

**ZOOLOGICAL RESULTS OF THE SECOND DOLAN EXPEDITION TO
WESTERN CHINA AND EASTERN TIBET, 1934-1936.**

PART III,—MAMMALS ¹

BY GLOVER M. ALLEN

Curator of Mammals, Museum of Comparative Zoölogy, Cambridge, Mass.

Although the larger mammals of the Tibetan plateau are probably now fairly well known, at least as to species, much nevertheless remains to be done in working out the details of distribution and racial status of many of them, while of the smaller species very little systematic collecting has been done. Most of our knowledge is due to the sportsmen and travellers who have reached the borders of these highlands and brought back trophies or specimens of the smaller mammals that fell into their hands. The Russian explorer, Przewalski, was one of the first naturalists to penetrate this region from the north. The many mammals which he collected have been in part reported upon by Büchner in various papers. Przewalski was followed in later years by his countryman Koslov who traversed the eastern borders of Tibet, while other travellers have reached the outposts of the region, coming by way of western China. Nearly a century ago, the English naturalist, Hodgson, during a residence in Nepal, made known various Tibetan mammals which he secured through native aid from the southern borders, and in more recent years a few British expeditions have brought back specimens from the region of Lhasa. The western borders of the Tibetan steppes have been penetrated a few times by collectors, notably by the Yarkand expeditions, of which the second, under the Austrian naturalist, Stolickza, obtained an excellent representation of mammals, which were reported upon by Blanford in 1879, and constituted our first considerable knowledge of the mammals of Chinese Turkestan.

The collections secured by Mr. Brooke Dolan, II and his assistant, Ernst Schäfer, were made and brought back under such extreme conditions of hardship and transportation, that it seems remarkable they should have come through at all. While the large game mammals naturally absorbed much of their effort, a number of smaller species were collected, some of which serve to extend recorded distribution while others represent species very little known. One of the important objectives, the discovery of the haunts of M'Neill's Deer and the securing of specimens, was brilliantly

¹ For the general itinerary of the expedition, a list of the localities visited and the position of the numerous camps, reference should be made to Part I of the reports on the results of the expedition, published in this volume of these Proceedings, pp. 159-184, pls. 12-20, and route map.

accomplished. This species, and the yak, chiru, Tibetan gazelle, white-lipped or Thorold's deer, steppe fox, blue bear, gray-tailed hare, and one or two species of hamster-mice appear to be rather characteristic of the Tibetan plateau at high altitudes. Others, as the argali, wolf, red fox and some of the mouse-hares and meadow mice have a wide range up to the borders of China. Field notes on the wild yak and the argali have already been published by Schäfer (1936, 1937) and a brief general account of the expedition and the larger game mammals, illustrated by a number of Mr. Dolan's photographs, has been given by Mr. Arthur deC. Sowerby (1936). A complete list of the species obtained by the expedition follows, with field notes concerning some of the larger mammals, contributed by Mr. Dolan.

SORICIDAE. Shrews

Sorex ?minutus tibetanus Kastchenko.

Sorex minutus tibetanus Kastchenko, Survey of Mammals of Western Siberia and Turkestan, Tomsk, p. 93, 1905 (in Russian). Tsaidam.

A skin without skull from Seshu Gomba, Khams, August 12, 1935, may represent this species. The small hind foot measures 9.6 mm. The color above is distinctly brownish, about seal brown, without darkening, and the lower side of the body has a faint wash of pinkish buff, slightly more extensive and pinker than in European specimens, which otherwise it closely resembles.

Nectogale elegans Milne-Edwards.

Nectogale elegans Milne-Edwards, Comptes Rendus Acad. Sci. Paris, vol. 70, p. 341, 1870. Mupin.

Of this remarkable water shrew, a single skin was secured north of Batang (Camp 30), at Derge Gönchen (98° 45' E., 31° 50' N.) (Camp 52), but the skull unfortunately was lost. Field measurements are: total length, 217 mm.; tail, 89; hind foot, 28. At the base of the tail two lateral flanges unite to form a mid-ventral keel, while two others form lateral keels slightly farther out. The Himalayan Water Shrew, *Nectogale sikkimensis* is longer-tailed and apparently lacks the buffy wash over the entire throat and chest of the typical *elegans*, a character well marked in the specimen from Derge Gönchen.

HIPPOSIDERIDAE. Horseshoe Bats

Hipposideros armiger armiger (Hodgson).

Rhinolophus armiger Hodgson, Journ. Asiatic Soc. Bengal, vol. 4, p. 699, 1835. Nepal.

Two of these large horseshoe bats were obtained at Yachow, Szechuan Province, China.

VESPERTILIONIDAE. Simple-nosed Bats**Pipistrellus abramus** (Temminck).

Vespertilio abramus Temminck, Monogr. de Mammalogie, vol. 2, p. 232, pl. 58, figs. 1, 2, 1835-41. Nagasaki, Japan.

A single specimen from Yachow, west-central Szechuan, China, must nearly represent the westward limit of distribution for this species.

Eptesicus sodalis ognevi Bobrinski.

Eptesicus ognevi Bobrinski, Materials for the Fauna (of Russia), Moscow, no. 15, p. 12, 1918?. Seven Mts. region of Bucharia, Askabad.

This is a medium-sized *Eptesicus* recalling a small Serotine in general appearance, but paler above, nearly pale ochraceous buff, throat grayish white, chest and belly white, the hairs everywhere with dark slaty-gray bases; membranes and ears blackish.

A single specimen from Sherug, or Sheru (Camp 70), Khams, August 27, agrees well with the original measurements and with Ognev's brief diagnosis in his Key to Russian Bats (Journ. Mammalogy, vol. 8, p. 153, 1927). As a species, *E. sodalis* is known from Switzerland, but is apparently rare or overlooked there. The pale desert race described by Bobrinski from Bucharia does not seem to have been recorded from other areas. Hence this extension of its known range into eastern Tibet is noteworthy, though paralleled by that of other mammals. The forearm of the specimen measures 46 mm., agreeing with Bobrinski's original measurement; the foot with claw, however, measures 9.5 mm., for which Bobrinski gives 8-10 mm., without mentioning if this includes the claw. Thus the identification seems fairly certain.

CANIDAE. Dogs, Wolves, Foxes**Canis lupus chanco** Gray.

Canis chanco Gray, Proc. Zool. Soc. London, p. 94, 1863. "Chinese Tartary."

In a previous paper I revived Hodgson's *Lupus laniger*, 1847, of Tibet for the wolf of the Gobi Desert and the region adjacent but overlooked the fact that *laniger* cannot be used in the genus *Canis* on account of the use of the same name previously for the domestic dog of the Puget Sound Indians. Gray's name, *chanco*, however, seemed nearly equivalent. Pocock (1935) has shown that the wolf of eastern Asia is hardly to be differentiated from that of Europe, except by slightly smaller teeth, while color varies so greatly both individually and seasonally that little value can be placed on supposed characters of this nature.

Two adult male wolves were secured by the expedition on the Chumar (Camps 118-126), and agree in being pale, whitish, with much black-tipping to the hairs of the middle of the shoulders or back. A third smaller skin has the black tips longer and more abundant, imparting a blackish look to

the specimen. Skull measurements of the two males, Nos. 17497 and 17498, follow in this order: greatest length, 234, 236 mm.; basal length, 208, 206; palatal length, 116, 116; zygomatic width, 129, 128; mastoid width, 79, 72.5; width across upper carnassials, 77.8, 72.5; upper cheek teeth, canine to last molar, 105, 98.4; lower cheek teeth, canine to last molar, 114.5, 114; first lower molar, greatest length, 29.1, 25.8; length of nasals, 92, 89; length of contact between premaxillary and nasal, 37, 44.

According to Mr. Dolan, wolves "were most numerous on the steppe. Those seen were always solitary, although at night they must run together to judge from the sound of their howling. Their principal food is probably ochotonas, though they sometimes kill gazelles and wild-ass colts, and probably sheep."

Vulpes vulpes montana (Pearson). Hill Red Fox.

Canis vulpes montanus Pearson, Journ. Asiatic Soc. Bengal, vol. 1, p. 99, 1832. Himalayas.

All the Old World Red Foxes are of generally similar appearance, but Pocock in his recent review of the foxes of British India (Journ. Bombay Nat. Hist. Soc., vol. 39, p. 38, Dec. 1, 1936) distinguishes the animal of the Himalayas from Gilgit to Sikkim, Tibet, and Yunnan, as having on the average a smaller skull and teeth than the typical Scandinavian race. There is much variation in color. One from Camp 61, Seshu, western Szechuan, taken February 27, 1935, has the nape fulvous, the middle of the back tipped with bright bay, flanks hoary, tibiae chestnut varying to fulvous posteriorly, and with a grayish spot on the metatarsus. The tail is full, with a white tip, its gray hairs finely pointed with black, and with its middorsal area fulvous. On the belly the hairs are gray at the base, tipped with white. A second skin in moulting condition was taken at Camp 147, Yilung, Szechuan, in September.

Vulpes ferrilata Hodgson. Steppe Fox.

Vulpes ferrilatus Hodgson, Journ. Asiatic Soc. Bengal, vol. 11, p. 278, pl., 1832. Near Lhasa, Tibet.

The pretty little Steppe Fox is readily distinguished by its relatively short tail (less than half the length of head and body), short ears, colored much like the nape with a clear pale-fulvous patch behind each, and by the thick but rather short and dense pelage. The center of the back is fulvous, slightly silvered with whitish tips and mixed with a few scattered black hairs; flanks grizzled as well as the tail, except at its tip which is white, and the extreme base above which is reddish or fulvous like the center of the back. Several specimens were secured, at Yilung (Camp 147), and Draya, on the Tibetan plateau, as well as two others from Tatsienlu, which probably came from farther west. One skin (without exact locality), differs from the others in that the entire back is sandy buff instead of the usual

fulvous and the flanks have very little admixture of black hairs, while the throat has almost no trace of the black tips on each side that form two blackish lines in most skins. This is apparently an unusually pale individual.

These foxes, Mr. Dolan writes, are found "all over the steppe. Schäfer found them most numerous on a steppe near Kanze. They are very stupid and easy to kill."

Cuon javanicus fumosus Pocock.

Cuon javanicus fumosus Pocock, Proc. Zool. Soc. London, p. 49, Apl. 16, 1936.
Western Szechuan.

In his recent review of the Wild Red Dogs, Pocock makes all of them races of *C. javanicus*, the oldest name, and in this is doubtless correct. Three skins from western Szechuan, collected by the expedition are apparently referable to his new race, *fumosus*, based on a winter skin from "western Szechuan". One is from Gemoh (Camp 28), and is deep fulvous, almost chestnut on the back and upper side of the tail, the latter very thick and bushy with black tips to the hairs above. The lining of the ears, the throat, chest, and inner side of the limbs are white, grading into pale fulvous on the lower throat and abdomen. The upper lips are narrowly bordered with white, but the vibrissae are, as Pocock describes, not pale but dark chestnut, like the face. A second skin is from Tienhsingou, and a third, of a deeper rufous mixed with black, is from Sungpan.

URSIDAE. Bears

Euarctos thibetanus (G. Cuvier).

Ursus thibetanus G. Cuvier, Ossemens Foss., vol. 4, p. 325, 1823. Tibet.

An old female of this bear was killed in September 1931, at Tschotsi (Drukagi: Brit. Survey of India map), western Szechuan, the skull of which seems small, with the sutures well closed and the teeth considerably worn. The last upper molar is affected by caries. The skull measures: greatest length, 249 mm.; basal length, 231; palatal length, 131; zygomatic width, 158; mastoid width, 131; width outside molars, 61.8; upper cheek teeth, canine to last molar, 97; lower cheek teeth, canine to last molar, 106; length of last upper molar, 25.

Ursus arctos pruinosus Blyth. Blue Bear of Tibet. Plates 21 and 22.

Ursus pruinosus Blyth, Journ. Asiatic Soc. Bengal, vol. 22, p. 589, 1853. Near Lhasa, Tibet.

Ursus lagomyiarius Severtzow, Cat. Zool. Coll. Przewalski, p. 9, 1887. Kansu.

The so-called Blue Bear is hardly blue, but rather silvery, more like a Barren-ground Grizzly, with a white collar that may or may not be complete. In habits and structure also, it resembles the Grizzly, having a long skull, with long nasals the length of which equals or usually definitely exceeds the width across the last premolars of the upper jaw. These bears live on the barren areas of the Tibetan plateau eastward to the borders of

Szechuan and Kansu, subsisting largely at certain times of the year on the young of mouse-hares, which they unearth much as Grizzly Bears in western North America dig up and devour ground squirrels. In his revision of the Old World Brown Bears, Pocock (1932) justly regards the Tibetan animal as a race of the European Brown Bear and describes five skins in the British Museum. There is considerable variation in the coloring dependent partly on age and season. The Dolan Expedition secured a fine small series of winter-killed specimens, old and young, of both sexes. Of these a male from Waterh (Camp 62), Szechuan (No. 17359) killed March 17, is a general yellowish white to whitish with a buffy muzzle, a white collar, and with dark fore and hind limbs. The area between the shoulders and on the rump becomes darker, brown slightly silvered. Another specimen (unsexed, No. 17557) has a similar coloring, with complete white collar but the back is darker, a mixture of blackish brown and white. A third (No. 17358) from Batang, has the white collar incomplete dorsally, the sides of the head pale, the entire dorsal side elsewhere dark blackish brown, silvered over the middle of the back. Below, except for the complete white collar around the throat, it is dark, the chest black, becoming brown on the abdomen. In an immature male, No. 17361, the collar is narrow but complete dorsally, its hairs white to their base; legs blackish, and the entire back mottled in appearance, the hairs with blackish bases and silvery tips; the belly is pure white in the middle.

Cranial measurements of two adult males and two adult females follow:

No.	15035	17360	17363	17364
Sex	male	male	female	female
Greatest length	335	345	304	297
Basal length	306	306	270	270
Palatal length	179	180	156	158
Length of nasals	98	96	76	86
Zygomatic width	186	184	180	168
Mastoid width	142	142	138	127
Width across molars	88	92	81	84
Upper cheek teeth	129	134	113	117
Lower cheek teeth	147	152	133	132
Length of last upper molar	38.4	37	32	36

There can be no doubt that these bears, as Miller suggests, are closely related to the North American Grizzly Bears, which doubtless represent the Brown Bears in the New World.

The following notes on the distribution and habits of this large bear are contributed by Mr. Dolan: "These bears are distributed all over the marches of eastern Tibet, from the neighborhood of Tachienlu westward and northward into Tibet proper. They probably do not occur farther east than

Sungpan. Although they are present in some numbers on the forested slopes of the trenches of the large river courses, they are most abundant on the high steppes of northern Tibet and Kokonor, where they seem to live almost exclusively on ochotonas. The steppes are everywhere pitted with the excavations made by the bears in digging out these animals, which occur in incredible numbers and support thousands of foxes, wolves, bears, and various birds of prey. The Tibetan grizzly seems to have definite hibernating habits, although in the forested country around Batang we had good evidence that they frequently emerge in midwinter for water or for some other cause. Around Batang their favorite habitat seems to be the zone of prickly oak (*Quercus ilex*) between 10,000 and 12,000 feet, where food is abundant. On the high steppe they hibernate in shallow troughs in the grassland and do not seem to emerge before late March or April. On the steppes of the upper Yellow River in late April, I saw only a few, whereas Schäfer in July saw as many as fourteen in a single day in the same type of country. They are not persecuted by the natives, who are afraid of them and many of whom have a superstition that the bear is first cousin to man."

MUSTELIDAE. Weasels, Martens

Mustela altaica tsaidamensis (Hilzheimer).

Arctogale tsaidamensis Hilzheimer, Zool. Anzeiger, vol. 35, p. 309, Jan. 4, 1910. Tsaidam Mts., Tibet.

Four males from Yalung Plain (Camp 79 and vicinity), Tibet, in April, are still in the winter pelage, and are decidedly yellower or more suffused with buffy above than are winter skins from the Altai and northwestern Kansu, taken as representing true *altaica*. Five other skins from the same region in summer coat (Camps 73, 101, 79) are more golden brown, less chocolate above than summer skins of *altaica*, and paler below. Two are entirely whitish on the under surface while the others show the usual white chin and throat, with the rest of the belly tinted buffy, not so deep and pinkish as in some specimens from northwestern Kansu. The fore feet from toes to the wrist, as well as more or less of the toes of the hind feet are white.

These specimens evidently represent Hilzheimer's *Arctogale tsaidamensis*, the type locality of which is the Tsaidam Mountains, Tibet. It was very briefly diagnosed as like *Putorius kathiah* Hodgson, but smaller, and with paler feet. Apparently, too, the *Mustela sacana* Thomas (Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 566, June 1914) from 150 miles southwest of Djarkent, and *Mustela kathiah caporiaccoi* de Beaux (Atti Soc. Ligustica Sci. e Lett. Genova, vol. 14, p. 65, 1935) are not very different. Hilzheimer's name antedates both, and his type came from the same general region, hence I use it for this race of southeastern Tibet.

In the series of skulls, it is apparent that with age the zygomata become more outwardly bowed, the sagittal and supraorbital ridges become slightly heavier in the male, the muzzle wider, and the postorbital constriction narrower. The following measurements help to supply a previous lack:

Cranial Measurements of *Mustela altaica tsaidamensis*

No.	17717	17733	17738	17734	17736
Sex	female	male	male	male	male
Occiput to front of incisors	41.3	47.4	48.0	47.0	—
Palatal length	17.2	21.1	22.1	20.5	22.5
Zygomatic width	—	24.5	—	24.3	27.7
Width of brain case	17.4	20.2	20.5	20.3	—
Interorbital distance	8.4	9.9	9.4	9.3	10.7
Width outside upper tooth rows	—	15.3	15.7	14.9	16.4
Upper cheek teeth	12.0	13.8	14.3	13.8	15.3
Lower cheek teeth	13.7	16.5	16.7	16.6	17.3
Postorbital constriction	8.8	10.3	7.5	7.9	7.4
Width of muzzle outside canine roots	9.5	10.0	10.5	10.2	12.7

Mustela sibirica moupinensis Milne-Edwards.

Putorius moupinensis Milne-Edwards, Recherches pour servir à l'Hist. Nat. des Mamm., p. 347, pl. 59, 1868-74. Mountains of Mupin, Szechwan, China.

One specimen of this race of the Chinese highlands was taken at Batang (Camp 30), December 16, a female, in bright fulvous pelage, with the dark tail-tip characteristic of the subspecies. This is perhaps near the western boundary of the range.

Mustela putorius larvata (Hodgson). Tibetan Polecat.

Putorius larvatus Hodgson, Journ. Asiatic Soc. Bengal, vol. 18, pt. 1, p. 447, pls. 11, 12, 1849. Utsang, southern Tibet.

Putorius tibetanus Hodgson, Journ. Asiatic Soc. Bengal, vol. 18, pt. 1, p. 448, 1849. Utsang, southern Tibet.

A single specimen of the Tibetan Polecat taken at Waterh (Camp 62), one day's march northwest of Seshu, without doubt represents Hodgson's "Black-faced Polecat of Tibet". It is, however, much paler than his description implies, with the fur of the body nearly white basally, without any fulvous tint, and tipped extensively with black. The facial mask extends only from the nose to the back corner of each eye, and the base of the short ears is also black. The skull of the specimen, a male, does not show the contact of the hamular process with the anterior point of the audital bulla mentioned by Pocock (1936) in his recent review of the polecats, so that this too, may be a character individually variable.

The skull of the specimen measures: length from occiput to front of incisors, 61.8 mm.; palatal length, 33; zygomatic width, 38.5; mastoid width, 34.1; width outside upper tooth rows, 23.2; upper cheek teeth, 20.8; lower cheek teeth, 25.2; interorbital width, 17.8; postorbital constriction, 13.4.

Pocock shows that *M.p. tibetanus*, coming from the same locality as *M.p. larvata*, is synonymous with it. He also regards the polecats as generically distinct from *Mustela*, of which they are usually regarded as a subgenus only.

Martes foina toufaea Hodgson.

Martes toufaea Hodgson, Journ. Asiatic Soc. Bengal, vol. 11, p. 281, 1842. Tibet.

A skin, lacking hind feet and skull, hence doubtless of native origin, agrees closely with the description of this Stone Marten. The entire upper part of the body is pale brown, the under fur drab gray with a faintly brownish or pinkish tinge; the tail darker, becoming black near the tip; fore feet and forearms dark brown. The ears are bordered with short white hairs; the chin, throat, and upper chest are pure white except for an irregular large brown spot behind the angle of the mouth on each side and two others in the central line of the throat. The specimen is labelled from Kolondo (Camp 53), Szechuan, but may have come from eastern Tibet whence it was originally described from imperfect specimens by Hodgson. Kolondo is in the Khams region of eastern Tibet.

FELIDAE. Cats, Lynx

Lynx lynx isabellina Blyth.

Lynx isabellina Blyth, Journ. Asiatic Soc. Bengal, vol. 16, p. 1178, 1847. Tibet.

A fine adult male was secured at Batang (Camp 30), January 2. In color it is dull ochraceous above, the hairs tipped with whitish, and with slight mixture of black hairs.

Mr. Dolan writes: "We saw but one, high up in an old glacial basin at 14,000 feet, catching ochotonas. It spied me at a great distance, and evidently mistaking me for a sheep or a musk deer, stalked to within two hundred yards."

OCHOTONIDAE. Mouse-hares

Ochotona tibetana tibetana (Milne-Edwards).

Lagomys tibetanus Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 7, Bull., p. 93, 1871. Mupin, Szechwan.

This little brown mouse-hare is an inhabitant of thickets and scrub, often at high altitudes. It is apparently active throughout the year, for specimens were secured by the expedition in November, December, and February as well as in the summer months. The long, loose pelage of winter is decidedly paler than the shorter coat of summer, but in both the hairs have a long slaty base, then a pale subterminal ring,—pale buffy in winter, brighter ochraceous in summer,—and a black tip. Below, the hair tips are white, washed with pale buff on the throat and on the median area of the chest. Individual variation is not great and is limited to slight

differences in the intensity of the pale band, from buff to ochraceous. In summer specimens this often presents a decided brown tone. The winter coat is carried through the greater part of the year. In the specimens secured by the expedition it is represented from November 18 (Leh) to April 20 (Camp 79 in Kokonor, Tibet); while the summer coat is worn by those taken up to October 2. This species was collected at various localities between Hokow and Batang, and again "in bush", at one hundred miles northeast of Jyekundo, which must be near the limit of its westward range.

Ochotona dauurica melanostoma (Büchner).

Lagomys melanostomus Büchner, Zool. Przewalski Exped., Mamm., pt. 4, p. 176, Sep. 25, 1890 (description); pt. 5, pl. 22, figs. 2-3, Apl. 1, 1894. Kuku-nor, Tsaidam, Kansu.

A large series of mouse-hares, mainly taken in mid-April at Camp 79, one hundred miles northeast of Jyekundo, and in late February at Nojelina, represents this form which was described by Büchner on the basis of specimens brought back by Przewalski's expedition from farther to the northeast, Kuku-nor, Tsaidam, and Kansu. He points out that it is very similar to *O. dauurica*, but differs notably in that the tip of the nose and the lips are black instead of whitish, while the skull is stouter and larger, and somewhat more flattened posteriorly. There can be no question that in these eastern parts of Tibet this black-lipped form replaces the paler *O. dauurica* of the Mongolian desert and should be regarded as a subspecies of that animal. The fine series brought back by the Dolan Expedition further indicates that in winter pelage, *melanostoma* is less pale than typical *dauurica*, with a distinctly pinkish-buffy tint instead of pale buffy on the upper side; the central buffy streak on the chest is continued farther back, to the abdomen, or in some specimens the entire lower surface is suffused with pinkish buff. The blackish lips and tip of the nose are characteristic of the entire series. In summer skins the general tone is darker, more brownish, due to the effect of the many black tips and ochraceous-buff subterminal bands of the hairs. The backs of the ears are clearer blackish with less mixture of buff than in winter. The skulls of this series do not bear out Büchner's statement as to their larger size. They are, however, noticeably more proodont, with the upper incisors slanting forward at an angle, rather than being nearly perpendicular as they are in specimens from the Gobi.

Half-grown young were collected in mid-June at Camps 105, 107, on the Tibetan plateau. The long black claws of both fore and hind feet are a noticeable character of this species, and enable it to burrow in the open grasslands. The completely hairy soles further distinguish it from *O. pallasii* which it somewhat resembles exteriorly.

Ochotona erythrotis gloveri Thomas.

Ochotona gloveri Thomas, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 190, Feb. 1922. Nagchukar, western Szechuan.

The fine series of some thirty-five Red-eared Mouse-hares falls readily into two groups, the first of which consists of ten specimens in winter pelage, taken at Leh, a day's journey south of Batang (Camp 30), in extreme western Szechuan. These are noticeably darker, more brownish on the back and with grayer cheeks contrasting with the buffy drab of the forehead, than in the series from farther west on the Tibetan plateau. They undoubtedly represent the winter coat of the race *gloveri* Thomas, of which previously only summer skins have been available for comparison. These latter include topotypes from Nagchukar and a skin from Mounin (N. of Tachienlu), the last collected in 1931 by Mr. Dolan. All these differ from typical *erythrotis* in their darker color and the less extent of the rufous in the summer pelage. This is shown in Büchner's figures and description of the original specimens. In his figure of a specimen in partially assumed summer coat, from Kansu, the rufous extends from the tip of the muzzle to and including the ears as well as the cheeks and sides of the head. A specimen from Chone, Kansu, in the Museum of Comparative Zoölogy, taken July 20, is similar, with a rufous throat and general russet tone over the back. The more southern race, *gloveri*, of extreme western Szechuan, on the other hand, is a much darker and browner animal, and in summer coat differs notably in having the bright rufous tint confined to the nose, forehead and ears while the sides of the face from before and above the eyes to the base of the ear are contrastingly gray, produced by the wide whitish subterminal band and blackish tip of the hairs of this region. In winter pelage the color is considerably lighter but essentially similar with well-marked contrast.

Büchner designated no type or type locality for his *Lagomys erythrotis*, but his figured specimen from Kansu, with the red summer coat coming in on the head and neck may be taken as the lectotype and northwestern Kansu as the general type locality.

The series of nine specimens from Leh and one from Drupalong were taken in late November. Farther west this race responds to the more arid conditions in its paler hues, and forms a well-marked race, which may be named, in honor of the organizer and leader of the expedition, as follows:

Ochotona erythrotis brookei G. M. Allen.

Ochotona erythrotis brookei G. M. Allen, Proc. Acad. Nat. Sci. Phila., vol. 89, p. 341, Oct. 25, 1937. Jyekundo, Khams, Tibet.

The material of this well-marked race has been discussed at length in the original description.

LEPORIDAE. Hares and Rabbits

Lepus oiostolus sechuenensis De Winton.

Lepus sechuenensis De Winton, Proc. Zool. Soc. London, for 1899, p. 576, pl. 32 (colored), Oct. 1. Dunpi, northwestern Szechwan.

Lepus sechuenensis Trouessart, Cat. Mamm. Viv. Foss., pt. 2, p. 543, 1904.

Lepus szetchuenensis Hilzheimer, Zool. Anzeiger, vol. 35, p. 310, Jan. 4, 1910.

Lepus kozlovi Satunin, Annuaire Mus. Zool. Acad. des Sci., St.-Pétersbourg, for 1906, vol. 11, p. 162, 1907. Re-tschu and neighboring valleys, Khams.

A series of seventeen skins of hares from localities west of Tachienlu falls readily into two series: one, consisting of specimens from Molashi, Litang (Camps 16-20), and west to Batang (Camp 30), which are noticeably darker; and the other, consisting of much paler examples, from the more open plateau to the westward, in Khams, from Jyekundo (Camp 72) and camps beyond. All belong to the gray-rumped group, with pale-backed ears and the tail white below with gray bases to the hairs. The base of the fur in the middle of the back is white or nearly so.

Without material sufficient to revise this group of hares, it is impossible at present to determine which of the various names applied to these are really valid. Apparently the oldest name given in the group is *Lepus oiostolus* of Hodgson, whose type came from Ladak, far to the west. The specimen on which this name is based, however, is too young to show clearly what the characters are (Blanford, 1879, p. 63). The next to be described is *Lepus sechuenensis* De Winton (1899) the type of which was from Dunpi, northwestern Szechuan. To this probably, the Litang-Batang series should provisionally be referred as a subspecies. With this race, further, it seems likely that *Lepus kozlovi* Satunin, 1907, is synonymous. In describing this hare, Satunin especially calls attention to its dark coloration,—with the entire upper surface so thickly interspersed with black hairs that some specimens look nearly all black. Satunin's specimens were from Re-tschu, Bar-tschu, Nam-tschu and Dse-tschu,—streams indicated on maps of northeastern Khams, near the Szechuan border. The series brought back by the Dolan Expedition are in winter pelage, and agree well with this characterization. Their rump patch is very dark iron gray, the individual hairs dusky at base, broadly tipped with whitish, and ending in a minute black point. The nape is clear buffy to ochraceous, like the back. The tail is blackish above, soiled white at the sides and below, where the hairs are blue-gray basally. Along the sides of the body are numerous long, projecting hairs, with their basal two-thirds blackish, their tips broadly whitish.

The specimens from farther west where higher and drier conditions obtain, are referred to the following race.

Lepus oiostolus przewalskii Satunin.

Lepus przewalskii Satunin, *Annuaire Mus. Zool. Acad. des Sci., St.-Pétersbourg*, for 1906, vol. 11, p. 156, 1907. Gass, southern Tsaidam.

Lepus oiostolus tsaidamensis Hilzheimer, *Zool. Anzeiger*, vol. 35, p. 310, Jan 4, 1910. Wahon Mountains, Tsaidam.

The specimens collected by Schäfer from Jyekundo (Camp 72) and points to the northward on the Tibetan plateau are much paler, more buffy, with less admixture of black above than the Litang-Batang series. The rump patch is noticeably more whitish, the tail clearer white below, with only the extreme bases of its white hairs grayish. These paler hares, if not typical *oiostolus*, represent a closely allied race to which Satunin has given the name *prezawalskii*. They agree exactly with a specimen received from the Zoological Museum at Leningrad, collected by Kozlov in northwestern Kokonor, and identified as *L. oiostolus*. Probably Hilzheimer's *Lepus oiostolus tsaidamensis* is a synonym. It was very briefly described on the basis of a skin from Wahon Mountains, Tsaidam. Further, the status of Hodgson's *Lepus pallipes* is still uncertain. The types were from Lhasa and Sikkim. De Winton (1899) regards this as a synonym of *L. oiostolus*, although Blanford (1879) wrote that the type specimens appear "at first very distinct" from western specimens, taken near Yarkand. Should it eventually turn out that they are different, however, it may be that *pallipes* should replace *prezawalskii* for these specimens from northern Khams.

SCIURIDAE. Squirrels**Callosciurus erythraeus bonhotei** (Robinson and Wroughton).

Sciurus castaneiventris bonhotei Robinson and Wroughton, *Journ. Federated Malay States Mus.*, vol. 4, p. 234, Nov. 1911. Szechwan.

Three specimens from Yachow, Szechuan, agree in the distinct olive-brown tint above and deep uniform chestnut below, characteristic of this race. There is no midventral line of speckled hair such as some of the other races have. Quite similar is a skin from Wan-hsien in the same province, in the Museum of Comparative Zoölogy.

Dremomys pernyi pernyi (Milne-Edwards).

Sciurus pernyi Milne-Edwards, *Revue et Mag. de Zool.*, ser. 2, vol. 19, p. 230, pl. 19, July 1867. Szechwan, China.

A series of fourteen skins, from Batang (Camp 30), Muliting (Camp 29), Horbo north of Batang (Camp 48), Tunggnolo valley (Camp 5), and thirty miles east of Hokow (Camp 8), all come from a circumscribed area in extreme western Szechuan. The series might represent Thomas's race *griselda* (type from Nagchuka, western Szechuan) but this seems so poorly marked that it is unworthy of subspecific distinction. The ochraceous-buff patch at the root of the tail and behind the ears varies in intensity to a deeper ochraceous rufous. There may be a slight buffy wash over the otherwise white throat, paling out on the belly.

Sciurotamias davidianus consobrinus (Milne-Edwards).

Sciurus davidianus consobrinus Milne-Edwards, Recherches pour servir à l'Hist. Nat. des Mamm., p. 305, 1868-74. Mupin, Szechwan.

A single skin from Wasukou, Szechuan (25 miles east of Tachienlu), seems typical of this race of rock squirrel.

Tamiops maccllelandi swinhoei (Milne-Edwards).

Sciurus maccllelandii var. *swinhoei* Milne-Edwards, Recherches pour servir à l'Hist. Nat. des Mamm., p. 308, 1868-74. Mupin, Szechwan.

The only specimen of this genus of striped tree squirrels secured by the expedition was captured thirty-five miles west of Hokow (Camp 8) on September 14. It presents an interesting stage of pelage in which the paler winter coat is not yet completely developed. This shows particularly in the case of the black stripes. The median black stripe is as strongly marked as in summer, while the next lateral pair, though become nearly all rusty brown, shows a short section about 15 mm. long at the forward (shoulder) end of each that still remains black with a second smaller black spot farther back on the stripe, about over the hip. The outer pale stripe is wide, of a pale ochraceous buff, and ends at the foreshoulder. The short black stripe which in summer coat borders this pale stripe below, is in the specimen completely changed to pale rusty, scarcely distinct.

Marmota himalayana himalayana (Hodgson).

Arctomys himalayanus Hodgson, Journ. Asiatic Soc. Bengal, vol. 10, p. 777, 1841. Tibet.

Hodgson's types were from Tibet in the region immediately north of Nepal. One of the types I have examined in the British Museum. To this typical form I would refer three specimens from the Tibetan plateau, two of them from Jyekundo (Camp 72), and the third from Camp 79, about fifty miles northeast of that locality. They average paler than specimens from the borders of Szechuan with less admixture of black above, and the ears and sides of the muzzle are a brighter or clearer orange rufous, instead of dull rusty. The black of the area between the eyes is much more mixed with buffy hairs except over the eyebrows which are deep black and tend to form a small distinct patch, somewhat separated from the dark crown by an intervening tongue of mixed buffy and black, thus contrasting with the darker race listed below. No doubt wear and fading may combine to affect the general coloration, but the points above mentioned come out distinctly in series.

Hodgson's "*Arctomys himalayanus*, potius *tibetensis*" is doubtless to be regarded as a synonym of this race, as Blanford long ago pointed out (Journ. Asiatic Soc. Bengal, vol. 44, p. 121, 1875).

An adult skull from Camp 79, fifty miles northeast of Jyekundo, measures: condylobasal length, 98.3 mm.; basal length, 92.6; palatal length, 57.7; zygomatic width, 64.1; mastoid width, 46.6; width across molars, 28.3; upper cheek teeth, 23.8; lower cheek teeth, 22.5.

Marmota himalayana robusta (Milne-Edwards).

Arctomys robustus Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 7, Bull., p. 92, 1870. Western Szechwan.

Five skins of marmot from Cheto Pass (Camps 1-2), Tsong Ben La (16,000 ft. pass, Camps 26-27), and Litang (Camp 16), on the border of eastern Tibet, evidently represent Milne-Edwards's *Arctomys robustus*, which should be ranked as a subspecies of *Marmota himalayana*. Compared with this race, it chiefly differs in its darker average color, much more mixed with black-tipped hairs over the nape and back, while the dark cap is more marked, extending as a solid blackish patch from the muzzle to the upper eyelids and back nearly to the ears where a sprinkling of buffy hairs occurs on the occiput. The dark eye-brow patch is not separately distinguishable but merges with the dark forehead. The range of this slightly darker subspecies probably covers a narrow area from Batang eastward along the borders of Szechuan.

PETAURISTIDAE. Flying Squirrels**Petaurista clarkei** Thomas.

Petaurista clarkei Thomas, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 396, Oct. 1922. Mekong Valley, 28° N., Yunnan.

Two native skins, one with a skull, agree closely with Thomas's brief description. Both are from Batang (Camp 30) but may not have been killed in the immediate vicinity. The head is gray with a prominent spot of ochraceous around the posterior base of the ear; fore part of the back mixed buffy and black, but on the middle and hinder portion of the back the ochraceous-buff annulations of the long hairs become whitish, tipped with black; hands blackish brown, feet blackish. Tail full and long, mixed ochraceous and black. Under side grayish white, faintly washed with buffy; at the sides of the membrane anteriorly is a band of ochraceous buff both above and below, and the extreme edge is marked by a line of whitish, not sharply defined. The skull of No. 17537 is smaller with smaller bullae than in specimens I have regarded as *xanthotis* from Kansu and the Kokonor Mountains. This species was originally described from western Szechuan, but without comparative material it is not possible at this time to determine if the Kansu animal is really distinct. In the Batang skull, the ascending process of the premaxillary tapers dorsally nearly to a point, while in skulls from Kansu it has a broader ending. The dimensions of skull No. 17535 are: occipito-nasal length, 60.5 mm.; palatal length, 33.7; zygomatic width, 36.2; mastoid width, 40.1; width outside premolars anteriorly, 14.8; upper cheek teeth, 16.2; lower cheek teeth, 15.6. The incisors are yellow, not orange. The first upper premolar is a very small spicule, tucked away below the crown of the large second premolar in an angle on the antero-internal side. The molar teeth are fully in place but only slightly worn.

Trogopterus xanthipes edithae Thomas.

Trogopterus edithae Thomas, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 658, June 1923. Likiang Range, Yunnan.

A skin from Batang (Camp 30), December 12, 1934, is quite the same as specimens from the Likiang Range, Yunnan, except that the terminal third or more of the tail is black with a few rusty-tipped hairs on the dorsal side except at the very tip. The long erect hairs about the inner base of the ear are a noticeable character. No doubt this should be regarded as a race of *T. xanthipes* of northeastern China.

CRICETIDAE. Hamster-like Mice**Cricetulus alticola tibetanus** Thomas and Hinton.

Cricetulus alticola tibetanus Thomas and Hinton, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 180, Feb. 1922. Tingri, Tibet, 14,000 feet.

A series of nine skins and skulls from Camps 76, 77, 79, 137, north and east of Jyekundo agrees closely with the description of this hamster-mouse, the type of which came from Tingri, Tibet, some distance to the southwest. Adults are nearly uniform pale ochraceous above, with only a very slight admixture of black-tipped hairs, paler, more sandy on the forehead, cheeks and nape. The ears are dusky brown on both proëctote and metentote, narrowly edged with white except at the basal third, and with a small white tuft at the inner base of each ear. The tail is dusky above, pure white below; backs of feet white. The sides of the muzzle and lower cheeks, and the entire ventral surfaces are white with dark slaty bases to the hairs. Immatures are nearly uniform drab gray, the sides washed with pale buffy; ears with their exposed parts blackish brown, white-edged. With advancing age, the buff and ochraceous tints finally predominate.

The precise relationships of this mouse are not clear. It is apparently less pale than *Cricetulus migratorius fulvus* Blanford from Yarkand a thousand miles to the westward, with darker bases to the hair of the lower side, but is doubtless closely related and may prove to be merely a race of *C. migratorius*. No specimen has an all-white tail. The hind foot with claws measures about 17.5 mm. The tail, as measured from the skin, is about 30 mm., and the ear about 16 mm. A skull (No. 17706) shows the following dimensions: condylo-basal length, 25.4; palatal length, 14.5; zygomatic width, 15.6; mastoid width, 12.1; width across molars, 6.0; length of bulla, 6.8; upper cheek teeth, 4.5; lower cheek teeth, 4.8.

Cricetulus lama Bonhote.

Cricetulus lama Bonhote, Abstract Proc. Zool. Soc. London, no. 22, p. 14, Nov. 21, 1905; Proc. Zool. Soc. London, for 1905, vol. 2, p. 305, Apl. 1906. Lhasa, Tibet.

Four specimens of this species were taken at camps 74-79, a short distance beyond Jyekundo to the northward, April 14-18, 1935, an extension of its known range. This is a totally distinct species from *C. alticola*

tibetanus, which occurs at the same localities, although possibly in different situations. It is at once distinguished by its longer tail and hind foot, smaller ears and darker color. The general coloring is much as in less-mature individuals of that species but even darker, with the forehead and cheeks grayish, due to a mixture of black with grayish or very pale-buffy hairtips. Over the shoulders the tint is a more pronounced buffy, while over the back the black hairs predominate. The short ears are hardly distinguishable in color from the surrounding areas of mixed grayish and black. They lack the white basal tuft at the inner side but are minutely edged with white. On the sides, posteriorly, there is a broad tongue of blackish and buffy or russet encroaching on the white of the ventral surface. A similar but nearly black tongue extends down upon the upper part of the hind leg, marked off behind by white and before by another white area. The feet are white; tail dark brown above, white below with a short terminal pencil of both brown and white. Elsewhere the under surfaces are white with deep slaty bases to the hairs. The hind foot with claws measures 17.5 mm.; tail from the skin, about 43; ear about 12. The style of coloring, dark mixed black and buff above and the blackish hip mark set off on both sides by upward extensions of the white of the belly, and the longer and more coarsely haired tail, separate this species at once from *C. alticola tibetanus*.

Microtus malcolmi Thomas.

Microtus malcolmi Thomas, Abstr. Proc. Zool. Soc. London, no. 90, p. 4, Feb. 4, 1911; Proc. Zool. Soc. London, p. 174, 1911. Mountains southeast of Tauchow, Kansu.

Two medium-sized microtines agree very closely with the description of *Microtus malcolmi*, the type of which is from the mountains southeast of Tauchow, Kansu. Hence its discovery in the southeastern corner of Tibet is a considerable extension of its known range. One was captured May 16, at Camp 90; the other on June 10, at Camp 102, on the Chinghai steppes. This meadow mouse is of a distinctly grayish brown, or as Thomas puts it, a brownish "rather lighter than 'bistre'". The under surface has the hairs gray-tipped, with slaty-gray bases. The distinctive characters are: the rather small hind foot, 16-17 mm. with claws; the small ears, about 12-13 mm. in the dried skin; the tail of medium length, about twice that of the hind foot. The skull is rather lightly built, with a distinctly arched profile. The teeth are quite like those of the *M. ratticeps* group, to which this mouse is therefore assignable, but its exact relationships, whether as a race of that animal or a distinct species, must await further study of the group as a whole. The distinctive points are: upper teeth with the pattern of *M. arvalis*, the last upper molar consisting of a transverse space, followed by two small outer and one large inner triangles, then a narrow C-shaped crescent, turned to the inner side. The first lower molar,

as in *M. ratticeps*, is of characteristic form, with a posterior transverse space, then in front of it two large inner and two smaller outer closed triangles, with a fifth inner triangle confluent with a terminal loop. There is a slight indentation of the margin of the inner border of this loop. The second lower molar consists of a posterior transverse space, in front of which are two large inner and two small outer closed triangles.

No doubt this species has a wide range over the eastern part of Tibet to the grasslands of northwestern Kansu. It closely resembles specimens from the Altai region, identified by the late Ned Hollister as *M. obscurus* Eversmann, of which it may be but a geographic race. Typical *M. ratticeps* is apparently a larger species with a similar tooth pattern.

Microtus (Phaiomys) waltoni Bonhote.

Microtus (Phaiomys) waltoni Bonhote, Abstract Proc. Zool. Soc. London, no. 22, p. 14, Nov. 21, 1905; Proc. Zool. Soc. London, for 1905, vol. 2, p. 306, text-f. 53, Apl. 1906. Lhasa.

Two specimens are clearly referable to this mouse, first described by Bonhote from Lhasa, Tibet. The record extends the known range considerably to the eastward. One of them, taken at Camp 76, on June 8, is in long full pelage, of a buffy gray, shading to clear buff on the sides of the neck and on the flanks. This seems to represent the winter pelage, for a second specimen dated July 22, (from Camp 132), has nearly completed the moult to summer coat. Only a small area covering the hind quarters still retains the long buffy hair of winter, while over the rest of the back it is buffy gray, darker on the back and nearly clear buffy on the sides of the neck. The lower surface is lightly washed with pale buffy, hardly concealing the short gray bases of the hairs. The extended hind foot, with claws, measures 20.3 mm.

Microtus (Neodon) irene irene Thomas.

Microtus irene Thomas, Abstract Proc. Zool. Soc. London, no. 90, p. 5, Feb. 14, 1911; Proc. Zool. Soc. London, p. 173, Mar. 1911. Tachienlu, Szechuan.

The small meadow mice of this group are regarded by Hinton as worthy of rank as a distinct genus, *Neodon*, representing in the highlands of western China a more primitive *Pitymys*-like species without the special modifications resulting from fossorial life. As in that genus, the first lower molar consists of a closed triangular lobe in front, succeeded by two opposite and confluent triangles, then one outer and two inner closed triangles and a terminal transverse loop. The small feet thinly clad with short dull whitish hairs, are a distinguishing mark. Of the ten specimens secured, one is from forty miles east of Hokow, on the Yalung, four are from Batang, and the others from farther westward in Khams, at Camps 90 and 136. It is in general a species characteristic of high alpine meadows in this region.

MURIDAE. Typical Mice and Rats**Apodemus latronum** Thomas.

Apodemus speciosus latronum Thomas, Abstract Proc. Zool. Soc. London, no. 100, p. 49, Oct. 31, 1911; Proc. Zool. Soc. London, p. 137, Mar. 1912. Tachienlu, Szechwan.

This species is readily distinguished from its congeners in the same general locality by its larger size and large, nearly naked, blackish ears. The long hind foot measures about 27 mm., the ear from base about 20. It is apparently an inhabitant chiefly of wooded or scrubby areas. The expedition found it common about Batang (Camp 30) where ten specimens were collected, and at other camps between there and Tachienlu in western Szechwan, as at Magidrong (Camp 10), Dakotime, and forty miles east of Hokow. Probably Batang marks nearly the western bounds of its range.

Apodemus peninsulae (Thomas).

Micromys speciosus peninsulae Thomas, Proc. Zool. Soc. London, for 1906, p. 862, Apl. 11, 1907. Mingyong, 100 miles southeast of Seoul, Korea.

Four specimens in adult winter pelage from Chinghai, and a dozen others, old and young, from Dawo (Camp 153), Tunggnolo (Camp 5), and Batang (Camp 30), agree so closely in color and size with a series from Kansu, China, and from Korea, that I am unable to distinguish them with certainty. The four from Chinghai, taken April 15, are still in the bright-russet winter pelage, except that on their heads and fore shoulders moulting seems to have begun, so that these areas appear grayer than in more eastern skins. A series from the Tibetan plateau in winter coat, might show that the animal in this area is a slightly paler race. Otherwise this species holds its characters with remarkable constancy over a wide area from Korea across northern China, to Kansu and the eastern part of the Tibetan plateau. It is distinguished by its uniformly colored upper side, of an even mixture of black and russet hairs in summer, with a clearer russet above in winter, only slightly darkened in the mid-back. The ears are clothed with short gray and russet hairs on their exposed surfaces, not contrasting with the surrounding fur. The last upper molar, unless greatly worn, shows three subequal lobes on the inner side.

Although Thomas regarded this as a continental race of the Japanese *Apodemus speciosus*, the latter seems to be a much larger and distinct species.

Rattus norvegicus socer (Miller).

Epimys norvegicus socer Miller, Proc. Biol. Soc. Washington, vol. 27, p. 90, May 11, 1914. Taochow, Kansu.

Two rats, a half-grown young and an older individual, from Batang are of this species and though rather young to show the full development of cranial characters distinguishing this race, doubtless represent the native form, to which they may be tentatively referred.

Rattus confucianus confucianus (Milne-Edwards).

Mus confucianus Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 7, Bull., p. 93, 1871. Mupin, Szechwan.

The Sulphur-bellied Rat is a common species over most of China, frequenting bushy or partly tree-grown areas in rocky situations. One secured by the expedition at Hokow (Camp 8), on September 16, is still in the summer coat, which is partly spinous. Two other adults are from Batang (Camp 30), while a half-grown young animal from Jyekundo (Camp 72), August 8, is unexpectedly far to the westward of the Chinese border.

ZAPODIDAE. Jumping Mice**Zapus (Eozapus) setchuanus** Pousargues.

Zapus setchuanus Pousargues, Bull. Mus. d'Hist. Nat., Paris, vol. 2, p. 13, fig. 1-3, 1896. Tachienlu, Szechwan.

The single specimen in the collection is a male taken in the Anya valley four days' travel west-southwest of Tachienlu, the type locality. It thus extends slightly the known range of the typical race, with which it agrees in the presence of a well-developed yellow line in the center of the white under side. The collector's field measurements are: total length, 180 mm.; tail, 105; hind foot, 28; ear, 12.

MOSCHIDAE. Musk Deer**Moschus moschiferus sifanicus** Büchner. Chinese Musk Deer.

Moschus sifanicus Büchner, Mélanges Biologiques, vol. 13, no. 1, p. 162 = Bull. Acad. Imp. des Sci., St.-Petersbourg, new ser., vol. 2, p. 116, 1891. Southern Kansu.

Several specimens were brought back. According to Mr. Dolan's notes, it is universally distributed throughout the marches of eastern Tibet, with a wide range of habitat from comparatively low altitudes to the highest growth of dwarf rhododendrons. "Its favorite haunts are in rhododendron, spruce, or prickly oak. It is chiefly in such cover that it is trapped by professional musk hunters but its salvation seems to lie in the fact that there is a reserve in higher altitudes where the native hunters cannot trap it profitably."

CERVIDAE. Deer**Elaphodus cephalophus cephalophus** Milne-Edwards. Tufted Deer.

Elaphodus cephalophus Milne-Edwards, Recherches pour servir à l'Hist. Nat. des Mamm., p. 353, pl. 65-67, 1871. Mupin, Szechwan.

The Tufted Deer Mr. Dolan found well distributed "over the marches of eastern Tibet in the lower gorges of the river courses. Its favorite haunt is in poplar and birch forest at altitudes of about 11,000 feet. In such situations it occurs around Batang and Tachienlu in considerable numbers. It is not held in much esteem by the natives and consequently is not much hunted."

Capreolus capreolus bedfordi Thomas. Duke of Bedford's Roe Deer.

Capreolus bedfordi Thomas, Abstract Proc. Zool. Soc. London, p. 32, June 16, 1908.
One hundred miles west of Taiyuan-fu, Shansi, China.

The roe deer of northern China is not very different from the races farther west. The specimens collected at Dzogchen (Camp 145), by the expedition come from what must be very nearly the southern limit of the range in western China. Here, Mr. Dolan writes, they were found "to the northwest of Sungpan, where they are plentiful but hard hunted, and at Dzogchen Lamasery where they occur more sparingly. In no other locality did we find evidence of them, although we heard of their occurrence near the tea road to Lhasa between Tachienlu and Dawo (Tao-fu). In both localities they were encountered in cover of rhododendron and dwarf rhododendron."

Rusa unicolor dejeani Pousargues. Dejean's Rusa Deer.

Rusa dejeani Pousargues, Bull. Mus. d'Hist. Nat., Paris, vol. 2, p. 12, 1896.
Szechwan.

The Rusa Deer is found in suitable country slightly to the north of Tachienlu, southward and westward as far as Batang in China. One fine male from the latter locality has the coarse hair a dark blackish brown, and the legs darker, fuscous, becoming pale ochraceous on the inner sides. In a second specimen consisting of the skull only, (Batang, November 21), the antlers are thick and solid, with a length from the burr to the tip of the front tine, following the outer curve, of 600 mm., or 27.25 inches, only 3.75 inches shorter than the record head listed in Rowland Ward's "Records of Big Game". The circumference above the burr is 225 mm. (8 $\frac{7}{8}$ inches); length of brow tine from the crotch, 235 mm. Other measurements are: condylobasal length, 360 mm.; basal length, 336; palatal length, 217; zygomatic width, 159; mastoid width, 128; nasals, length 143, combined width at widest place, 62; width across molars, 106; upper cheek teeth, 106. The nasals are not notched at the distal end.

These sambar, Mr. Dolan writes, seem to follow the deep river valleys from the south, and occur in the valley of Tachienlu, in the Yangtse valley, and probably in the valley of the Yalung, as well as in the mountains south of Litang. At Batang their favorite grounds were the semi-arid side ditches off the Yangtse, in semi-jungle of wild rose, plum, and other thorny plants, whence they extended their range up into the prickly-oak forest.

Cervus albirostris Przewalski. White-lipped Deer.

Cervus albirostris Przewalski, Reise in Tibet, p. 73, fig. p. 76, 1884. Nanshan.

This large deer was found to be fairly common in the mountainous country above Batang (Camp 30). It is apparently a characteristic species of the plateau region west of the Chinese highlands, from the Nanshan Mountains westward at least to Lhasa. The extremely coarse pelage, rough and harsh to the touch, the somewhat flattened skull, and the antlers with

their lack of a bez tine, are so distinctive a combination that Flerov has suggested a special subgenus, *Przewalskium*, for the species. While the antlers are usually described as having no bez tine, this condition may be interpreted, however, as representing a more primitive stage, in which the inter-node between brow tine and bez tine is still long, and the succeeding inter-node really represents that usually forming the more basal part of the beam. Pocock, however, is inclined to suppose that the bez tine in the elaphine type of antler is an interpolated or extra one, rather than the homologue of a succeeding fork. A large antler secured by the expedition measures $41\frac{1}{8}$ inches (1045 mm.) on the chord from the anterior base of the burr to the tip of the most distant point. Other measurements of this antler are: circumference just above burr, 197 mm. ($7\frac{3}{4}$ inches); length of brow tine on outer curve, 325 ($12\frac{3}{4}$ in.); length of "trez" tine from upper base, 498; length of third point, 337; of fourth, 200. The antlers of this deer seem to show a simple system of forking, in which, after the first fork, the posterior branch only again subdivides in each subsequent bifurcation.

This deer, as Mr. Dolan writes, is "more widely distributed than M'Neill's Deer, and still occurs all the way from the Tachienlu mountains westward into central Tibet and northward probably to the grasslands around the Amnye Machen. They were seen by us to the south of Litang around Batang, and to the northwest of Jyekundo, and tracks were found in the Tachienlu Mountains. However, they have been so persecuted that the stand is down to nothing in many localities. Four or five years ago they were said to have been extremely plentiful around Batang, but a force of Tibetan troops with British military rifles had so far reduced them in a season or two, that we had great difficulty in finding them. They range from mid-spruce forest up through rhododendron and dwarf rhododendron to the grasslands just below the peaks, that is, from about 12,000 to 16,000 feet. They occur on the fringes of the high steppes along the scarps of the upper Yangtse River in dwarf rhododendron and willow cover. These deer are probably also protected by native chiefs and lamaseries in the interior of Tibet, for of thirteen full yak loads of antlers observed by us when they were brought to the market at Jyekundo, about ninety per cent were shed antlers. It is said that the antlers are retained by the deer well through the month of March."

Cervus macneilli Lydekker. M'Neill's Deer. Plates 23 and 24.

Cervus cashmirianus macneilli Lydekker, Proc. Zool. Soc. London, p. 588, pl. 69, 1909; p. 987, Dec. 1910. Tibetan side of Sino-Tibetan border.

Cervus macneilli Lydekker, Cat. Ungulate Mamm. Brit. Mus., vol. 4, p. 145, 1915.

Cervus canadensis wardi Lydekker, Proc. Zool. Soc. London, p. 987, text-fig. 143, Dec. 1910. "Tibet".

One of the outstanding results of Mr. Dolan's expedition was the securing of a series of both male and female adults of the pale-colored M'Neill's

Deer. Described in 1909 on the basis of a hind shot on the Tibetan side of the boundary between Szechuan and Tibet, its true affinities have been obscured by the fact that not only were no others available in collections, but the antlers of the male were unknown with certainty. This state of affairs has now been remedied by the fine series of a dozen specimens of both sexes in the Academy's collection. From these antlers it is at once apparent that *Cervus macneilli* is a strictly elaphine type, perhaps even a race of *Cervus elaphus*, but until the whole matter of the relationships of the Asiatic *Cervus* can be carefully reviewed with adequate material, it does not seem yet possible to settle the status of this deer and such little-known ones as *C. wallichi* and its races, *C. cashmirianus*, and others. Nevertheless it is fairly certain, that as Lydekker himself, in 1915, suggested, his *Cervus canadensis wardi*, based on a pair of shed antlers purchased by a missionary in western Szechuan, is after all a synonym of *macneilli*, for the type antlers, which I was privileged to examine at the British Museum, though somewhat larger than the average of *C. macneilli*, evidently represent that animal. The antlers are collected by the Tibetans and traded into China, which doubtless accounts for the fact that the type antlers of *C. wardi* were purchased in Szechuan.

In a preliminary account of the Dolan Expedition's results, Mr. Arthur de C. Sowerby (1936) has published some excellent photographs of M'Neill's Deer, secured by Mr. Dolan, with brief notes on the species. As originally described from the female in the British Museum, the color in summer is very pallid, because of which the Chinese name for it is *pei lu*, meaning "white deer". My notes on the type describe the body as pale, a finely speckled gray and brownish black. The lips and nose are pale drab, not contrastingly white as in the White-lipped Deer. The inner side of the legs is pure white, as is also a narrow rim on the inner side of the buttocks. This latter area is bordered by blackish, which extends across dorsally to include the upper surface of the tail. The winter pelage as represented by Mr. Dolan's skins, seems grayer, with a brownish wash on the back, the throat and sides of the neck a mixed gray. The white pygal area is as narrow as in the summer condition. The antlers of the males when viewed from in front, have the main beam turned inward from the level of the trez tine, in this respect somewhat approaching the condition seen in Wallich's Deer (*Cervus wallichi*). Two immature males from Tsu Tchi are probably in their second year and still retain milk premolars, of which the second and third consist each of four crescents arranged in opposite pairs. Their antlers consist of a simple beam, unbranched, from a low pedicel about 43 mm. high, and have a slight outward curvature then turn in, giving a sigmoid form. In No. 17388, this simple antler is 295 mm. long on one side, and the skull still retains all three milk premolars, while the last permanent molar has not quite reached the alveolar level. In No.

17387, of about the same age, the antlers are a trifle longer, about 365 mm., the diameter of the pedicel just below the burr, 25 mm. In adult males both brow and bez tines are long and well developed, with a light upward curvature; the course of the main beam is then upward and outward, as seen from in front, until the trez tine is reached, situated on the outer side of the beam. The length of the trez varies in the series from a short snag to a much longer up-curved tine, which, however, does not exceed the brow tine in length. At this point the main beam turns decidedly inward, but apparently not so much as it does in *C. wallichi*. In a well-developed set of antlers, the part of the beam above the trez about equals that below it, from trez to bez tine, then the main beam forks in such a way that there is an anterior and a posterior tine, more or less in line, while a third one arises on the outer side, at or just above or below the point of forking, to make a more or less well-marked "cup". There is as usual much individual variation in the development of the several tines, and opposite sides may show considerable asymmetry. One large antler (No. 17378) exhibits the following measurements: length of brow tine from burr, on outer curve, 295 mm.; bez tine, 310; length of beam from upper base of bez to trez tine, 368; length of trez tine from outer side of beam on its curve, 260; length of beam between upper base of trez to the fourth tine 355; anterior tine of the "cup", 295; posterior tine of "cup", 350; lateral tine of "cup", 310. In one specimen, the main beam above the trez does not fork again; in another (No. 17394) the trez is very short, and above it the beam forks, with a long anterior tine, and a shorter posterior one that has a short fork terminally.

The upper canine is well developed in both sexes, but is decidedly smaller in females, only about three-fifths as long. In an adult male it is 15 mm. long by 7.5 in transverse diameter; in an adult female, 9 mm. long by 6 transversely. The cranial measurements of the four largest of each sex follow:

Skull Measurements of M'Neill's Deer

Males

No.	17383	17386	17394	17396
Condylbasal length	350	387	370	353
Basal length	330	357	352	326
Palatal length	210	230	232	216
Length of nasals	125	145	144	129
Combined greatest width of nasals	48.5	54.7	63.5	46.7
Zygomatic width	159	152	160	152
Width across orbits above	141	130	157.5	139
Width across molars	102	101.5	112	101
Upper cheek teeth	109	119.5	112	114
Lower cheek teeth	124	136	126	—
Upper premolar row	49.5	52	50	50

Females

No.	17380	17381	17390	17391
Condylobasal length	361	364	363	364
Basal length	338	353	342	350
Palatal length	222	224	213	228
Length of nasals	133	147	133	137
Combined greatest width of nasals	52	47	55	47
Zygomatic width	143.5	144	141	146
Width across orbits above	138	137	132	135
Width across molars	107	101	103	103
Upper cheek teeth	103	115	115	108
Lower cheek teeth	115	125	122	121
Upper premolar row	45	49	51	46

Concerning M'Neill's Deer, Mr. Dolan writes that it occurs "in the marginal forests of the Mekong, Yangtse and Yalung ranges, usually above 12,000 feet, in heavy growth of rhododendron. It is now very scarce in the vicinity of Litang, where the first specimen was taken by Captain M'Neill, and the expedition saw no evidence of it there except antlers and velvet shown to us by the merchants, and said to have come from deer killed in the vicinity, although they might well have come from far away. We collected them in March of 1935, two days west of Jyekundo. A stag observed had not yet shed its antlers. Schäfer later collected others in the Mekong drainage southwest of Jyekundo, and in September found them most plentiful near the monastery of Dzogchen, not far from Derge on the Yalung watershed. The big stags were about to shed their velvet, but the younger stags were in full velvet, with their antlers still soft. The skins taken in September were in clean summer hair. These deer have been much persecuted by the natives for the aphrodisiac properties believed by the Chinese to be inherent in antler velvet. They were probably once plentiful over most of eastern Tibet. At the present time they are protected by the monastery at Dzogchen, and we heard in Jyekundo that native chieftains protect them to the west of that place."

BOVIDAE. Antelope, Sheep, Cattle***Naemorhedus goral griseus*** Milne-Edwards. Gray Goral.

Nemorhedus griseus Milne-Edwards, Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 7, Bull., p. 93, 1871. Mupin, Szechwan.

The Gray Goral Mr. Dolan found "universally distributed in the river trenches between altitudes of 300 or 400 feet up to above 11,000 feet. Specimens were collected in the valley of the Min, near Wenchwan; in the Wassu country; at Waszekou, junction of the Tachienlu and Tung Rivers; at Hokow on the Yalung; and below Batang on the Yangtze. These little animals can be extraordinarily plentiful as on the cliffs above the Tsaopo River which drains the Wassu country. In the valley of the

Min we shot a buck which was browsing within one hundred feet of a band of domestic goats. On the other hand they can be extraordinarily shy where they are much hunted by natives, who almost invariably drive them with dogs."

Capricornis sumatraensis milne-edwardsii David. Serow.

Capricornis milne-edwardsii David, Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 5, Bull., p. 10, 1869. Mupin, Szechwan.

Several specimens of the serow were brought back. Of this animal Mr. Dolan notes that they are found "throughout the marches of eastern Tibet wherever, figuratively speaking, there is vegetation as high as their heads. They doubtless occur also in the trenches of the Mekong and the Salween, perhaps also of the Brahmaputra. There is great variation in color, which may account for the division into the two forms now recognized. We have seen them in conditions varying all the way from a thick white mane to a condition without mane, showing only the blackish body color on the neck. The under parts were found to vary from orange red to yellow buff. As regards habitat, they are one of the most adaptable of large mammals, occurring wherever vegetation is dense enough to afford them shelter. We found them most numerous at Tachienlu in heavy rhododendron jungle and at Batang in forests of prickly oak (*Quercus ilex*). However, in the neighborhood of Tachienlu, a specimen was collected at 13,000 feet in low juniper scrub. Near Batang they went as high as 13,500 feet. They feed chiefly at night, but may be seen abroad in the late afternoon or early morning. During the daytime serows occupy 'stalls' under the shelter of a cliff or overhanging rock. That they use such 'stalls' over long periods is attested by the accumulation of droppings, sometimes more than a foot deep. When frightened they 'blow' shrilly."

Procapra picticaudata Hodgson. Tibetan Gazelle.

Procapra picticaudata Hodgson, Journ. Asiatic Soc. Bengal, vol. 15, p. 334, pl. 2, 1846. Hundes district, Tibet.

Pocock (1910) in reviewing the cutaneous scent glands of ruminants, writes that if Hodgson be correct in stating that this gazelle lacks both preorbital and inguinal glands, it differs from all the true gazelles, and in addition has apparently smaller pedal glands. "In view of the constancy in occurrence and development of the cutaneous glands in the species of *Gazella*" he has examined, he is "disposed to think that *Procapra* should be admitted as a valid genus". While it is difficult in tanned skins to make certain of the presence or absence of glands, those I have examined seem to bear out Hodgson's statement; at least the preorbital gland if present must be very small, and has no corresponding antorbital pit in the skull such as is found in *Gazella*, nor was I able to make out any certain indication of inguinal glands. Another point, not mentioned, is that in *Gazella*

the nasals are short and broad, with a notch in their anterior border, whereas in *Procapra* the nasals are long and both taper to a median point. The slender and slightly sigmoid horns of this species have a wider backward sweep than in *Gazella*.

This is a characteristic species of the plateau country from the western borders of Szechuan across Tibet, to Ladak. Mr. Dolan writes that it "occurs as far south as four days below Batang and an undetermined distance south of Litang, and as far east as Sungpan. The kids are dropped probably in late June."

Pantholops hodgsoni (Abel). Chiru.

Antelope hodgsoni Abel, Edinburgh Journ. Sci., p. 163, 1827. Hundes district, Tibet.

The chiru is a highly characteristic antelope of the Tibetan plateau, occurring from eastern Tibet to Ladak and Yarkand. Several specimens were brought home by the expedition.

Mr. Dolan states that "the chiru have been persecuted like the yak and have withdrawn from the large areas formerly occupied by them to the wildest part of the high steppe. Their horns are much in demand for prongs to the forks which the Tibetans use as supports for their rifles. Schäfer encountered them only once while traveling for weeks over country where they were formerly plentiful. That was on the high steppes of the upper Yangtse, southeast of the Kukuschili range. In July they were in full moult, and the bucks in bands together. Their range in altitude coincides nearly with that of the wild yak, although they seem to occur lower on the Turkestan side of the Kuenlun Range."

Pseudois nayaur szechuanensis Rothschild. Blue Sheep.

Pseudois nahoor szechuanensis Rothschild, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 231, Aug. 1922. Szechwan (mounted skin) and Shensi (skull).

Pseudois nayaur caesia A. B. Howell, Proc. Biol. Soc. Washington, vol. 41, p. 118, June 29, 1928. Archuen, Minshan Mts., Kansu.

In briefly describing the Szechuan Blue Sheep, Lord Rothschild designated two cotypes, a mounted skin with horns from Szechuan, doubtless the western border, and a skull from Shensi. Six years later, Howell, overlooking Rothschild's paper, gave the new name *caesia* to a specimen from the Minshan Mountains, 140 miles south of Lanchow, Kansu. Presumably the Blue Sheep of Szechuan, Kansu, and Shensi are representatives of the same race, so that *caesia* becomes a synonym of *szechuanensis*, but lest in future, there may arise question as to the possible validity of the Kansu animal, I would here designate the mounted specimen from Szechuan in the British Museum as the lectotype of the race *szechuanensis*.

The status of this race is still not wholly made out. The color pattern varies not only with age and sex but individually, so that little reliance may be placed on the published descriptions as indicating race characters. Probably the most important character is that the tips of the horns in adult

males are usually straighter, curving directly backward instead of turning in at the points; but no doubt there is variation in this respect, for one large set of horns from Szechuan resembles the typical *nayaur* while others are typical of the eastern race. Mr. Dolan brought back a splendid series of skins and skulls from the western Chinese border, representing all ages from immature to adult. A brief statement of the color in this series and their stages of development seems worth while.

No. 17454, adult male, Drupalong south of Batang, Szechuan, January 8.—This is the largest animal of the valley series. The short stiff hairs on the top of the muzzle from nose pad to level of eyes, blackish with scattered minute buffy tips to some of the hairs; the buffy tips increase in length between the eyes and on sides of the face in front of and below the eyes giving a mixed buff and black appearance. A broad clear-buff area borders the upper eyelid and extends forward along the side of the muzzle, sharply marked off above in front of the eye by the blackish line of the dark forehead and muzzle. Cheeks grayish anteriorly. Occiput, neck and entire back to shoulders, flanks and upper haunches, drab. The coarser hairs of the back are about 40 mm. long, and under a lens appear grayish white with a narrow stripe of dark brown on the front and back. These stripes merge at the tip of the hair or are interrupted by a subterminal band of buffy. Along the sides of the neck and across the fore shoulder the bases of the hairs are paler,—white tinged with gray,—and with broad buffy tips giving to this area a warm-buffy tint, which extends across the lower sides of the flanks as a narrow stripe bordering the black flank stripe to the groin.

On the lower throat the pale-based hairs become broadly tipped with deep black, to form a median black patch. A black stripe about 20 mm. wide extends along the lower flanks from just behind the axilla all the way along the inner border of the thigh and down the front aspect of the hind leg to the foot, broadening at the ankle to send a narrow projection up along the outer side of the tibia, and again more distally to send a broad extension to each of the lateral hoofs. The outer side of the fore legs is similarly marked, with a broad black stripe on the anterior aspect of the limb, from about the middle of the humerus to the hoof, forking to send extensions to the lateral hoofs. A wide pale-buffy mark interrupts this stripe at the knee, extending from the whitish inner surface of the leg nearly across the black area. Backs of the ears colored like the nape, but the inner surface lined with white hairs. Tail black above and terminally below, with buffy to whitish sides and base below.

No. 17449, adult male, Leh (south of Batang), Szechuan, November 15.—Similar but the dark mark on bridge of muzzle less extensive, face and eye-ring paler gray, less buffy; buffy tips to the body hairs less worn and broken away, so that the general tint is more buffy. No black lateral stripe; hind-leg stripe begins at about the head of tibia and extends to the hoof.

No. 17457, immature male, Drupalong, January 3.—Face mixed whitish and dark; eye-ring and its anterior extension whitish; very little remains of the buffy hair tips on the body. No black lateral stripe, though many of the hairs below the buffy flank stripe are dark tipped. Black chest-mark small. Pelage soft, not harsh as in adults.

No. 17453, adult male, Leh, December 8.—Nose patch not well marked but much mixed with buffy-tipped hairs; eye-ring white. Middle of throat with many black-tipped hairs. Fore-leg stripe completely interrupted at the knee. No lateral black stripe, although it is indicated in the middle of the flanks by a clouding of dark tips to the hairs. Hind-leg stripe, clear and black from the groin.

No. 17460, immature female, Drupalong, January 3.—No side stripe of black but the buffy flank stripe is obvious; both fore- and hind-leg stripes are so mixed with buffy-tipped hairs all the way to the hoof as to be nearly obsolete. Fore-leg stripe interrupted at the knee.

From the foregoing brief descriptions of selected skins, it is evident that the general tint of the body varies slightly, according to the amount of buffy tips present, and these are subject to wear and breakage, which results in a more drab appearance. The lateral black stripe varies even in adults, and is normally absent in the immatures, while the leg stripes may be partly mixed with the buff of the body. The fore-leg stripe may be completely or only partly interrupted at the knee. Old males have more black on the lower throat.

On arranging the skulls in series according to age, it is seen that in the immature animals, probably two years old, the frontals are beginning to fuse together anteriorly along their line of contact. In the more advanced of these, the frontals are united except for a few pore-like deficiencies, to within a centimeter of the nasals, and posteriorly nearly to the parietal suture on the posterior aspect of the skull. In the next stage the frontals unite with the bases of the nasals and then the nasals themselves unite proximally along the median line, while at the same time the upper border of the lacrymal fuses with the outer edge of the frontal against which it abuts. With increasing age these sutures close completely and the bones become thicker and heavier to support the horns.

The longest pair of horns, as measured on the outside curve beginning at the inner angle, was 595 mm. In the following list are the horn lengths of the four next largest heads with complete dentition, followed by four which are immature males of slightly varying age, but still retaining the milk premolars. The horns of the female, even when adult are short and nearly erect. All in this list are from the Yangtse gorges where no very large heads were secured.

Horn Measurements of Blue Sheep

No.	Right side	Left side	Age and sex	Place
17454	475	(405)	adult male	Drupalong
17449	400	405	" "	Leh
17455	327	330	" "	Drupalong
17452	330	347	" "	Leh
17458	205	197	immature male	Drupalong
17457	162	157	" "	Drupalong
17448	150	143	" "	Leh
17456	102	105	" "	Drupalong
17461	125	127	adult female	Drupalong

The widest spread of horns in this series is 585 mm. from tip to tip in No. 17454, but in a specimen from the same region, No. 29958 Mus. Comp. Zoöl., it is 715 mm. In the young animals, the tips of the horns do not become ringed nor does the keel develop until they are about 60 to 65 mm. long. Other cranial measurements are given in the annexed table.

Cranial Measurements of Blue Sheep

No.	Condylor-basal length	Basal length	Palatal length	Zygomatic width	Mastoid width	Width across molars	Upper tooth-row p2-m3	Upper dp2-4
29958MCZ .	235	215	131	141	90	65	65.8	—
17454	220	203	121	138	84.6	63.8	65.0	—
17449	210	190	115	131	73.7	61.5	66.3	—
17455	208	191	113	125	78.8	62.0	66.0	—
17458	187	171	104	109	67.9	52.6	—	56.7
17457	193	177	105	113	74.3	56.0	—	58.5
17448	180	161	100	109	68.4	51.8	—	52.8
17456	189	171	107	111	69.4	51.8	—	52.5

An interesting detail in the distribution of this sheep was found. At Leh and Drupalong, in the deep gorge of the upper Yangtse River, Blue Sheep were encountered that appeared smaller with less heavy horns as compared with those of the upper grassy altitudes of the same region. A zone of thick scrubby forest three or four miles across and covering about fifteen hundred feet of altitude, intervenes between these ranges, so that the sheep of the uplands seem more or less cut off from those living in the gorges at the lower elevation. Both Dolan and Schäfer, who collected a series of each, were inclined to believe that the animals of the gorges represented a separate and depauperate race, as mentioned casually by Sowerby in his paper on their expedition. After a careful comparison of the specimens, however, it appears that the lowland animals are mostly immature,

and with one possible exception, younger than the big males of the upland pastures. Thus the smaller size is in part attributable to immaturity, but at the same time the less robust horn cores and horns may result from sparser pasturage. Only one of this valley series has the frontal and nasal outlines fairly well obliterated and its teeth well worn; its horns have the battered appearance of old rams but are smaller than those of equally battered upland rams. Selecting what seem to be comparable skulls of each group, those of the valley sheep run slightly smaller in some dimensions such as total length or diameters of the horn cores, but the gaps are bridged by individual variation and it does not seem possible to point out any certain distinctions. If the sheep of the gorges are really an isolated group, it is quite likely that they may not attain the size of the upland rams. That they can be regarded as a separate race, however, does not seem to follow, nor is it altogether clear that the forest belt between gorges and uplands constitutes a complete or impassable barrier.

Mr. Dolan notes further, that in the marches of eastern Tibet the Blue Sheep is well distributed from altitudes of 12,000 feet upward, depending upon rainfall. In the neighborhood of Tachienlu herds were seen in the autumn numbering as many as two hundred animals, including ewes, lambs and rams up to five or six years old. The oldest rams, however, were almost invariably seen alone or in partnership. Lambs are dropped in early May.

Ovis ammon hodgsoni Blyth. Hodgson's Sheep.

Ovis hodgsoni Blyth, Proc. Zool. Soc. London, p. 65, 1840. Tibet; probably the northern frontier of Nepal.

Several fine specimens from the extreme upper waters of the Yangtse in Chinghai (Kokonor, Tibet) doubtless represent typical *Ovis ammon hodgsoni* and agree with Lydekker's diagnosis of that race in having the horns less everted than in typical *ammon* of the Semipalatinsk, Altai, "the descending portion nearly vertical, the front outer angle often distinct, and the whole forming about one complete circle."

The largest male collected had thick heavy horns, but these do not equal in length the maximum of 48.5 to 57 inches mentioned by Lydekker, attaining only 34.5 inches (1020 mm.) on the outer curve, with a girth at base of 416 mm. Other measurements of this skull are: occiput to tip of premaxillaries, 365 mm.; condylobasal length, 340; basal length, 318; palatal length, 172; width across orbits dorsally, 215; width across zygomata, behind orbits, 145; occipital shield 195 mm. high by 130 broad; length of nasals, 155 (c.); width across first upper molars, 79; upper cheek teeth, 95; lower cheek teeth, 97; three upper molars together, 67; three lower molars together, 68.

Mr. Dolan writes that this sheep was first found on the steppe of Seshu (Camp 61), where they inhabited island-like ranges of granite rising from the steppe. Skulls and old sign were seen here. Later, specimens were collected west of Drechu Gomba (Camp 79) and farther west on the Chang Tang. Sheep were seen also on granite ranges north of Tossun Nor on the steppes of the upper Yellow River in Kokonor. Two large solitary rams were seen in May, and in July rams and ewes were found in separate bands on the mountains of the high steppe northwest of Jyekundo.

Poephagus grunniens mutus Przewalski. Wild Yak.

Poephagus mutus Przewalski, Journey in Tibet, p. 190, fig., 1883.

In the account of his third journey in Tibet, the Russian explorer Przewalski named the wild race, and gives its range as from Kharakhorum eastward along the Kuenlun to Altyn Tagh and the Nanshan range, becoming less rare in the valleys of the last. Pousargues (1898) adds that it is found also in the region of the sources of the Yangtse, but it avoids the Kokonor basin and the salt steppes of Tsaidam. It was met with by Mr. Dolan's expedition in the region of the Chumar branch of the upper Yangtse where two magnificent males were shot. Since measurements of the wild race are few, the following dimensions of the skulls of these two animals are given:

No.	17310	17311
Tip of premaxillaries to vertex of skull	610	576
Condylbasal length	555	540
Basal length	528	506
Width across orbits on dorsal surface	285	240
Width across zygomata behind eyes	235	225
Length of nasals	255	230
Combined width of nasals	97.5	81
Height of occiput, from foramen magnum to vertex	230	192
Width of occipital shield	252	250
Greatest spread of horns	810	735
Distance from tip to tip of horns	460	210
Width outside first molars	140	136
Upper cheek teeth, alveolar row	130	154
Upper molars alone	76	91.3
Lower cheek teeth, alveolar row	140	150

The wild yak bulls attain a huge size, considerably greater than the domesticated type. A brief account of the animal and its pursuit has already been published by Schäfer (1937), who gives the total length of a large specimen collected, as 368 cm., height at shoulder 203 cm. Mr. Dolan writes that its range seems to have steadily shrunk in recent times "due to unceasing hunting by nomads living on the fringe of the high Tibetan desert. Skulls and bones litter the steppes of the upper Yellow River, but the yak have not been common there for a decade so far as we could deter-

mine. The nomads in recent years have obtained European rifles and ammunition, and the military ammunition wounds three animals to every one brought down for meat and coat. Schäfer saw yak only three or four times in the course of six weeks' travel on the steppes of the upper Yellow River and the Yangtze. In July the animals were in full moult. During the summer the cows and calves were together in herds. The mature and older bulls may be in small bands or alone. Its range is from 14,000 feet to 17,000 feet or higher."

EQUIDAE. Horses

Equus hemionus kiang Moorcroft. Tibetan Wild Ass.

Equus kiang Moorcroft, Travels in Ladak, vol. 1, p. 312, 1842. Tibetan plateau.
Asinus hemionus kiang Schwarz, Der Zool. Garten, vol. 2, p. 93, 1929.

In the paper quoted above, Dr. Schwarz has reviewed the Asiatic wild asses, of which he recognizes six valid forms, all subspecies of *hemionus*. He regards *Asinus* as a valid genus, and includes the synonymy of each race. Typical *hemionus* is the race of the Gobi eastward of the Great Altai to Transbaikalia; the race *kiang* is the form of the Tibetan plateau from Kokonor in the northeast to the sources of the Indus in the southwest. Other races replace these to the southwestward. According to Schwarz, the race *kiang* is in point of size, nearest to the Mongolian *hemionus*, differing from it only in the darker, more reddish color of the rump, correlated with the greater paling of the markings and the almost white legs. The blackish-brown hoof stripes are wide and the narrow spinal stripe, about 40 mm. wide, shows no trace of a pale border.

This wild ass was common on the Tibetan plateau.

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EXPLANATION OF PLATES 21 TO 24

PLATE 21

A steppe bear (*Ursus arctos pruinosus*) killed March 18, hibernating in a shallow excavation near Waterh (Camp 62), open Chinghai steppe.

PLATE 22

The lightest color phase of the steppe bear.

PLATE 23

An adult stag of M'Neill's Deer (*Cervus macneilli*), velvet ready to peel, killed September 5, 1935, in dwarf rhododendron cover high in the mountains, southwest of Dzogchen Gomba (Camp 145).

PLATE 24

Rhododendron thickets at 14,500 feet in the mountains southwest of Dzogchen Gomba. Habitat of M'Neill's Deer.



ALLEN: ZOOLOGICAL RESULTS OF THE SECOND DOLAN EXPEDITION TO WESTERN CHINA AND EASTERN TIBET, 1934-1936. PART III,—MAMMALS



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