whether these three forms of *Cricetus* should be considered species or only varieties. *C. fulvus* is about double and *C. isabellinus* fully quadruple the weight of *C. phæus*. The different forms occur in several places, but this is not in favour of their being distinct.

Family SPALACIDÆ.



a *b*

Fig. 142.—Crowns of (*a*) upper and (*b*) lower molars of *Rhizomys pruinosus*, × 2.

The *Spalacidæ* are sometimes called rodent moles, and resemble a mole in general aspect, having cylindrical bodies, short limbs, small eyes and ears, large claws, and a short or rudimentary tail. The infra-orbital opening is small or moderate, with no perpendicular plate; and the palate is narrow. The incisors are large, the molars rooted, with re-entering enamel folds.

A single genus, *Rhizomys*, inhabits South-eastern Asia and occurs in the Himalayas and Burma; other members of the family are Palæarctic or Ethiopian.

Genus RHIZOMYS, Gray, 1831.

Syn. *Nyctocleptes*, Temm.

Form robust; eyes very small; ears small and naked; thumb very small, rudimentary, but furnished with a claw. Tail almost naked, having only a few scattered hairs, and not scaly, about one fourth to one third the length of the head and body.

Dentition: i. $\frac{2}{2}$ m. $\frac{3-3}{3-3}$. The upper incisors are arched forward and both they and the lower incisors are usually deep orange in colour; occasionally, however, the upper incisors are white, the lower orange. There are no premolars. Vertebræ: C. 7, D. 13, L. ?, S. 4, C. 19 (in *R. badius*). There are 3 pairs of inguinal and 2 pairs of pectoral mammæ. The anatomy has been described by Anderson (An. Zool. Res. p. 314).

Three distinct forms occur within our limits. Remains of a fossil species have been found in the Siwalik beds.

Synopsis of Indian and Burmese species.

A. Head and body 7 to 8 inches; colour chestnut or dark brown, not grizzled ..... *R. badius*, p. 438.
B. Head and body 10 to 14 inches; colour dark brown, grizzled ..... *R. pruinosus*, p. 439.
C. Head and body 15 to 19 inches; colour dark ashy to light brown ..... *R. sumatrensis*, p. 439.

312. Rhizomys badius. *The bay Bamboo-Rat.*

Rhizomys badius, *Hodgson, Calc. Journ. N. H.* ii, pp. 60, 410 (1842); *Blyth, J. A. S. B.* xii, p. 925; *id. Cat.* p. 122; *Jerdon, Mam.* p. 214; *Anderson, An. Zool. Res.* p. 329, pls. xiv, xvi; *Thomas, P. Z. S.* 1886, p. 65.

Rhizomys minor, *Gray, A. M. N. H.* x, p. 266 (1842); *Horsf. Cat.* p. 165; *Blyth, Mam. Birds Burma*, p. 41; *Anderson, An. Zool. Res.* p. 327, pls. xv, xvi.

Rhizomys castaneus, *Blyth, J. A. S. B.* xii, p. 1007 (1843); *id. Cat.* p. 123; *id. Mam. Birds Burma*, p. 41; *Blanford, J. A. S. B.* xlvii, pt. 2, p. 165.

Yukron, Kakhyen; *Khai*, Burmese.

Fur soft and rather thick. Ears hidden by the fur. Foot-pads smooth, not tuberculated.

Colour chestnut, bay or ashy brown, but nearly uniform in each individual, rather brighter and deeper above than below. All the basal portion of the fur, two thirds to three fourths or more, dark cinerous or leaden grey. Sometimes there is a white spot on the forehead. In most young specimens and some adults the tips of the hairs are dull rufous or ashy brown (*R. minor*).

Dimensions. Head and body 7 to 9 inches, tail about 2·7, hind foot from heel 1·3, both sexes the same; basal length of skull 1·85,

zygomatic breadth 1·45. Some skulls appear smaller, one apparently adult measures 1·75 by 1·3.

Distribution. The base of the Eastern Himalayas in Nepal, Sikhim, and Bhutan; Assam, Manipur, and throughout Burma, also north of Burma in the hill-ranges near Bhámo, and in Siam.

Habits. This animal lives in burrows made by itself, sometimes, it is said, under roots of trees, elsewhere, as observed by Anderson, in high rank grass. It leaves its burrow in the evening and feeds on various vegetables, especially young shoots of grasses and cereals, and probably of bamboo. It is also said to feed largely on roots; indeed, Hodgson's view, from observations on a living animal, was that these were the principal object of its burrows. It burrows rapidly, using its powerful teeth as well as its claws in the process. Above ground the pace of *Rhizomys* is slow; the animal appears fearless, so much so that wild individuals are said to allow themselves to be captured without resisting, though ready enough to turn upon an assailant.

This and other species are eaten by many of the Burmese hill tribes.

313. Rhizomys pruinosus. *The hoary Bamboo-Rat.*

Rhizomys pruinosus, *Blyth, J. A. S. B.* xx, p. 519; *id. Cat.* p. 122; *id. Mam. Birds Burma*, p. 41; *Anderson, An. Zool. Res.* p. 325, pls. xiii, xvi.

Fur soft and thick, concealing the small ears. Foot-pads covered with tubercles.

Colour dark brown throughout, with a hoary or grizzled appearance owing to scattered whitish hairs, which are shorter, finer, and closer together on the lower surface, giving a somewhat silvery tone. Basal half of dorsal fur dark ashy, paler on the head. In old females the sides of the head, muzzle, and chin are pale brown.

Dimensions of a large male: head and body 13 inches, tail 4, hind foot from heel 2·2. In a smaller individual, a female, the corresponding measurements are 10·75, 3·75, and 1·95. Basal length of a skull 2·6, zygomatic breadth 2.

Distribution. Khási and other hills south of Assam, extending to the Kakhyen hills north of Upper Burma and to Karennee. There is also in the British Museum a skull from Cambodia and another from Swatow, China.

Habits. So far as known, similar to those of *R. badius*. The female produces three or four at a birth.

314. Rhizomys sumatrensis. *The large Bamboo-Rat.*

Mus sumatrensis, *Raffles, Tr. Linn. Soc.* xiii, p. 258 (1822).

Rhizomys sumatrensis, *Gray, P. Z. S.* 1831, p. 95; *Cantor, J. A. S. B.* xv, p. 255; *Blyth, J. A. S. B.* xxviii, p. 294; *id. Cat.* p. 122; *id. Mam. Birds Burma*, p. 41; *Anderson, An. Zool. Res.* p. 322.

Rhizomys cinereus, *McClelland, Calc. Jour. N. H.* ii, p. 456; *Blyth, J. A. S. B.* x, p. 920.

Rhizomys erythrogenys, *Anderson*, *P. A. S. B.* 1877, p. 150; *id. An. Zool. Res.* p. 324, pl. xiii *a*.

Pwe, Burmese; *Tikus bulo*, Malay.

Fur short and thin, with numerous coarse whitish hairs scattered through it on the back. Foot-pads covered with flattish tubercles. Skull thick and massive, muzzle broad.

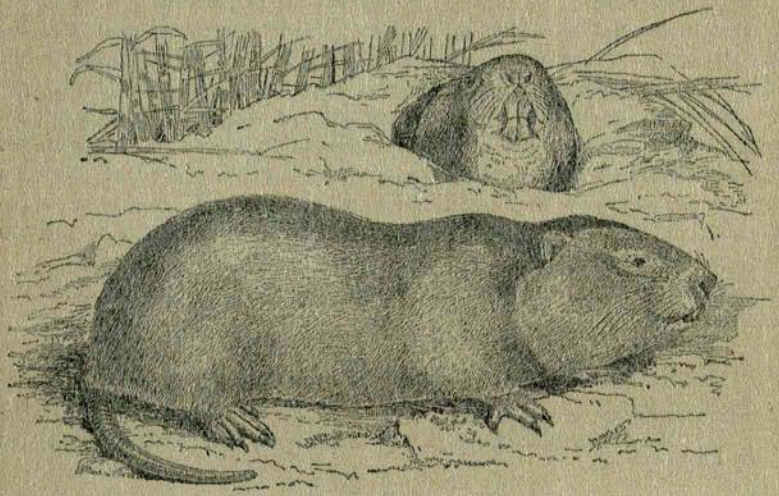


Fig. 143.—*Rhizomys sumatrensis* (after Anderson).

Colour varying from dark ashy grey or greyish brown to light brown or brownish buff or isabelline, the middle of the back darker and the lower parts paler. Sides of the head pale, or sometimes bright ferruginous red. There is occasionally a white frontal spot. The bright ferruginous coloration of the cheeks, from which the name *erythrogenys* was derived, and the dark ashy tint of the back are, according to Cantor, signs of immaturity.

Dimensions. Head and body in a large male 19 inches, tail 5½. Other specimens 15 to 17 inches, tail 5 to 6. A skull measures 3·15 in basal length, 2·5 in zygomatic breadth.

Distribution. The Malay Peninsula and Siam, extending throughout the Tenasserim Provinces as far north as Moulmein, Shwegyeng, and Karennee.

Habits. Like the other species of the genus, this is doubtless a burrower, but scarcely anything appears recorded of its habits in the wild state.

The only Asiatic species not found in Burma or the Himalayas are the Chinese *R. sinensis* and *R. vestitus*, which Anderson regards as identical. The remaining species of the genus inhabit Abyssinia.

Family HYSTRICIDÆ.

The porcupines and their near allies constitute this family and are easily recognized by their fur being more or less completely modified into spines. Spines, it is true, occur is some other rodents, but not to the same extent.

The form is robust (the largest Indian rodents belong to this family) and the limbs subequal. The clavicles are imperfect in all Indian forms; the fibula distinct. The zygomatic arch is stout, the malar bone not supported below by a continuation of the maxillary zygomatic process. Infraorbital opening large. The angular portion of the mandible arises from the outer side of the bony socket of the lower incisor. Facial part of the skull short and broad. Molars with external and internal enamel plaits, semirooted in all Indian genera.

Two genera occur within Indian limits.

A. Tail short, spinose, with hollow quills at the end..... HYSTRIX.
B. Tail long, scaly, with a tuft of bristles at the end..... ATHERURA.

Genus HYSTRIX, L. (1766).

Syn. *Acanthion*, Cuv.; *Acanthochærus*, Gray.

Body covered with rigid spines, some longer flexible spines being added on the back, the stoutest spines attached to the loins and rump. Tail short, spinose, and having at the end a bundle of slender-stalked open quills. Muzzle blunt. Mammæ 6.

Fig. 144.—Crowns of right upper cheek-teeth of *H. leucura*, × 1.

In the skull the nasal bones are well developed, much more so, however, in some species than in others. There are large air-sinuses in the frontals. Nasal cavity usually very large.

Dentition: i. $\frac{2}{2}$, pm. $\frac{1-1}{1-1}$, m. $\frac{3-3}{3-3}$. The upper grinding-teeth with one internal and three or four external folds; the folds become, with wear, loops of enamel inside the margin of the tooth. Lower teeth similar but with the folds reversed.

Vertebræ: C. 7, D. 15, L. 4, S. 4, C. 10–12. Toes 5—5, the pollex small.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. A crest of bristles 6 to 12 inches long or more on neck and shoulders ..... *H. leucura*, p. 442.
B. Crest present but less than 6 inches long .... *H. bengalensis*, p. 444.
C. Crest wanting or quite rudimentary ..... *H. hodgsoni*, p. 444.

One species of *Hystrix* is found fossil in the Pliocene Siwaliks and another in the Pleistocene cave-deposits of Kurnool.

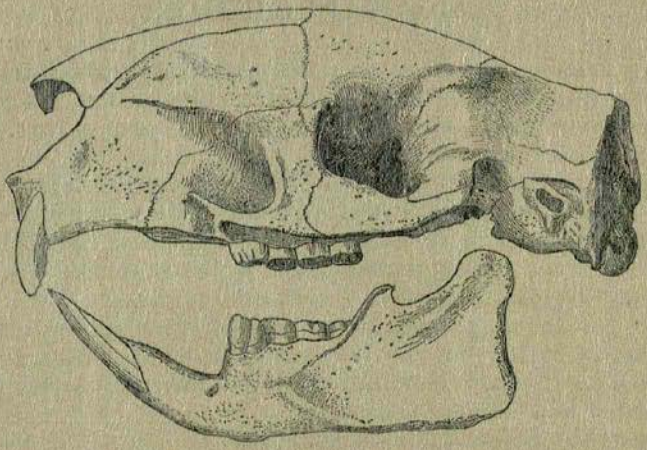


Fig. 145.—Skull of *Hystrix leucura*, × ½.

315. **Hystrix leucura.** *The Indian Porcupine.*

Hystrix cristata, var. indica, *Gray and Hardwicke, Ill. Ind. Zool.* ii, pl. 14 (1830).
Hystrix leucurus, *Sykes, P. Z. S.* 1831, p. 103; *Elliot, Mad. Jour. L. S.* x, p. 218; *Kelaart, Prod.* p. 70; *Adams, P. Z. S.* 1858, p. 520; *Blyth, Cat.* p. 128; *Jerdon, Mam.* p. 218.
Hystrix hirsutirostris, *Brandt, St. Petersb. Acad. Mem.* i, 1835, p. 375; *Waterhouse, Mammalia*, ii, p. 454; *Blyth, J. A. S. B.* xxi, p. 351.
Hystrix zeylonensis, *Blyth, J. A. S. B.* xx, p. 171 (1851).
Hystrix malabarica, *Sclater, P. Z. S.* 1865, p. 353, pl. xvi; 1871, pp. 233, 234.

Sáyi, Sáhi, Sáyal, Sarsel, H. &c.; *Sájru*, B.; *Dumsi, Chotia-dumsi*, Nepal; *Saori, Chaodi*, Guzrati; *Salendra*, Mahr. of the Ghâts; *Sinkor*, Sindhi; *Sikhan*, Baluch.; *Shkunr*, Pushtu; *Hoigu*, Gond.; *Jekra*, Korku; *Jiki*, Ho-Kol; *Yed, Mûl-handi*, Can.; *Yeddu pandi*, Tel.; *Malânpani*, Tam. Mal.; *Hitava*, Cingalese.

A crest of very long coarse bristles, from 6 or 8 inches to occasionally over a foot in length, commencing on the forehead and extending along the spine to the middle of the back. Muzzle densely clad with hair; fore part of body, limbs, and abdomen covered with short spines mingled beneath with hair, the loins and base of tail with long spines, those situated anteriorly long and flexible, the others on the lower back and rump stout and rigid, so that the long flexible spines conceal the stouter quills except when all are erected. Skull moderately convex above, the nasals being nearly twice the length of the frontals, and having their lateral margins subparallel and their hinder border transverse; posterior

portion of premaxillary not differing greatly from a nasal in breadth. Mammæ 6, pectoral, laterally placed.

Colour blackish brown, with the exception of the tips of the quills on the cheeks and on a band across the throat (forming a collar), the terminal one fifth to one half, and one, two, or three narrow rings on the long dorsal quills, and all the spines and hollow quills of the tail, which are white. A few of the crest-bristles also are tipped with white or whitish in some individuals. The quills around the base of the tail are in great part white, and there is often a mesial line of white spines on the lower back. In some specimens the caudal spines and the tips and rings on the dorsal quills are partly orange-red instead of white.

Dimensions. Head and body 28 to 32 inches, tail 3 or 4, with spines 7 or 8, hind foot from heel 3·75; basal length of adult skull 5·5, zygomatic breadth 3·2. Weight 25 to 30 lbs.

Distribution. Throughout India and Ceylon, extending into the lower spurs of the Eastern Himalayas and to the westward far into the mountains, this species being found in Kashmir. A closely allied form, probably merely a variety *, extends throughout Western Asia to the Caspian and Black Sea. *H. leucura* has not been recorded east of the Bay of Bengal.

Habits. During the day the Indian porcupine remains in caves amongst rocks, or in burrows made by itself in hillsides, river-banks, bunds of tanks, &c. It has a predilection for rocky hills, and it is frequently gregarious. It rarely leaves its burrow till after sunset and generally returns thereto before sunrise. From being so thoroughly nocturnal, this, one of the commonest wild animals of India, is seldom seem. It feeds on vegetables, principally on roots, and is destructive to crops, especially to garden produce (peas, potatoes, onions, carrots, &c.), and to fruit, and is said to be very dainty and particular in its choice of food.

When irritated or alarmed porcupines utter a grunting sound and erect their spines with a peculiar rattling noise, produced, apparently, by the hollow tail-quills. When attacked by dogs or other animals, they charge backwards and inflict severe wounds with the rigid spines of their hind quarters. In confinement porcupines often gnaw, with their powerful teeth, through wooden cases or cages. They are fond of gnawing bones, and I have seen an elephant's tusk, found in the forest, deeply scored by their incisors. The flesh of the porcupine is well known to be excellent eating. From two to four young are produced at a birth, and are born with their eyes open and the body covered with short soft spines.

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* This is often called *H. cristata*, L. (as it was by myself in 'Eastern Persia, ii, p. 80). Waterhouse, however, 'Mammalia,' ii, p. 448, showed that the Italian and North African species must retain the Linnæan title. In true *H. cristata* the skull is very tumid, the nasals being enormous, more than 3 times the length of the frontals, much wider than the premaxillaries, and having together an oval contour.

316. **Hystrix hodgsoni.** *The crestless Himalayan Porcupine.*

Acanthion hodgsonii, *Gray, P. Z. S.* 1847, p. 101.
Hystrix alophus, *Hodgson, J. A. S. B.* xvi, p. 771, pl. xxxii (1847).
Hystrix hodgsoni, *Waterhouse, Mammalia*, ii, p. 461.
Hystrix longicauda, *Blyth, Cat.* p. 129, partim; *Jerdon, Mam.* p. 221, nec *Marsden*.

Anchotia dumsi, Nepalese; *Sathung*, Lepcha; *O-e*, Limbu; *Midi*, Cachari; *Subon-dem*, Manipuri; *Suku*, Kuki; *Sisi*, Daphla; *Tuigon, Soke, Liso, Vikhá, Sekru*, Naga.

No crests on head, neck, or shoulders as a rule, but occasionally a few bristles, slightly longer than the neighbouring spines, in a line on the back of the neck. Anterior portion of body, limbs, and abdomen covered with short flexible spines, flattened and deeply grooved, with hair-like terminations. Longer rigid spines and, scattered amongst them, still longer thin flexible spines, some of the latter often 10 inches in length, on the loins and rump. In the skull the nasals are about $2\frac{1}{2}$ times the length of the frontals and have a convex posterior termination.

Colour dark brown, blackish on the limbs. A narrow band of white-tipped spines forms a collar in front of the neck; longer quills of the back having sometimes the base, sometimes the tip, sometimes both white. Tail-quills of black and white mixed.

Dimensions. Head and body 23 inches, tail 4, or with the quills 8; basal length of skull 4·4, zygomatic breadth 2·5. Weight 16 to 20 lbs.

Distribution. The lower slopes of the Himalayas in Nepal and Sikhim up to about 5000 feet, and Assam. A crestless porcupine inhabits Burma and other countries east of the Bay of Bengal, but whether the present species or *H. longicauda* is uncertain.

Habits. According to Hodgson these porcupines are monogamous, living in burrows, and resembling *H. leucura* in habits and food. They breed in spring and produce usually two young. The flesh is excellent and is much esteemed.

317. **Hystrix bengalensis.** *The Bengal Porcupine.*

Hystrix bengalensis, *Blyth, J. A. S. B.* xx, p. 170 (1851); *id. Cat.* p. 128; *id. Mam. Birds Burma*, p. 42; *Jerdon, Mam.* p. 220.

Sajru, Bengali: *Phyu*, Burmese.

This resembles *H. hodgsoni* and *H. longicauda* in size and general character, having only a very few long and slender quills intermixed with the ordinary weapon-quills. The latter are much longer and thicker than in *H. hodgsoni*, and the body-spines are still flatter and more strongly grooved and terminate towards the neck in slight setæ, towards the quills in rigid points. There is a distinct but small thin crest, the longest bristles of which measure 5 or 6 inches and are tipped with white for the terminal third; and the white demi-collar is strongly marked. General colour as in

H. hodgsoni, the quills generally having the basal half white, the rest black, most of them with a white tip more or less developed, the few long and flexible quills white with a narrow black band about the middle. Tail as in *H. hodgsoni*.

The above is an abridged copy of Blyth's original description. Jerdon gives the length of the head and body as 28 inches, tail 4.

Distribution. Lower Bengal, Assam, Arrakan, and probably Burma generally. Specimens have also been brought from Sikhim.

I have not been able to examine a specimen of this species. Anderson (An. Zool. Res. p. 333) describes the skull as closely resembling that of *H. longicauda* (Marsden, History of Sumatra, p. 118, pl. xiii), with which *Acanthochœrus grotei* of Gray (P. Z. S. 1866, p. 310) is said to be identical (see Sclater, P. Z. S. 1871, p. 234). Mr. Thomas has shown to me a skull with broad nasals collected by Mr. Fea in Karennee, and agreeing fairly with Anderson's description of that of *H. bengalensis*. The frontals are about half the length of the nasals, and the breadth of the nasals in front is nearly the length of the frontals. Basal length 4·75 inches, zygomatic breadth 2·7. As I find a rudimentary crest in some specimens of *H. hodgsoni*, the presence or absence of a small crest is not a specific character.

The skulls of *H. longicauda* (from Malacca, identified by Cantor) and *H. bengalensis* differ from that of *H. hodgsoni* in having the nasal bones not more than twice the length of the frontals. The crestless *H. javanica*, Cuv., from Java, and the small crested *H. yunnanensis* (Anderson, An. Zool. Res. p. 332), from Yunnan, have the frontals nearly as long as the nasals.

The remaining Asiatic forms of *Hystrix* besides *H. yunnanensis* and *H. javanica* are the Chinese *H. subcristata*, Swinhoe (P. Z. S. 1870, p. 638), and *H. crassispinis*, Günther (P. Z. S. 1876, p. 736, pl. lxx), from Borneo. *H. muelleri*, Jentink (Notes Leyd. Mus. 1879, p. 87), from Sumatra, is identical with *H. longicauda* of Cantor and others.

Genus **ATHERURA**, Cuv. (1829).

Tail elongate, about half the length of the head and body, scaly, with spiny bristles between the scales, and furnished with a tuft of long bristles partly flattened at the end. Spines of body flattened and grooved throughout, those of the lumbar region and rump not greatly exceeding those of the shoulders in length.

Skull much as in *Hystrix*, but the nasal cavity is smaller and the nasal bones shorter than the frontals. Dentition as in *Hystrix*.

But a single species is found within Indian limits and this is restricted to the countries east of the Bay of Bengal. Formerly, however, the genus must have existed in the Indian Peninsula, for its teeth have been found in the Pleistocene cave-deposits of Kurnool.

318. Atherura macrura. *The Asiatic brush-tailed Porcupine.*

Hystrix macroura, *L. Syst. Nat.* i, p. 77 (1766).
Hystrix fasciculata, *Shaw, Gen. Zool.* ii, p. 11; *Gray and Hardw. Ill. Ind. Zool.* ii, pl. 15.
Atherura fasciculata, *Cantor, J. A. S. B.* xv, p. 257; *Blyth, Cat.* p. 129; *id. Mam. Birds Burma*, p. 43; *Sclater, P. Z. S.* 1871, p. 236.
Atherura macrura, *Waterhouse, Mammalia*, ii, p. 472; *Blyth, J. A. S. B.* xx, p. 519; *Günther, P. Z. S.* 1876, p. 742; *Thomas, P. Z. S.* 1886, p. 71.

Ládak, Malay.

Body covered with rigid spines above, those of the lumbar region longer and mixed with a few still longer flexible bristle-like spines; head and lower parts covered with soft flattened spines. The tail is spiny near the base, then scaly, spiny bristles emerging between

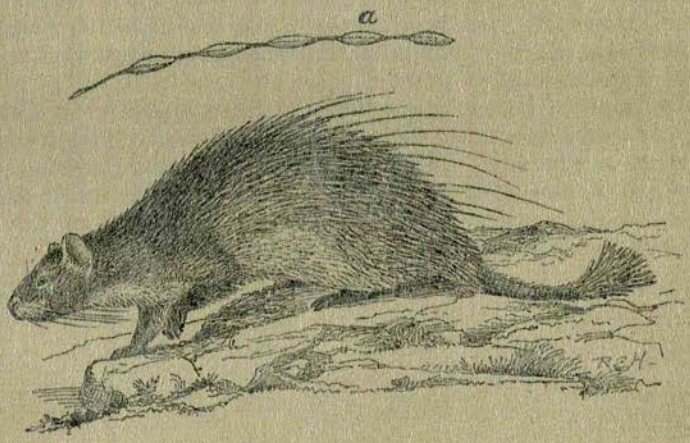

Fig. 146.—*Atherura macrura*; *a*, one of the bristles at the end of the tail.

the scales, at the tip is a tuft of longer bristles, partly simple, but chiefly each composed of three or four elongate elliptical flattened disks joined together end to end, and to the tail by short bristles.

Colour above dark brown, either uniform or with the tips of the spines paler; the long lumbar bristles mostly white, lower parts and bristles at the tip of the tail whitish.

Dimensions. Head and body of a male 22 inches, tail 10, of a smaller specimen 18·5 and 9; basal length of skull 3·4, zygomatic breadth 1·8.

Distribution. Burma and the Malay countries, extending northward to Chittagong, Tipperah, and the Khási hills, and southward to Java, Sumatra, and perhaps Borneo.

Habits. Similar to those of *Hystrix*.

The only remaining species of the genus, *A. africana*, occurs in Western and Central Africa. Another Oriental genus is *Trichys*, of which one species, *T. guentheri*, inhabits Borneo. The American porcupines belong to a distinct subfamily, *Synetherinæ*.

Suborder *DUPLICIDENTATA*.

This suborder, distinguished by having two pairs of upper incisors in adults, the smaller additional pair being behind the usual rodent teeth, not at the side of them, comprises two families—the hares and the *Lagomyidæ*, sometimes known as Pikas, calling or piping hares, or mouse-hares. In all there are, at birth, three pairs of upper incisors, but the outer tooth on each side is soon lost. Enamel extends all round the incisors. The molars are rootless, with transverse enamel-folds. The anterior palatine or incisive foramina are very large, usually confluent, and extending back to the premolars; the bony palate is very short; and the opening of the posterior nares is between the true molars. There is no true alisphenoid canal. The fibula is anchylosed to the tibia and articulates with the os calcis. The testes are permanently external to the abdominal cavity. All the species are exclusively vegetable feeders and have very long intestines and a large cæcum. All are terrestrial, none arboreal or aquatic.

Both families occur in India and are thus distinguished:—

Ears long; a tail present	**Leporidæ.**
Ears short, rounded; no tail	**Lagomyidæ.**

Family LEPORIDÆ.

Hares and rabbits compose this family. The ears are long, usually about the same length as the skull or longer, and there is a short tail. The limbs are long, the hind limbs in general conspicuously longer than the fore. The eyes are large and there are no eyelids. The skull is compressed; the frontals are broad between the orbits and furnished with peculiarly shaped post-orbital processes, narrow where joined to the frontals, then expanded and forming the upper rim of the orbit. The clavicles are imperfect.

Dentition: i. $\frac{4}{2}$, pm. $\frac{3-3}{2-2}$, m. $\frac{3-3}{3-3}$. Toes 5–4. Vertebræ: C. 7, D. 12, L. 7, S. 4, C. 13–15.

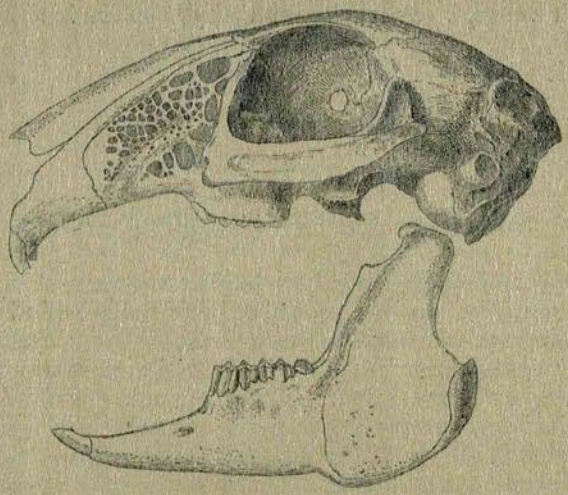

Fig. 147.—Skull of *Lepus nigricollis*. × $\frac{2}{3}$.

But a single genus is usually recognized in this family. Hares are found in all geographical regions except the Australian.

Genus **LEPUS**, L. (1766).

Syn. *Caprolagus*, Blyth (1845).

Characters of the family. Hares are well known and scarcely require description. There are several Indian species, some found in tropical parts of the country, others confined to the Himalayas. As a rule two different species do not inhabit the same area, but *L. ruficaudatus* and *L. hispidus* may form an exception, as both apparently occur in Eastern Bengal and Assam.

Hares have much resemblance to each other in habits; as a rule they dwell in grass, or amongst bushes or rocks, each living solitarily in a particular spot, known as its *form*; usually a mere seat in the grass, or beside a bush or stone. To this form the animal returns, sometimes daily, for a considerable period, changing, however, with the season of year. Hares move about and feed in the morning and evening and at night, living entirely on grass and other plants. They are swift of foot, and owing to the length of their hind legs can ascend a slope at great speed. True hares do not burrow. They breed several times in the year; the period of gestation is about a month, and the young are born with their

eyes open and are able to reproduce at the age of about 6 months. In the European hare the young of the same litter are said to be sometimes dropped at considerable intervals. Rabbits differ from hares considerably; they dwell in burrows, and the young are born naked and with the eyes closed. The curious hispid hare also burrows.

Synopsis of Indian, Ceylonese, and Burmese species.

A. Ears as long as the head or longer, tail white beneath.
  a. A black patch on the back of the neck ..... *L. nigricollis*, p. 449.
  b. No black patch.
    a'. Upper surface of tail rufous-brown; fur harsh ..... *L. ruficaudatus*, p. 450.
    b'. Upper surface of tail blackish brown; fur soft ..... *L. dayanus*, p. 451.
    c'. Upper surface of tail black.
      a''. General colour distinctly rufous .. *L. peguensis*, p. 451.
      b''. General colour not rufous ..... *L. tibetanus*, p. 452.
    d'. Tail wholly or almost wholly white.
      a''. Ear longer than hind foot with tarsus ..... *L. oiostolus*, p. 452.
      b''. Ear not longer than hind foot with tarsus ..... *L. hypsibius*, p. 453.
B. Ears shorter than head, tail brown throughout; fur bristly ..... *L. hispidus*, p. 454.

319. Lepus nigricollis. *The black-naped Hare.*

Lepus nigricollis, *F. Cuv. Dict. Sc. Nat.* xxvi, p. 307 (1823); *Elliot, Mad. Jour. L. S.* x, p. 218; *Kelaart, Prod. F. Z.* p. 72; *Blyth, Cat.* p. 132; *Jerdon, Mam.* p. 225.

Khargosh, H.; *Sassa*, Mahr.; *Malla*, Can.; *Musal*, Tam.; *Kundeli, Chourapilli*, Tel.; *Moilu*, Mal.; *Hava*, Cing.

Ears thinly clad. Fur somewhat harsh and coarse.

Colour above rufescent brown and black mixed, except a large black or brownish-black patch on the back of the neck, extending from the ears to the shoulders. Tail rufous-brown above, blackish towards the end. Fore neck, breast, and limbs rufous; chin, throat, and lower parts from fore limbs white, the dorsal and ventral tints passing gradually into each other on the flanks. Ears outside brown anteriorly, grey posteriorly, dusky towards the tip, narrowly margined with whitish inside. Dorsal fur ash-grey or creamy white at the base, then black, then rufous or rufescent white, the extreme tips black. Animals from the Nilgiri hills and Ceylon are more richly coloured than those from the plains, but one Nilgiri skin, sent to me by Mr. Hampson, is blackish brown above and not rufous.

Dimensions. Head and body 19 inches, ears 4·75, tail (without hair?) 2·5; a skull measures 2·9 in basal length and 1·65 in breadth across the zygomatic arches. Nilgiri hares weigh 5 to 8 lbs., but

in the plains the weight is less, Col. Hamilton (Hawkeye) says 5 to 7.

Distribution. The Indian Peninsula, south of the Godávari, and Ceylon. This hare ascends hills and is found commonly on the Nilgiris and at Newera Ellia.

Habits. Nothing particular appears to have been recorded. Like *L. ruficaudatus*, this hare takes refuge in holes (on the Nilgiris, in hollow trees) when pursued, and like that species appears to have fewer young at a birth than the European hare. Mr. Davison tells me he has generally found one but not unfrequently two. On the Nilgiris this hare breeds chiefly from October to February.

320. **Lepus ruficaudatus.** *The common Indian Hare.*

Lepus ruficaudatus, *Geoff. Dict. class. d'hist. nat.* ix, p. 381 (1826); *Blyth, J. A. S. B.* xi, p. 100; *Cat.* p. 131; *Jerdon, Mam.* p. 224.
Lepus timidus, *McClelland, P. Z. S.* 1839, p. 152, nec *Linn.*
Lepus macrotus, *Hodgson, J. A. S. B.* ix, p. 1183 (1840); *Adams, P. Z. S.* 1858, p. 520; *Wagner, Hügel's Kaschmir*, iv, p. 574, pl.
Lepus aryabertensis, *Hodgson, Calc. Jour. N. H.* iv, p. 293.
Lepus tytleri, *Tytler, A. M. N. H.* (2) xiv. p. 176 (1854); *Blyth, J. A. S. B.* xxii, p. 415, xxiv, p. 471.

Khargosh, P. & Hindustani; *Khará*, *Susra* or *Sassa*, H. & B.; *Lambha* or *Lambhána*, H.; *Malol*, Gond.; *Kulhai*, Kol, Santál; *Koarli*, Korku; *Manye*, Paharia of Rajmehál.

Ears very thinly clad. Fur somewhat harsh and coarse; three pairs of mammæ, 1 pectoral, 2 inguinal.

Colour above light rufous-brown mixed with black on the back and face; breast and limbs rufous; chin, upper throat, and lower parts from between the fore legs white. Fur of back creamy white (sometimes very pale ashy grey) at the base, then for a short distance dark brown to ashy brown, then pale rufous, and the extreme tips black. Tail above rufous-brown. Anterior outer and posterior inner surface of ears more thickly clad than the remainder of the ear-conch, dark brown mixed with rufescent. Near their tips the ears are narrowly bordered with black outside and with rufous inside.

Dimensions. Head and body 18 to 20 inches, tail with hair 4, ear from crown 5, breadth laid flat 2·75, hind foot and tarsus from heel to end of claws 4; basal length of skull 2·9, zygomatic breadth 1·55; weight 4 to 5 lbs. Males are smaller than females.

Distribution. Northern India generally, except in Western Rajputana, Sind, and the South-west Punjab. This species ranges from the foot of the Himalayas to the Godávari or somewhat further south, being found, I believe, around Poona in the Deccan. To the eastward *L. ruficaudatus* occurs in Assam, to the north-west I have a specimen from Hazára.

Habits. This hare is chiefly found in waste ground or dry culti-

vation, amongst grass and bushes. It is common in many parts of Northern India, is often shot and occasionally coursed with greyhounds. When pursued it not unfrequently takes refuge in a fox's hole or some other burrow. In more than one instance, I have found a single fœtus in the female; Hodgson, however, found two and states that this is the number of young generally produced at a birth.

The flesh is not so good as that of the European hare, though much of the usual inferiority is probably due to cookery. When jugged this hare is by no means unpalatable.

321. Lepus dayanus. *The Sind Hare.*

Lepus dayanus, *Blanford, P. Z. S.* 1874, p. 663.
Lepus joongshaiensis, *Murray, Vertebrate Zoology of Sind*, p. 51.

Sassa, Saho, Seher, Sindhi.

Ears thinly clad. Fur very soft. In the skull the nasals are shorter and much less bent over anteriorly at the sides than in *L. ruficaudatus*.

Colour above light greyish brown mixed with black; breast and limbs pale rufescent, lower parts except the breast white. Dorsal fur at base light grey to creamy white, paler posteriorly, beyond the middle of each hair is a black ring, then a whitish space, the tip being black. Tail blackish brown above. Face-stripes whitish; around eyes white. Margin of ear near the tip blackish brown outside, buff inside.

Dimensions. Head and body 17 inches, tail with hair 4, without hair 2·75, ear from crown 4·5, hind foot and tarsus 4; basal length of skull 2·75, zygomatic breadth 1·6.

Distribution. Sind and Cutch, with the greater part of the Indian desert east of the Indus, probably also the Derajât in the Punjab.

Habits. Similar to those of *L. ruficaudatus*. This is, however, more of a desert form. It is much greyer than *L. ruficaudatus* and at once distinguished by its soft fur, and by the upper surface of the tail being blackish brown instead of rufous.

322. Lepus peguensis. *The Burmese Hare.*

Lepus sinensis, *Blyth, J. A. S. B.* xxi, p. 359, nec *Gray*.
Lepus peguensis, *Blyth, J. A. S. B.* xxiv, p. 471 (1855); *id. Cat.* p. 132; *id. Mam. Birds Burma*, p. 43.

Yun, Phu-goung, Burmese.

Colour above rufous mixed with black, below white, the two colours well defined, not passing into each other. Dorsal fur pale grey or white at the base, then black, terminal portion fulvous brown with black tips. Tail black above. Towards the rump there is sometimes a strong ashy tinge on the back. A large blackish terminal patch on the posterior outer surface of each ear.

Dimensions. Head and body 21 inches, tail with hair 4, ear 4·25,

hind foot 4·5 (Tickell). A female skin in spirit is smaller, hind foot 4·1; the skull measures—basal length 2·7, extreme length 3·4, zygomatic breadth 1·6.

Distribution. Burma; in the Irrawaddy valley as far down as Henzada, wanting near the coast and in dense forest. Not recorded from Arrakan, but found to the southwest as far as the Thoungyin valley west of Moulmein (Stray Feathers, ix, p. 141) and perhaps farther south. I am indebted to Major Bingham for a good skin of this species, of which there was until recently no specimen in Europe.

323. Lepus tibetanus. *The Afghan Hare.*

Lepus tibetanus, *Waterhouse, P. Z. S.* 1841, p. 7, *id. Mammalia*, ii, p. 58; *Günther, A. M. N. H.* (4) xvi, p. 228 (1875); *Blanford, Yark. Miss., Mam.* p. 63; *Scully, P. Z. S.* 1881, p. 207.
Lepus craspedotis, *Blanf. Eastern Persia*, ii, p. 80, pl. viii.
Lepus biddulphi, *Blanf. J. A. S. B.* xlvi, pt. 2, p. 324.

Ears broad. Fur soft.

Colour above varying from light greyish to light rufescent brown mixed with black, the rump sometimes with an ashy tinge; lower parts white, except the breast which is light brown. Tail with a broad black band above. Dorsal fur ashy at the base, varying in depth of tint, passing into whitish, then black or dark brown followed by a very pale brown ring and the extreme tip black. Often, in winter fur, longer fine black-tipped hairs are intermixed on the back. Outside of the ears brown in front, behind buff, passing into black at the tip. In most specimens the ear-conch is margined with buff.

Dimensions. Head and body 19 inches, tail 3·5 (with hair 5), ear 5, breadth of do. 3, hind foot and tarsus 4·8. Weight 3½ lbs. The skull is 2·75 inches in basal length and 1·7 in zygomatic breadth.

Distribution. The upper Indus valley (Little Tibet), the greater part of Afghanistan, and Baluchistan. This hare is found as low as 500 feet above the sea in the latter (*L. craspedotis*). I have shot it on the Khirthar range west of Sind and near Quetta.

324. Lepus oiostolus. *The woolly Hare.*

Lepus oiostolus, *Hodgson, J. A. S. B.* ix, p. 1186 (1840), xi, p. 288.
Lepus pallipes, *Hodgson, J. A. S. B.* xi, p. 288, pl. (1842), *Blanford, Yark. Miss., Mam.* p. 62.
? Lepus tibetanus, *Blanf. J. A. S. B.* xli, pt. 2, p. 34, *nec Waterhouse.*

Rigong, Tibetan.

Ears densely clad outside and exceeding the head in length. Fur soft, thick, woolly, slightly curled in adults, more so in the young. Postorbital processes in the skull large, broad, and bent upwards, so that the frontal area between the orbits is broad and concave.

Colour above light yellowish brown mixed with dark brown, rump

ashy grey. Tail almost entirely white, a few ashy hairs above near the base. Some of the fur on the back of the neck is tipped with ashy. Fore neck and breast pale rufescent, chin and abdomen white. Dorsal fur ashy at the base on the shoulders, white in the middle of the back, then dark brown or black followed by light brown, the tips of the longer hairs black. Ears externally dark brown in front, white behind, passing into ashy towards the base and black close to the tip, the border of the ear buffy white almost throughout; inside of ear-conch with short brown hair near posterior margin, except near the tip, where the hair is white. Eye-stripe whitish, whiskers mixed black and white. The young is pale brownish or slaty grey above.

Dimensions. Head and body 22 inches, ear 4·75, hind foot and tarsus 4·5, tail without terminal hair 4, with it 6; zygomatic breadth of skull 1·5.

Distribution. Tibet north of Nepal and Sikhim and probably farther east at high elevations. *L. oiostolus* occurs also in some of the high valleys south of the main range; I have seen it in Sikhim near the Kongra Lama pass.

This species is closely allied to *L. variabilis*, of which it and *L. hypsibius* may perhaps ultimately both prove to be varieties.

325. Lepus hypsibius. *The upland Hare.*

? Lepus oiostolus, *Adams, P. Z. S.* 1858, p. 520, nec *Hodgson.*
Lepus pallipes, *Blyth, Cat.* p. 131, nec *Hodgson.*
Lepus hypsibius, *Blanford, J. A. S. B.* xliv, pt. 2, p. 214 (1875); *id. Yark. Miss., Mam.*, p. 60, pl. iii, fig. 1, pl. iv *a*, fig. 1.

Fur long, woolly, curly, and very thick, the hairs of the rump nearly 2 inches long in winter. Ears scarcely exceeding the head in length. Postorbital processes of skull large and bent upwards.

Colour above rufous-brown, mixed with black on the back, rump dark ashy. Tail entirely white. Lower parts white, except the breast which is rufescent. Fur ashy at the base on the shoulders, creamy white in the middle of the back, then there is a blackish ring followed by a longer pale brown one, the extreme tip black. Hair of rump ashy grey throughout, some piles black-tipped. Outer surface of ears brown in front, whitish behind, with the extreme tip black.

Dimensions from dried skins. Head and body 24 inches, ear 4·5, hind foot and tarsus 5; basal length of skull 2·8, zygomatic breadth 1·73.

Distribution. The higher plains of Ladák such as Changchemno, and also of Rukshu. Not known to occur below 14,000 or 15,000 feet elevation.

This may be a variety of the last, but appears to be considerably larger with shorter ears.

326. Lepus hispidus. *The hispid Hare.*

Lepus hispidus, *Pearson, McClelland, P. Z. S.* 1839, p. 152; *Hodgson, J. A. S. B.* xvi, p. 572, pl. xiv; *Blyth, Cat.* p. 133; *id. J. A. S. B.* xxii, p. 415; *Jerdon, Mam.* p. 226.
Caprolagus hispidus, *Blyth, J. A. S. B.* xiv. p. 249, plates.

Ears very short, shorter than the skull. Eyes small. Fur coarse, bristly; underfur fine with the coarse longer hairs intermixed. Hind legs short, but little exceeding the fore legs in length. Claws strong. Mammæ 6. Skull very thick, flat above; frontals longer and nasals shorter than in other hares. Postorbital processes small, united to the frontals anteriorly; incisive foramina small; bony palate as long as broad. Teeth large.

Colour above black mixed with brownish white, producing a general dark brown aspect, and passing on the sides gradually into the sullied brownish white of the lower parts. The rump is more rufescent in some skins. Tail brown throughout, darker above. Basal half of dorsal fur greyish brown; terminal portion at first dark brown or black, then yellowish white followed by a long black tip sometimes interrupted by a second pale ring. Ears brown outside throughout. Breast a little darker brown than the abdomen.

Dimensions. Head and body 19 inches, tail 1·1, with hair 2·1, ear 2·75, hind foot and tarsus 3·9; basal length of skull 3, zygomatic breadth 1·75. Weight 5½ lbs.

Distribution. The tract along the foot of the Himalayas from Gorakhpur to Upper Assam. The hispid hare does not range into the mountains, but is said to be found as far south as the Rajmehal hills, Dacca, and, according to Hodgson, Tipperah.

Habits very imperfectly ascertained. According to Hodgson the hispid hare inhabits the *Sál* forest, whilst Jerdon states with more probability that it is found in the Terai (that is, of course, the marshy tract usually thus called), frequenting long grass, bamboos, &c. It is said to burrow like a rabbit, but not to be gregarious. Its food, as Hodgson was informed by the Mechis, consists chiefly of roots and the bark of trees. The flesh is said to be white.

This hare should perhaps be placed in a distinct genus *Caprolagus* as proposed by Blyth. An allied form, with black markings, *L. nitscheri*, has recently been described from Sumatra.

Family LAGOMYIDÆ.

The animals comprised in this family are of small size, all being considerably smaller than a rabbit. The ears are short and rounded,

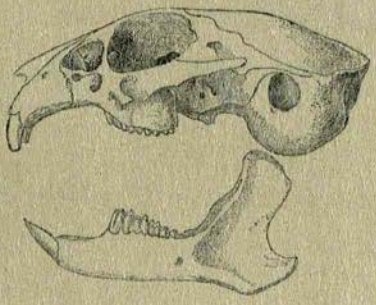

Fig. 148.—Skull of *Lagomys rufescens*, × 1.

and there is no external tail. The skull is depressed, orbits elliptical and separated by a narrow frontal area. There are no postorbital processes. A narrow pointed bony lamina extends backwards from the zygomatic arch nearly to the meatus. The clavicles are perfect, the fore and hind limbs short and subequal.

Only a single genus is known.

Genus **LAGOMYS**, Cuvier (1798).

Characters of the family. The species are like a guinea-pig in form and inhabit burrows amongst rocks. Some have a peculiar call, on account of which they have been designated piping hares, but this peculiarity does not appear to have been observed in Himalayan species. In many of the forms, perhaps in all, individuals have rufous patches at the side of the neck corresponding apparently to glandular areas. All have the soles of all the feet hairy; the fur is generally thick and soft. The intestines are excessively long in all the species; I found them in *L. rufescens* to be 12 times the length of the head and body.

Dentition: i. $\frac{4}{2}$, pm. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$. Vertebræ: C. 7, D. 18, L. 5, S. 2, C. about 10 (in *L. rufescens*).

The genus is chiefly confined to Central and Northern Asia, one species extending into Eastern Europe and one being found in North America. Several kinds inhabit the Himalayas, Tibet, and Afghanistan.

Synopsis of Indian Species.

A. Ears moderate, less than an inch broad.
  a. Toe-pads exposed.
    a'. Colour dark brown or bay, a narrow pale collar or none ..... *L. roylei*, p. 456.
    b'. Colour pale brown, a broad pale collar .. *L. rufescens*, p. 458.
  b. Toe-pads concealed by hair, colour light sandy brown ..... *L. curzoniæ*, p. 457.
B. Ears more than an inch broad.
  a. Incisive foramen subtrigonal, with sides straight ..... *L. macrotis*, p. 457.
  b. Incisive foramen constricted in middle and with curved sides. Colour brownish yellow ..... *L. ladacensis*, p. 458.

327. Lagomys roylei. *The Himalayan Mouse-Hare.*

Lagomys roylei, *Ogilby, Royle's Ill. Botany &c. Himalaya*, p. lxix, pl. 4 (1839); *Adams, P. Z. S.* 1858, p. 520; *Jerdon, Mam.* p. 226; *Blanf. J. A. S. B.* xli, pt. 2, p. 35; *Büchner, Przewalski, Reis. Mam.* p. 156, pl. xxiii, figs. 1, 2.

Lagomys nipalensis, *Hodgson, J. A. S. B.* x, p. 854, plate at p. 816 (1841).

Lagomys hodgsoni, *Blyth, J. A. S. B.* x, p. 817, plate at p. 844.

Lagomys tibetanus, *A. Milne-Edwards, Rech. Mam.* i, p. 314, pls. xlviii, xlix.

Rang-runt, rang-duni, in Kunawar; *Gúmchen*, Bhutia, Sikhim.

Ears moderate. Toe-pads naked. Incisive foramen subtriangular, with the sides nearly straight.

Colour above brown, varying from greyish brown to rufous brown, sometimes blackish brown, and in many cases bay or deep ferruginous on the neck only or on the head and neck, or throughout the upper surface. Lower parts paler, sometimes whitish. Basal three fourths of fur throughout the body leaden black, terminal fourth of the longer hairs light brown or rufous brown, with, on the upper parts, dark brown or black tips. Ears frequently with a narrow whitish border. Feet pale brown above, soles of hind feet darker brown. There is occasionally a narrow pale collar, but never a broad one as in *L. rufescens*.

Dimensions. Head and body 6·5 inches, tarsus and hind foot from heel to end of claws 1·1; length of ear 0·7, breadth 0·6. Some individuals are rather larger. Zygomatic breadth of skull 0·85.

Distribution. Found throughout the Himalayas from Kashmir to Moupin at elevations between 11,000 and 14,000 feet, or as high as 16,000 in Spiti, according to Stoliczka; also found by Przewalski in the mountains of N.E. Tibet, and of Kansu in China.

Habits. The Himalayan mouse-hare is chiefly found in rocky ground, burrowing and hiding amongst rocks and coarse stones. In the Eastern Himalayas it inhabits pine-forests on steep slopes. It is gregarious, several being found together; it feeds on vegetables

near its burrow, and darts into its hole when alarmed. Mr. A. Anderson found four young in a pregnant female; nothing more is known of its breeding-habits.

328. Lagomys curzoniæ. *Hodgson's Mouse-Hare.*

Lagomys curzoniæ, *Hodgson, J. A. S. B.* xxvi, p. 207 (1857); *Günther, A. M. N. H.* (4) xvi, p. 230.

Abra, Tibetan.

Ears moderate. Toe-pads hidden by long hair. Incisive foramen as in *L. roylei*, but orbits in the skull smaller and much closer together, nasals shorter and upper surface of skull more convex.

Colour light sandy brown above, nearly white below. Basal half or more of the fur leaden black, terminal portion whity brown, longer dorsal hairs tipped black. Ears with a broad pale border, feet sullied white above and below. Chin dark brown.

Dimensions. Length (of a dried skin) about 8 inches, ear 0·75, tarsus and claws 1·25, zygomatic breadth of skull 0·83.

Distribution. The types were from the Tibetan (but Cis-Himalayan) Chumbi valley east of Sikhim; I have also two specimens procured by Mr. Mandelli's collectors, I believe from very high elevations in Sikhim.

This species is near *L. roylei*, but I think distinct, as the skull appears different.

329. Lagomys macrotis. *The large-eared Mouse-Hare.*

Lagomys macrotis, *Günther, A. M. N. H.* (4) xvi, p. 231 (1875); *Blanf. Yark. Miss., Mam.* p. 75; *Scully, P. Z. S.* 1881, p. 207; *id. A. M. N. H.* (5) viii, p. 100 (1881).

Lagomys auritus, *Blanford, J. A. S. B.* xliv, pt. ii, p. 111 (1875); *id. Yark. Miss., Mam.* p. 74, pl. vi, f. 2, pl. vii *a*, f. 2.

Ears large, rounded. Toe-pads exposed. Skull very similar to that of *L. roylei*.

Colour above from pale brownish yellow to smoky or wood-brown, below whitish. Fur leaden black for more than half the length, then sullied white, tips on the upper parts brown, a few with the extreme point black. Feet white. In some animals there is a rufous band across the throat, in others the head, rump, and shoulders are more or less rufous.

Dimensions. Head and body 7·2 inches, length of ear from orifice 1, hind foot from heel with claws 1·35; total length of skull 1·75, breadth across zygomatic arches 0·85.

Distribution. The type came from north of the Kuenlun range on the road from Yárkand to the Karakoram pass. Specimens have since been obtained by Scully and Biddulph in the Gilgit district at from 7500 to 13,000 feet.

The specimens described as *L. auritus* were procured by Dr. Stoliczka at Lukong on the Pangong Lake, Ladak.

Habits. According to Scully, this species frequents open stony ground near the snow-line. It is very locally distributed, but abundant where found.

An allied but distinct form *L. griseus* is found on the Kuenlun range, in the Sanju pass, south of Yárkand. It so closely resembles *L. rutilus* in winter fur, as figured by Büchner, that the two are probably identical. *L. rutilus* inhabits parts of Turkestan and Northern Tibet. Two other species from N. Tibet, *L. erythrotis* and *L. melanostoma*, have just been described by Büchner.

330. Lagomys rufescens. *The Afghan Mouse-Hare.*

Lagomys rufescens, *Gray, A. M. N. H.* x, p. 266 (1842); *Hutton, J. A. S. B.* xv, p. 140; *Blyth, Cat.* p. 133; *Blanf. Eastern Persia,* ii, p. 83, pl. vi, fig. 2; *Wood-Mason, P. A. S. B.* 1880, p. 173; *Scully, J. A. S. B.* lvi, pt. 2, p. 75.

Ears moderate. Toe-pads exposed. Fur short. Incisive foramen pyriform.

Colour above light rufescent brown to pale brownish rufescent, below sullied white. Fur leaden black for more than half the length, then brownish white, the points on the back black. A broad whitish collar round the back of the neck, succeeded behind by a dull rufous collar, sometimes sharply limited behind but generally passing gradually into the colour of the back. The rufous collar terminates on each side in a well-marked rufous patch in front of each shoulder. The pale colour is less distinct in the long winter fur and the rufous collar is not seen. Soles of feet whitish.

Dimensions. Head and body of a large male 7·5 inches, ear from meatus 0·8, hind foot from heel to end of claws 1·3; total length of skull 1·9, zygomatic breadth 0·9. Females are a little smaller.

Distribution. Found abundantly on the Bolán pass and the mountains around Quetta and thence northwards in many parts of Afghanistan. This *Lagomys* is also found in Afghan Turkestan, and near Isfahan in Persia. It appears not to occur at less than 5000 or 6000 feet above the sea.

Habits. Like most other species of the genus *L. rufescens* haunts rocky places in communities, dwelling in burrows and fissures and coming out to feed in the morning and evening. It is said to be easily tamed.

331. Lagomys ladacensis. *Stoliczka's Mouse-Hare.*

Lagomys curzoniæ, *Stoliczka, J. A. S. B.* xxxiv, pt. 2, p. 108; *Anderson, P. Z. S.* 1871, p. 562, nec *Hodgson.*

Lagomys ladacensis, *Günther, A. M. N. H.* (4) xvi, p. 231 (1875); *Blanford, J. A. S. B.* xliv, p. 110; *id. Yark. Miss., Mam.* p. 71, pls. vi, vii, vii *a.*

Zabra, Karin or *Phise Karin,* Ladák.

Ears large, rounded. Toe-pads exposed in summer, but nearly concealed by long hairs in winter. Skull very different from those of other Himalayan species. The auditory bullæ are less tumid and differently shaped, and the cranium more convex above. The incisive

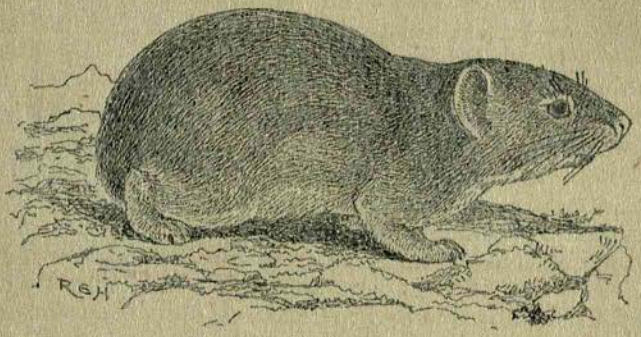

Fig. 149.—*Lagomys ladacensis.*

foramen is constricted about halfway between the incisors and premolars, and almost divided into a small anterior elongate elliptical orifice and a large posterior pyriform space between the premolars.

Colour above pale rufescent fawn with a greyish tinge varying to rufous, below pale buff or whitish. In worn summer fur, the face and back are distinctly rufous and the dark basal portion of the hair shows. Basal half of fur or more than half leaden black throughout the body, distal portion fulvous, tips on the back dark brown or black. Face and outside of ears generally more rufous than the back. Whiskers mixed black and white. Soles of feet pale-coloured. Young animals light-coloured.

Dimensions. Head and body 9 inches, ear from orifice 1·1, hind foot and nails 1·5; total length of skull 2·25, zygomatic breadth 1·25. These measurements are those of a large old individual.

Distribution. Eastern Ladak and Rukshu at great elevations between 14,500 and 19,000 feet.

Nothing particular has been recorded of the habits. The skull of this species differs from those of all other Himalayan and Afghan forms in the peculiarly shaped incisive foramen, which resembles those of *L.* (*Ogotona*) *dauricus* and *L. alpinus*. *L. rufescens*, however, is somewhat intermediate in this character between *L. ladacensis* and its allies on the one hand, and *L. roylei*, *L. curzoniæ*, &c. on the other.

Many other species of *Lagomys* inhabit Central and Northern Asia.

Order UNGULATA.

The great order of hoofed quadrupeds, to which belong horses, rhinoceroses and tapirs, sheep, oxen, goats and antelopes, deer, pigs, hippopotami, and their allies, together with a vast number of extinct animals, is by most modern naturalists extended to include the elephants and hyraces, whilst by other systematists these animals are distinguished as separate orders called *Proboscidea* and *Hyracoidea*. The first view is here accepted. The order Ungulata, thus defined, includes the Pachydermata and Ruminantia of Cuvier.

In general organization the Ungulates are much higher than Insectivores, Bats, and Rodents, and are but little inferior to Carnivores. All the living forms are terrestrial in their habits (except *Hippopotamus*), and all feed mainly or exclusively on vegetables.

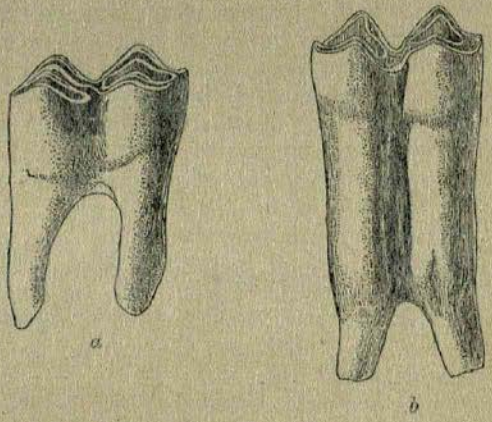

Fig. 150.—A. Brachydont lower molar of deer (*Cervus elaphus*), × 1.
B. Hypsodont lower molar of ox (*Bos taurus*), × ⅓.

In all, the limbs are adapted for progression and not for prehension. All are heterodont and diphyodont, and their molars have broad crowns with tuberculated or ridged surfaces. The toes, except in *Hyrax* and the *Camelidæ*, terminate in hoofs which enclose the ungual phalanges more or less completely; in a few forms the toes are connected together by the integuments, but as a rule they are free. The digits of each foot vary in number from five to one. Clavicles are wanting.

Ungulates are bunodont, when the crown of the unworn molars is tubercular, as in pigs; or selenodont, when it is composed of one

or more crescents, as in deer and oxen. They are termed hypsodont when the crown of each tooth is long and the root short, and brachydont when the reverse is the case, as shown in the accompanying figure. The brachydont is the normal or original form, and the great lengthening of the crown in horses, oxen, &c., appears to be the result of specialization. Rootless teeth with persistent pulps, like the incisors of rodents, elephants, and hippopotami, are a more advanced stage of the same specializing process. Hypsodont molars in a rodent have already been noticed in the case of *Eupetaurus* (p. 359).

The present order contains four existing suborders, of which three are Indian. They are thus distinguished :—

A. *Os magnum* of carpus articulating with lunar or cuneiform, not with scaphoid. (*Subungulata.*)	
a. Size very large; a long flexible proboscis; toes 5—5	PROBOSCIDEA.
b. Size small; no proboscis; toes 4 (5)—3. Resembling rodents	HYRACOIDEA.
B. *Os magnum* articulating with scaphoid (figs. 151, 157, pp. 468, 480); toes never exceeding 4 in number. (*Ungulata vera.*)	
a. Third or middle digit of all feet largest	PERISSODACTYLA.
b. The two median digits (3rd and 4th) equal	ARTIODACTYLA.

The *Hyracoidea* (*Hyrax* or *Procavia*) are only found in Africa, Syria, and Arabia.

In preparing the following account of the Indian Ungulates, I have been able to make use of the important new work on "Mammals, living and extinct," by Flower and Lydekker, and of W. L. Sclater's new 'Catalogue of Mammalia in the Indian Museum'; whilst for details of habits and occasionally of coloration and measurement, especially those of Himalayan and Tibetan species, I have taken much from Kinloch's 'Large Game Shooting.' Sterndale's 'Mammalia of India and Ceylon' has also been of much service in the present as in other orders.

The Indian extinct Ungulata are so numerous that it is impossible to notice all in this work. Full details will be found in the 'Palæontologia Indica,' Series x. (Lydekker), and in Falconer's 'Fauna Antiqua Sivalensis' and 'Palæontological Memoirs.' A general list, with notes, by Lydekker has been printed in the Records of the Geological Survey of India for 1887, pp. 51–79. Earlier lists by the same writer appeared in 1880 (J. A. S. B. xlix, pt. 2, p. 8) and 1883 (Rec. G. S. I. xvi, p. 87).

SUBUNGULATA.

Suborder *PROBOSCIDEA.*

Nose produced into a long flexible proboscis, with the nostrils at the end, and serving as a prehensile organ. Incisors forming conical tusks, often of large size in male animals, never exceeding one pair in each jaw and confined to the upper jaw in living forms. No canines. Molars large, more or less elongate, with flat parallel sides and transversely ridged. Limbs stout; radius distinct from ulna and tibia from fibula. Feet massive, each with 5 toes, the outer more or less rudimentary. Stomach simple. A capacious cæcum. Testes permanently abdominal. Uterus bicornuate. Placenta non-deciduate, zonary. Mammæ two, pectoral. Brain of low type, the cerebellum being entirely behind the cerebrum and uncovered by it.

The Proboscideans, although highly specialized, are of lower grade than other Ungulates. By many naturalists elephants and their allies are regarded as having affinities with Rodents.

A single family containing but one living genus. Of extinct forms a large number are found in later Tertiary beds, and from the Upper Miocene, Pliocene, and Pleistocene of India no fewer than 7 species of *Elephas* are known, besides 8 of the allied genus *Mastodon* and 2 of *Dinotherium*.

Family ELEPHANTIDÆ.

Genus **ELEPHAS**, Linn. (1766).

Dentition: i. $\frac{2}{0}$, c. $\frac{0}{0}$, m. $\frac{6-6}{6-6}$. The incisors (tusks) are preceded by milk-teeth, shed at an early age, and have enamel only on the tips before these are worn away, the remainder of each tusk consisting of solid dentine. The molars come into use successively from the back of the jaw, and are worn away and shed in front, not more than one, or portions of two, on each side of each jaw being in wear at once; the three anterior, which come first into use, being regarded as milk-molars not succeeded by premolars, whilst the last three are true molars. All are composed of enamel-covered plates or ridges of dentine with cement between. The number of transverse ridges increases from the first to the last molar.

Skull large, high, and globular, the greater portion consisting of cancellous tissue containing air-cells which communicate with the nasal passages. The brain is small, and lies far back between the

ear-orifices, or rather a little below them and in front of them. Nasal bones short and placed above the narial opening in the skull, which opening is high on the face. Malar small, forming only the middle part of the zygomatic arch, the anterior portion of which is a process of the maxillary, quite unlike the arrangement in true Ungulates. Vertebræ: C. 7, D. 19–21, L. 3–4, S. 4, C. 26–33.

In the limbs the upper or proximal segment (humerus or femur) greatly exceeds in length the distal segment (manus or pes). The ankle-joint or heel in the hind leg, corresponding to the hock of other Ungulates, is very little raised above the ground. Pelvis and scapula nearly vertical. Feet short and broad, the fore foot nearly circular, the hind foot smaller, longitudinally oval.

Elephants are purely herbivorous. There are two living species, one peculiar to Africa, and distinguished by a differently shaped head, larger ears, much fewer and differently shaped ridges on the molar teeth, and other characters, and one found in India.

332. **Elephas maximus.** *The Indian Elephant.*

Elephas maximus, *L. Syst. Nat.* i, p. 48 (1766), partim.
Elephas indicus, *Cuv. Règne An.* i, p. 231 (1817); *Kelaart, Prod.* p. 77; *Blyth, Cat.* p. 134; *Falconer, Nat. Hist. Review*, 1863, pp. 81, &c.; *Jerdon, Mam.* p. 229; *W. Sclater, Cat.* p. 206.
Elephas sumatranus, *Temm. Coup d'œil Poss. Néer.* ii, p. 91 (1847); *Schlegel, Amsterdam, Verslag. Akad.* xii, p. 101 (1861); *id. Nat. Hist. Review*, 1862, p. 72.

Hathi (fem. *Hathni*), H.; *Hasti, Gája*, Sansc.; *Fil*, Pers.; *Haust*, Kashmiri; *Gáj*, Beng.; *Ane*, Tel., Tam., Can., Mal.; *Yáni*, Gond; *Hattanga, Khondha Eniga*, Tel; *Yanei, Kunjaram, Veranum*, Mal.; *Ata, Allia*, Cing.; *Tengmú*, Lepcha; *Lángchen, Lámboché*, Bhotia; *Mongma, Naplo*, Gáro; *Miyung*, Cachári; *Atché*, Aka; *Sotso, Supo, Chu, Tsu*, Nága; *Sitte*, Abor; *Tsang*, Khámtí; *Magui*, Singhpho; *Saipi*, Kuki; *Amieng, Mányong*, Mishmi; *Sámú*, Manipuri; *Tsheng*, Burm.; *Tsing*, Talain; *Tsan*, Shan; *Káhsa*, Karen; *Gája*, Malay.

Skin nearly naked. Tail with a row of long coarse hairs for a few inches before and behind and round the end only. Five hoofs normally on each fore foot, four hoofs on each hind foot. The number of ridges in each molar from the first to the last is 4, 8, 12, 12, 16, and 24, with slight variation. Males as a rule have well developed tusks; some males, known in India as *makna*, have merely short tusks like females.

Colour blackish grey throughout. The forehead, base of the trunk, and the ears often mottled with flesh-colour. White elephants are albinoes.

Dimensions. The vertical height at the shoulder in adult elephants is almost exactly twice the circumference of the fore foot. Adult males do not as a rule exceed 9 feet, females 8 in height, but a male has been measured by Sanderson as much as 10 feet 7½ in.; Col. Hamilton says that Sir V. Brooke killed one of 11 feet; and a

skeleton *, now in the Indian Museum, Calcutta, measures 11 feet 3 in., so the animal when living, if the skeleton is correctly mounted, must have been nearly 12 feet high. Kelaart records having seen a Ceylon elephant of the same dimensions. A male 9 ft. 7 in. high measured 26 ft. 2½ in. from tip of trunk to end of tail. Weight of a male 8 feet high, 57 cwt.; of a female 7 ft. 6 in. high, 51 cwt. (P. Z. S. 1881, p. 450). The last two animals were not full-grown. Tusks vary greatly, the longest recorded I believe (Sir V. Brooke's, from Mysore) measured 8 ft. and weighed 90 lbs., but a shorter tusk from Gorakhpur is said to have weighed 100 lbs. Both were from elephants with but one tusk perfect. Two pairs from the Gáro hills are said to have weighed 157 and 155 lbs. respectively ('Asian,' October 16th, 1888, p. 35).

Distribution. The forest-clad portions of India, Ceylon, Assam, Burma, Siam, Cochin China, the Malay Peninsula, Sumatra, and Borneo, perhaps introduced in the last named. In India elephants are still found wild along the base of the Himalayas as far west as Dehra Dún; also in places in the great forest country between the Ganges and Kistna as far west as Bilaspur and Mandla, in the Western Ghats as far north as 17° or 18°, and in some of the forest-clad ranges in Mysore and farther south. They do not appear to ascend the Himalayas to any elevation, but are sometimes found at considerable heights above the sea in Southern India, and in Ceylon they wander at times near Newera Ellia to over 7000 feet. Formerly the range of the elephant in India was greater; it was found wild about A.D. 1600 in Malwa and Nimar (Ain-i-Akbari, Gladwin's translation, ii, pp. 45 & 63), and at a much more recent date in Chánda, Central Provinces.

Habits. The following summary is chiefly taken from the admirable description by Sanderson in 'Thirteen years among the Wild Beasts of India,' chapters vi, viii, &c. Sir Emerson Tennent's account of the Ceylon elephants, though often quoted, is not, like Sanderson's, the result of personal observation, and is less accurate.

The country chiefly inhabited by elephants is tree-forest, undulating or hilly, generally containing bamboos in considerable quantities, but the animals often enter the high grass growing on alluvial flats. Individuals of various sizes and ages, and of both sexes, associate in herds, usually numbering 30 to 50, but not uncommonly more, sometimes 100. These herds often break up temporarily into smaller groups. The males are frequently found alone, but as a rule each belongs to a herd and joins it occasionally.

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* The animal, I believe, when alive was the tusker of a small herd that for many years haunted the country north of the Rániganj coal-field, from Soory and the southern spurs of the Rájmehal hills to Jamtára. Though I never came across them I often heard of them, and saw their old tracks between 1856 and 1860. Some fossil Indian elephants, for instance *E. ganesa* and *E. namadicus*, probably surpassed all living elephants in stature.

Since the above was written, I have been told by Mr. Sanderson that he compared the femur of the Calcutta skeleton with that of an elephant known to have been less than 10 feet high, and only found one-eighth inch difference in length.

All members of a herd generally belong to the same family, and are nearly related: different herds do not mix, but stray females or young males appear to obtain admission to a herd without difficulty. The leader of a herd is invariably a female. According to Sanderson a really solitary elephant is rare, many "rogue" elephants that have become notorious belonging to a herd.

The food of elephants consists principally of various kinds of grass, leaves and shoots of bamboos, wild plantains (*Musa*), of which both stems and leaves are eaten, and leaves, small branches, and bark of particular trees, especially of species of *Ficus*. Sanderson found by experiment that a full-grown elephant consumes between 600 and 700 lb. of green fodder per diem. Elephants drink twice a day in general, before sunset and after sunrise. Both food and drink are conveyed to the mouth by the trunk; tufts of grass or branches of trees are plucked by coiling the end of the trunk round them; leaves are stripped from boughs, and even bark from trees or branches, in a similar manner; only very small objects, such as small fruits, are picked up between the lobes above and below the nostrils at the tip of the trunk. In drinking, the end of the trunk is immersed and the lower part (in Sanderson's opinion not more than 15 or 18 inches) filled by suction with water, which is then discharged into the mouth. Grain such as rice is eaten in a similar way, being drawn into the end of the trunk and then blown into the mouth.

In the wild state elephants roam about and feed for the greater part of the day and night, resting from about 9 or 10 A.M. till about 3 P.M. and again from about 11 P.M. to 3 A.M. They lie down to sleep like other mammals. Whilst feeding the herds scatter somewhat, but they quickly collect when alarmed. In many places elephants migrate considerable distances at particular seasons, chiefly in search of fodder, but partly it is believed to avoid insects, and generally from higher to lower ground or *vice versâ*, or from one kind of forest to another. In marching, they keep in strict Indian file. They are fond of bathing and of rolling in mud in warm weather. They squirt water on their bodies with their trunks when heated, and when water is not at hand they draw some, by means not clearly understood, from the mouth or throat. The fluid thus obtained is probably a secretion, perhaps salivary. They sometimes, especially when exposed to the sun, throw dust or leaves over their backs.

The sense of smell is highly developed, but neither sight nor hearing is particularly acute.

The only pace of elephants is a walk, slow or quick, at times increased to a shuffling run. They are incapable of any motion resembling a gallop, or of the least jump, vertical or horizontal. A 7-foot trench is impassable by them, though a large elephant can clear 6½ feet in its stride. They climb very steep places, bending the fore legs when ascending and the hind legs when descending, and kicking or pressing holes for the feet if necessary (J. A. S. B. xiii, p. 917, pl. ii). In kneeling down an elephant

first bends the hind legs one after the other, then the fore legs, which are stretched out in front; in rising the process is reversed.

Few animals not aquatic by nature swim as well as elephants. They have been known to swim for six hours or even more without resting. The pace is not rapid, probably about a mile an hour.

The principal sounds made by elephants are the following. First the shrill trumpet, varying in tone, and expressive, sometimes of fear, sometimes of anger. Secondly a roar from the throat, caused by fear or pain. A peculiar hoarse rumbling in the throat may express anger or want, as when a calf is calling for its mother. Pleasure is indicated by a continued low squeaking through the trunk. Lastly, there is a peculiar metallic sound made by rapping the end of the trunk on the ground and blowing through it at the same time. This indicates alarm or dislike, and is the well known indication of a tiger's presence. An elephant sometimes tries to frighten its enemies by blowing through its trunk.

Most elephants are timid inoffensive animals, though individuals are vicious; females with young offspring and solitary males or "rogues" being most disposed to attack. The attack is made with the trunk tightly coiled, the feet, and in males the tusks, being used for purposes of offence, and the adversary, if caught, is generally trampled upon.

I quite agree with Sanderson in believing that the intelligence of elephants has been greatly overrated. They are singularly docile and obedient—no other mammal is known to be capable of domestication when adult to nearly the same extent—and docility in animals is generally I think confounded with intelligence *. Judging by the development of its brain, an elephant is probably of lower intellectual capacity than other Ungulates.

Tame elephants very rarely breed in India. In parts of Burma and Siam breeding from tame females is said to be common. The period of gestation has been ascertained to be about 19 months (Heysham, P. Z. S. 1865, p. 731, and 1880, p. 23), though it is said to vary from 18 to 22; and according to some writers (*e. g.* Campbell, P. Z. S. 1869, p. 139) the latter period has been recorded (see also P. Z. S. 1880, p. 222, and J. Ac. Sc. Philad. (2) viii, p. 413). The young are generally born in September, October, and November, though a few are produced at other seasons. Twins are a rare exception, a single young one the rule. The young when born is about 3 feet high and weighs about 200 lb. It sucks with the mouth, not with the trunk, which is short and but little flexible. An elephant is full grown, but not fully mature, at 25 years of age, and individuals have been known to live over 100 years in captivity; in a wild state their existence probably extends to 150 years.

Male elephants are liable to periodical attacks of excitement, supposed to be of a sexual nature, though this does not appear

* 'Geology and Zoology of Abyssinia,' p. 225, note.

clearly proved. During such attacks the animals are said to be "mast," and are often dangerous to men or to other elephants. The attack is preceded and accompanied by the flow of an oily secretion from a small orifice in each temple. Sanderson says he has seen the same secretion in newly caught female elephants. A somewhat similar phenomenon occurs amongst camels.

Much has been written on the capture and hunting of elephants. Wild herds are usually driven into stockades or *Kheddahs*, enclosures made of trunks of trees. The animals are then secured, and removed one by one by the aid of tame elephants. Another mode of capture, especially of large males, is to follow them on females and to tie their hind legs when they are asleep. Some wild individuals are run down by fast tame elephants, and the neck or legs noosed.

UNGULATA VERA.

The true Ungulates form a very well-marked group, and all living forms are higher in organization than the Subungulates. They agree in the following characters:—The toes never exceed four in any foot; the first digit is always wanting. The malar or jugal bone in all living forms is in contact with the lachrymal, and is not confined to the zygomatic arch, but forms part of the wall of the skull. The *os magnum* of the carpus articulates with the scaphoid. The testes descend into a scrotum. The uterus is bicornuate, the placenta non-deciduate, and the chorionic villi either evenly diffused or collected in groups or cotyledons. The mammæ are usually inguinal and never exclusively pectoral. Cerebral hemispheres well convoluted and covering part of the cerebellum.

Suborder *PERISSODACTYLA.*

This suborder is poorly represented at the present day—horses, rhinoceroses, and tapirs being the only surviving members of a group of animals that was extensively developed in the earlier Tertiary periods.

Perissodactyle Ungulates are characterized by the third or middle digit being much more developed than the others, and by its having the two sides similar. The number of digits in each foot is, as a rule, odd, and in living forms either one or three, except in tapirs, which have four toes on each fore foot. The femur bears a "third trochanter," a flattened and curved process from the outer side of the bone near the proximal end; the dorsal and lumbar vertebræ together are 22 to 24 in number; the nasal bones are expanded posteriorly, and there is an alisphenoid canal. The premolar and molar teeth in existing genera are similar and form a continuous series; the crown of the last lower molar is bilobed. The stomach is simple, the cæcum large, the placenta diffused, and the mammæ inguinal.

The three existing genera of this suborder constitute distinct subdivisions of considerably higher rank than ordinary families.

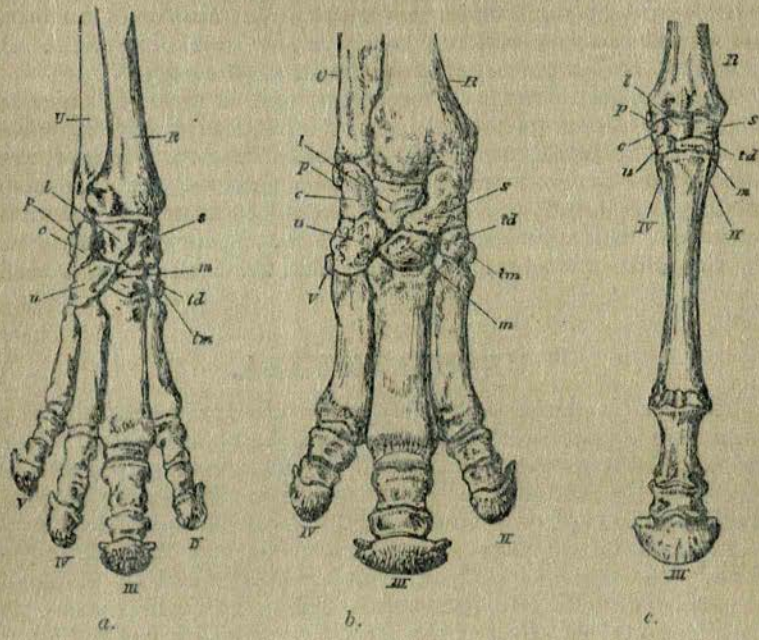

Fig. 151.—Bones of the manus of:—*a*. Horse (*Equus caballus*), *b*. Rhinoceros (*Rhinoceros sumatrensis*), *c*. Tapir (*Tapirus indicus*). II, III, IV, V, second, third, fourth, and fifth digits. *U*, ulna; *R*, radius; *c*, cuneiform; *l*, lunar; *s*, scaphoid; *u*, unciform; *m*, magnum; *td*, trapezoid; *tm*, trapezium. (From Flower's 'Osteology of Mammalia.')

They may, however, for simplicity be classed as of family rank, and living forms may be distinguished thus:—

Only one digit developed in each foot	**Equidæ.**
Three digits on each foot; one or two horns on the nose	**Rhinocerotidæ.**
Four digits on fore feet, three on hind; no horns	**Tapiridæ.**

Family EQUIDÆ.

Genus **EQUUS**, Linn. (1766).

The characters of the family may, for convenience, be included in the description of the only living genus. In this each foot is formed of a single digit consisting of a metacarpal or metatarsal and three phalanges, the distal phalanx being surrounded by a

broad hoof. This single digit is the third (not, as was formerly thought by some naturalists, two toes united), the rudimentary metatarsals and metacarpals of the second and fourth digits forming the splint bones, one on each side *. The ulna and fibula are rudimentary and incomplete distally.

The general form is graceful, and the limbs are adapted for great speed. The head is elongate, there is a crest or mane of longer hairs along the back of the neck, and there are long hairs on the tail. Inside each forearm in all living species, and also inside each tarsus in the horse (*E. caballus*) only, is a peculiar callosity, the use of which is not known. There are two inguinal mammæ.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$. Canines generally wanting in females. There is sometimes an additional small anterior upper premolar. The incisors have a flat crown, with at first a deep hollow in the middle; this (the "mark" in horses) disappears with age. The premolars and molars have flat rectangular crowns with extremely complicated folds of enamel, and are of the hypsodont type, having elongate crowns and short roots. Vertebræ: C. 7, D. 18, L. 6, S. 5, C. 15–18.

a. *b.*

Fig. 152.—Crowns of (*a*) upper and (*b*) lower second right true molars of *Equus hemionus*, the inner side uppermost.

This genus contains the horses, asses, and zebras, now restricted, in the originally wild state, to Asia and Africa, though wild horses, descended from tame animals, abound in parts of America. One species occurs on the north and west frontiers of India.

In late Tertiary times the genus had a far wider range, and remains of several species are found in Indian deposits. Two forms, one indistinguishable from *E. asinus*, the other closely resembling *E. hemionus*, are represented in the Karnul Caves (Pleistocene); a larger kind, *E. namadicus*, in the Pleistocene Nerbudda beds; and two species of *Equus*, besides four of the 3-toed *Hipparion*, in the Pliocene Siwaliks.

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* In several extinct genera of *Equidæ* other digits were developed, and a gradual passage from a four-toed form to the present greatly specialized single-toed type has been traced.

333. Equus hemionus. *The Asiatic Wild Ass.*

Equus hemionus, *Pallas, Nov. Com. Acad. Petrop.* xix, p. 394, pl. vii (1775); *Sykes, P. Z. S.* 1837, p. 91; *Walker, J. A. S. B.* xvii, pt. 2, p. 1, pl. i; *Thomason, P. Z. S.* 1848, p. 62; *Blyth, J. A. S. B.* xxvi, p. 239, note, xxviii, p. 229; *Strachey, J. A. S. B.* xxix, p. 136; *Blyth, Cat.* p. 136; *George, Ann. Sc. Nat.* xii, p. 23 (1869); *W. Blanf. Eastern Persia,* ii, p. 84; *Aitchison, Tr. L. S.* (2) v, p. 61; *W. Sclater, Cat.* p. 198.

Equus kiang, *Moorcroft, Travels,* i, p. 312 (1841); *Hay, P. Z. S.* 1859, p. 353, pl. lxxiii.

Asinus equioides, *Hodgson, J. A. S. B.* xi, p. 287 (1842).

Asinus polyodon, *Hodgson, Calc. Jour. N. H.* vii, p. 469, pl. vi (1847); viii, p. 98.

Asinus onager *and* A. hemionus, *Gray, Cat. Ung. Furc. B. M.* pp. 269, 272 (1852).

Equus onager, *Blyth, J. A. S. B.* xxviii, p. 229; *id. Cat.* p. 135; *Jerdon, Mam.* p. 236.

Equus hemippus, *Is. Geoffr. St. H. Compt. Rend.* xli, p. 1214 (1855).

Asinus indicus, *Sclater, P. Z. S.* 1862, p. 163.

Ghor-khar, P. & H.; *Ghur, Ghurán,* Baluch; *Kiang,* Tibetan.

Ears rather large. Tail covered with short hair near the base, growing gradually longer to the end. Mane erect. A naked callosity inside each forearm, none on the hind legs.

Colour. A dark brown stripe, sometimes with a whitish margin, along the back from nape to tail, and continued down part of the latter, the anterior part of the stripe formed by the mane; remainder of upper parts varying from rufescent grey (isabelline) to fawn colour or pale chestnut, lower parts white. Occasionally there is a dark cross stripe on the shoulder, and faint rufous bars are said to occur at times on the limbs. End of tail blackish. Tips of ears and hair close to hoof darker.

Dimensions. Height at shoulder 3 feet 8 inches to 4 feet. An adult female, that I shot on the Punjab and Sind frontier in 1882, measured: height 3 ft. 10 in., length from nose to rump over curves of back 6 ft. 11 in., length of tail (including hair) 2 ft. 2 in., ear from crown 9. A male skull from Tibet measures in basal length 17·5 inches, zygomatic breadth 7·8.

Distribution. Found throughout a large area in Central and Western Asia. Common in Ladak and throughout Tibet, north of the main Himalayan range. A few occur in Baluchistan, especially west of the Indus near Mithankot, on the Punjab frontier. Some are found east of the Indus, in Bickaneer, Jeysulmere, and on the Rann of Cutch.

Varieties. There are three forms of the Asiatic wild ass that have been classed as distinct species:—*E. hemionus* (the *Kiang*) of Tibet and Mongolia, *E. onager* v. *indicus* (the *Ghorkhar*) of Western India and Baluchistan, and *E. hemippus* of Persia and Syria. The last two by all accounts differ but little, but the *Kiang* is in general darker and redder than the *Ghorkhar* and has a narrower dorsal stripe. In the *Ghorkhar* this stripe is broader and narrowly

bordered with whitish or white. Other alleged differences, such as greater size in the *Kiang*, and the presence of a cross shoulder-stripe in the *Ghorkhar*, are not borne out by specimens I have examined. I agree with Sykes, Blyth, Strachey, George, and Flower in classing all these wild asses as one species.

Habits. The Asiatic wild ass inhabits desert or semi-desert plains, and is usually found in herds varying in number from 4 or 5 to 30 or 40 individuals; occasionally much larger numbers collect; Dr. Aitchison, in North-western Afghanistan, saw a herd that he estimated to contain 1000 animals. This was in April, and the large herds are said to consist of mares and foals.

The food consists of various grasses, green or dry, and of other plants. The voice of this animal has been described as a shrieking bray. Wild asses are renowned for speed, but in the Rann of Cutch adults have been run down by men on horseback and speared. I believe, however, the animals run down were mares in foal. The young are captured by using relays of horsemen to hunt them until tired out.

In the country west of the Indus the mares are said to drop their foals in June, July, or August. The period of gestation is probably the same as in the horse and ass, about 11 months.

Family RHINOCEROTIDÆ.

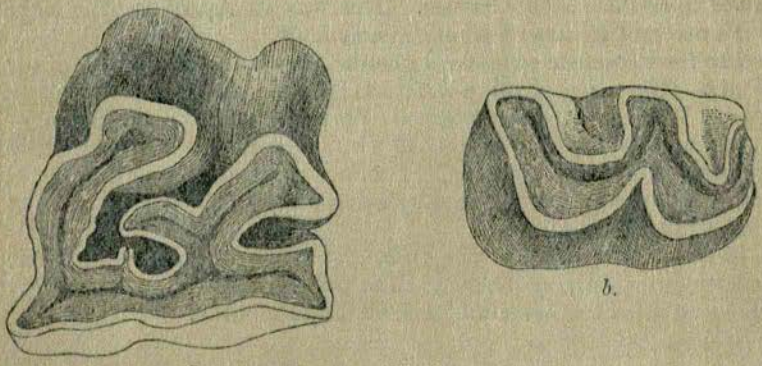
Genus **RHINOCEROS**, Linn. (1766).

In this family also all living species are by most naturalists referred to a single genus. There are three toes on each foot, each toe terminating in a small hoof-like nail. The size is large, the general form is heavy, and the legs are short and stout. The skin in all living forms is thinly clad with hair or is naked, and in all Indian species it is thick (so much so, that it was formerly supposed to be bullet-proof) and thrown into deep folds in places. One or two dermal horns are situated on the median line above the snout. These horns grow throughout the animal's life, and if lost are reproduced. The head is large, the eyes small, and the ears moderate. There are two inguinal mammæ.

The skull is elongate, with a high occipital crest. The nasal bones are large and united, broad behind, and in contact or nearly in contact with the large lachrymals; they are arched in front and project over a wide space that separates them from the premaxillaries. There are no postorbital processes, the orbits opening into the temporal fossæ. Tympanics small, not forming bullæ.

Dentition: i. $\frac{2(4)}{2(4)}$, c. $\frac{0}{0}$, pm. $\frac{4-4}{4-4}$, m. $\frac{3-3}{3-3}$. The incisors are somewhat variable: all are deciduous in African species; in adults of the Asiatic forms there are generally one pair, broad and blunt, in the upper jaw, and one or two pairs in the lower, the outer pointed

and formidable weapons; according to some these are lower canines. The anterior premolar in both jaws is very often wanting. The other upper premolars and molars are subquadrate with a longitudinal crest along the outer side and peculiarly incurved ridges on the inner; lower molars and premolars narrower, each formed of two crescentic ridges. The patterns on the teeth after wear are shown by the accompanying figure. Vertebræ: C. 7, D. 19–20, L. 3, S. 4, C. about 22. Ulna and fibula well developed and distinct.



a. *b.*

Fig. 153.—Crowns of (*a*) upper and (*b*) lower second right true molars of *Rhinoceros unicornis*, the inner side uppermost.

The genus is only found living in Africa and South-eastern Asia. Formerly it was widely distributed. Three extinct species, besides *R. unicornis*, have been recorded from the Pleistocene, and five from the Pliocene and Miocene beds of India.

Synopsis of Indian and Burmese Species.

A. A single horn on the nose.
  a. Fold in front of shoulder not continued over back of neck; skin of sides bearing tubercles ..... *R. unicornis*, p. 472.
  b. Fold in front of shoulder continued over back of neck; skin of sides divided into small polygonal scales ..... *R. sondaicus*, p. 474.
B. Two horns on nose ..... *R. sumatrensis*, p. 476.

334. **Rhinoceros unicornis.** *The great one-horned Rhinoceros.*

Rhinoceros unicornis, *L. Syst. Nat.* i, p. 104 (1766); *Hodgson, P. Z. S.* 1834, p. 98; *Gray, P. Z. S.* 1867, p. 1010; *Sclater, P. Z. S.* 1871, p. 8; *id. Tr. Z. S.* ix, p. 645, pl. xcv; *Flower, P. Z. S.* 1876, p. 454; *W. Sclater, Cat.* p. 202.

Rhinoceros indicus, *Cuv. Règne An.* i, p. 239 (1817); *Blyth, J. A. S. B.* xxxi, pp. 151, 199; *id. Cat.* p. 136; *Jerdon, Mam.* p. 232; *Lydekker, J. A. S. B.* xlix, pt. 2, p. 135; *Cockburn, J. A. S. B.* lii, p. 56.

Rhinoceros stenocephalus, *Gray, P. Z. S.* 1867, p. 1018.

Guinda, Gargadan, H.; *Karkadan*, P.; *Gonda*, Beng.

Skin naked except on the tail and ears, and on the sides studded with convex tubercles, half an inch to an inch or rather more in diameter, the largest on the buttocks and thighs and on the shoulders. Skin of body divided into great shields by folds before and behind each shoulder, and before each thigh; the folds behind the shoulders and before the thighs continuous across the back, those in front of the shoulders not joined across the back but turning backwards and lost above the shoulder. There are also great folds round the neck, others below the shoulders and thigh-shields and behind the buttocks, so that the tail lies in a groove. Epidermis on limbs forming small polygonal scales. The head is higher and altogether larger than in other Asiatic species. Incisors generally $\frac{2}{4}$; inner lower incisors small, outer large, pointed. Skull very high, mesopterygoid fossa narrow; hinder margin of bony palate simply concave. Horn well developed in both sexes.

Colour blackish grey throughout.

Dimensions. Height at shoulder 5 feet to 5 feet 9 inches. A large male measured: height 5 ft. 9 in., length from nose to root of tail 10 ft. 6 in., tail 2 ft. 5 in., girth 9 ft. 8 in. (*Kinloch*). Length of horn rarely exceeding a foot. Basal length of a skull 23 inches, zygomatic breadth 15·3.

Distribution. At the present day the great Indian rhinoceros is almost restricted to the Assam plain, and it is very rare, if it exists, west of the Teesta river. Twenty to thirty years ago it was still common in the Sikhim Terai, and not many years previously it was found along the base of the Himalayas in Nepal and as far west as Rohilcund. Up to about 1850, or rather later, some rhinoceroses inhabited the grass-jungles on the Ganges at the north end of the Rájmehal hills, and were, I think, probably *R. unicornis*. Formerly this animal was extensively distributed in the Indian Peninsula. It was common in the Punjab as far west as Pesháwar in the time of the Emperor Baber (1505–1530). Semifossilized remains of it have been found in the Bánda district, North-west Provinces, and near Madras; and its co-existence with several mammals now extinct, the Indian hippopotamus for one, is shown by its occurrence in the Pleistocene beds of the Nerbudda Valley.

Habits. The great Indian rhinoceros is a denizen of the grass-jungles, tracts of grass from 8 to 20 feet high, that cover so much of the uncultivated portions of the North-Indian alluvial plains. It appears never to ascend the hills; it has a distinct preference for swampy ground, and is fond of rolling in mud. Though each animal is solitary as a rule, several are often found in the same patch of jungle.

Despite its bulk and strength, this rhinoceros is as a rule a quiet inoffensive animal, the stories of its ferocity and of its deadly enmity to the elephant, that were copied from the not very veracious pages of Captain Williamson's 'Oriental Field Sports' into European works on natural history, being fables. A rhinoceros when wounded or driven about will, however, sometimes charge home, though this is an exception. When it does attack, this species

uses its sharp lower incisors (or, as some think, lower canines) much as a hog does. I was shown in Cooch Behar a straight horizontal scar on the leg of one of the Maharaja's elephants just above the foot. This I was assured on good authority was the mark of a

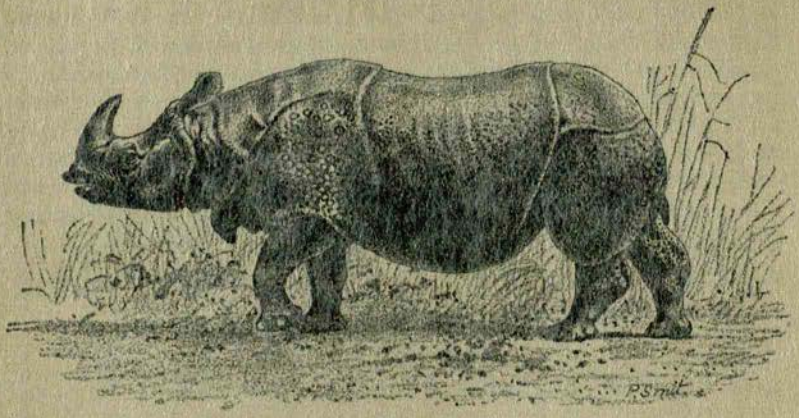


Fig. 154.—*Rhinoceros unicornis.*

wound inflicted by a rhinoceros, and it is manifest such a wound could not have been produced by the horn (see also Blyth, J. A. S. B. xi, p. 891).

The only sound known to be produced by the present animal is a peculiar grunt that it repeats frequently when excited. It is said by several writers to have a habit of depositing its dung in the same spot until a pile accumulates. The African *R. bicornis* has, I believe, no such habit.

Like other Ungulata, rhinoceroses can trot and gallop as well as walk. They as a rule sleep during the day and feed in the morning and evening. Their food consists, I believe, chiefly of grass. Their flesh is excellent, as I can testify. This rhinoceros is a long-lived animal and, according to Hodgson, is believed to live 100 years. I have heard of individuals that had existed 50 or 60 years in confinement. The period of gestation is said by Hodgson to be 17 or 18 months, by Desmarest under 9 months, a single young one being produced.

335. **Rhinoceros sondaicus.** *The smaller one-horned Rhinoceros.*

Rhinoceros sondaicus, *Cuv., Desm. Mam.* p. 399 (1822); *Blyth, J. A. S. B.* xxxi, p. 151; *id. Cat.* p. 137; *id. Mam. Birds Burma*, p. 50; *Jerdon, Mam.* p. 234; *Sclater, P. Z. S.* 1874, p. 182, pl. xxviii; *id. Tr. Z. S.* ix, p. 649, pl. xcvi; *Fraser, J. A. S. B.* xliv, pt. 2, p. 10, pl. v; *Flower, P. Z. S.* 1876, p. 454; *Ball, P. A. S. B.* 1877, p. 170; *Cockburn, P. A. S. B.* 1884, p. 140; *W. Sclater, Cat.* p. 202.

Rhinoceros javanicus, *Cuv. Hist. Nat. Mam.* livr. 45, pl. 309 (1824); *Rainey, P. A. S. B.* 1878, p. 139.

Rhinoceros inermis, *Lesson, Compléments du Buffon*, ed. 2, i. p. 514 (1848); *Peters, MB. Akad. Berl.* 1877, p. 68, pls. i–iii.
Rhinoceros nasalis *and* R. floweri, *Gray, P. Z. S.* 1867, pp. 1012, 1015.

Gainda, H.; *Gondu*, Beng.; *Kunda, Kedi, Kweda*, Nága; *Kyeng, Kyan-tsheng*, Burmese; *Bádák*, Malay.

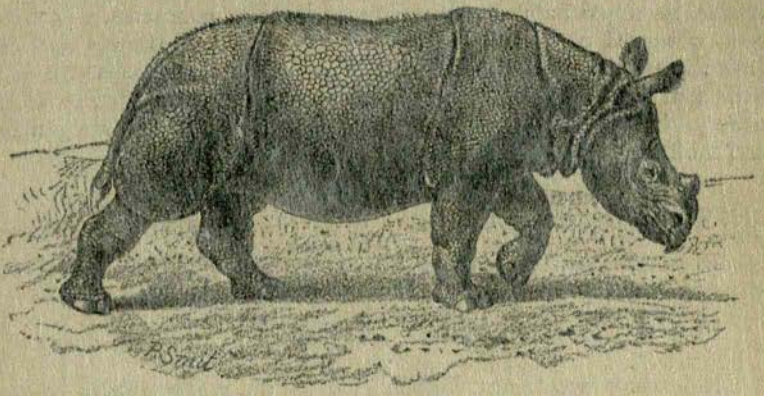


Fig. 155.—*Rhinoceros sondaicus.*

Animal altogether smaller, though scarcely, if at all, lower at the shoulder than *R. unicornis*; head much smaller. Skin naked or nearly so, not tubercular, the epidermis divided by cracks into small, polygonal, subequal scale-like disks throughout the body and limbs. Surface of body divided into shields by folds, as in *R. unicornis*, but the fold in front of the shoulders is continuous across the back like that behind the shoulders and that in front of the thighs. Neck-folds comparatively little developed. Incisors generally $\frac{2}{1}$; upper molars smaller and with a simpler pattern than those of *R. unicornis*; skull and mandible of less height, mesopterygoid fossa broad. Hinder margin of bony palate produced in the middle; a partially ossified septum narium. The horn is frequently, perhaps always, wanting in the female.

Colour dusky grey throughout.

Dimensions. Rather less than those of *R. unicornis*, but most of the measurements published appear to be those either of young animals or of individuals in confinement, which very often do not attain their full growth. A large female, according to Mr. Fraser and Mr. Cockburn, was 5 feet 6 inches high. A skull measures 23 inches in basal length, 13·8 in zygomatic breadth.

Distribution. The Sundarbans and parts of Eastern Bengal; Kinloch shot an undoubted specimen in the Sikhim Terai. From Assam this rhinoceros is found throughout Burma and the Malay Peninsula, and in Sumatra, Java, and Borneo. Blyth states that this species was formerly found near Rajmehal, but does not give any reason for the identification. The statement, mentioned by

Jerdon, that a few individuals existed in the forests of Orissa, has been ascertained by Mr. Ball and myself to be a mistake. So far as I am aware, there is no evidence at present that this rhinoceros ever inhabited the Peninsula of India. Its remains have, however, been found fossil in Borneo (P. Z. S. 1869, p. 409).

Habits. *R. sondaicus* is more an inhabitant of tree-forest than of grass, and although it is found in the alluvial swamps of the Sundarbans, its usual habitat appears to be in hilly countries. It has been observed at considerable elevations both in Burma and in Java; and the tracks seen by Major Macgregor south-east of Sadiya, at 7000 feet above the sea (Proc. R. Geog. Soc. 1887, p. 27), were probably made by this species. It is said to be more gentle and inoffensive than *R. unicornis*.

336. **Rhinoceros sumatrensis.** *The Asiatic two-horned Rhinoceros.*

Rhinoceros sumatrensis, *Cuv. Règne An.* i, p. 240 (1817); *Sclater, P. Z. S.* 1872, p. 790, pl. lxvii; *id. Tr. Z. S.* ix, p. 650, pl. xcvii; *Anderson, P. Z. S.* 1872, p. 129; *Bartlett, P. Z. S.* 1873, p. 104, pl. xi; *Beddard & Treves, P. Z. S.* 1889, p. 7; *W. Sclater, Cat.* p. 204.

Rhinoceros sumatranus, *Raffles, Tr. L. S.* xiii, p. 268 (1820); *Blyth, J. A. S. B.* xxxi, p. 151; *id. Cat.* p. 137.

Rhinoceros crossei, *Gray, P. Z. S.* 1854, p. 251; *Blyth, P. Z. S.* 1861, p. 307; *id. J. A. S. B.* xxxi, p. 156.

Rhinoceros lasiotis, *Sclater, P. Z. S.* 1872, p. 493, pl. xxiii; *id. Tr. Z. S.* ix, p. 652, pl. xcviii; *Flower, P. Z. S.* 1878, p. 634; *W. Sclater, Cat.* p. 204.

Ceratorhinus crossei *and* C. sumatrensis, *Blyth, A. M. N. H.* (4) x, p. 399 (1872); *id. Mam. Birds Burma*, pp. 51, 52.

Ceratorhinus sumatranus, C. niger, C. crossei, *and* C. blythii, *Gray, A. M. N. H.* (4) xi, pp. 357–360, pl. xi (1873); *id. Hand-list Edent. &c. Mam. B. M.* pp. 47–50.

Ceratorhinus sumatrensis *and* C. lasiotis, *Flower, P. Z. S.* 1876, p. 455.

Kyan, Kyan-shaw, Burmese; *Bádák*, Malay.

This is the smallest of living rhinoceroses and the most hairy, the greater part of the body being thinly clad with hair of some length, and there being hair of considerable though varying length on the ears and tail. The two horns are some distance apart at the base; both are slender above, and the anterior horn, in fine specimens, elongate and curved backwards. The skin is usually rough and granular; the folds, though much less marked than in the one-horned species, are still existent, but only that behind the shoulders is continued across the back. Incisors in adults $\frac{2}{2}$, the lower pair lateral, large, and pointed; sometimes lost in old animals.

Colour varying from earthy-brown to almost black; hair of body brown or black.

Dimensions. Somewhat variable. The type of *R. lasiotis* was 4 ft. 4 in. high at the shoulder, and 8 feet long from snout to root of tail; its weight about 2000 lbs. (*Anderson*). An old female from Malacca was only 3 ft. 8 in. high. The average height of adults is probably

4 feet to 4 feet 6 in. The largest known specimen of the anterior horn measures 32 inches over the curve. Skull 20 inches in basal length, 11·25 in zygomatic breadth.

Varieties. Specimens from Chittagong and Malacca were living at the same time in the Zoological Society's Gardens, London, in 1872; and the former was distinguished by Sclater as *R. lasiotis* on account of its larger size, paler and browner colour, smoother skin, longer, finer, and more rufescent hair, shorter and more tufted tail, by the ears having a fringe of long hair but being naked inside, and above all by the much greater breadth of the head. Unquestionably the differences are considerable; but by far the most remarkable—the shape of the head—was shown by Blyth to be variable in both *R. unicornis* and *R. sondaicus*, for he figured and described a broad and a narrow type of each (J. A. S. B. xxxi, p. 156, pls. i–iv) as well as of *R. sumatrensis*. The other distinctions scarcely appear to me of specific value, and I am inclined to regard the two forms as varieties only.

Distribution. Rare in Assam, though one specimen has been recorded on the Sankosh river, in the Bhutan Duars (P. Z. S. 1875, p. 566). Another was shot 20 miles south of Comillah in Tipperah in February 1876 (P. Z. S. 1877, p. 269). From Assam the species ranges to Siam, the Malay Peninsula, Sumatra, and Borneo.

Habits. Very similar to those of the other species; this rhinoceros inhabits forests and ascends hills to a considerable elevation, having been observed 4000 feet above the sea in Tenasserim by Tickell. This is a shy and timid animal, but easily tamed even when adult.

Details obtained by Mr. Bartlett concerning a young animal born in London, induced him to regard the period of gestation as probably a little over 7 months (P. Z. S. 1873, p. 104). This differs greatly from Hodgson's account of the period in *R. unicornis* (P. Z. S. 1834, p. 98), but no details are furnished in the case of the last-named species, whilst the evidence is stated in that of *R. sumatrensis*. Still, for so large and apparently so long-lived an animal, 7 months of uterine life is short.

Anderson, in his 'Fauna of Mergui and its Archipelago,' i, p. 333, mentions his having heard of a two-horned rhinoceros seen swimming in the sea, near High Island in the Archipelago. Probably all rhinoceroses are good swimmers. The story of the Chittagong rhinoceros that was unable to swim (P. Z. S. 1872, p. 494) must be, I think, a mistake. The account given by Mason and repeated by Blyth, of this or any rhinoceros attacking fire, should be received with great caution. To my personal knowledge, Mr. Blyth's principal informant had a weakness for relating "shikar stories," which were frequently good, but not always authentic.