

## THE VOLES COLLECTED BY DR. W. L. ABBOTT IN CENTRAL ASIA.

BY GERRIT S. MILLER, JR.

During three recent expeditions in Central Asia, Dr. W. L. Abbott collected fifty-four voles representing the following ten species. These specimens form part of the large collection of Asiatic mammals which he has presented to the United States National Museum. I publish this paper here by permission of the Secretary of the Smithsonian Institution.

Genus **MICROTUS** Schrank.

1798. *Microtus* Schrank, Fauna Boica, i, p. 72. Type by elimination  
*Microtus terrestris* Schrank = *Mus arvalis* Pallas.

All of the voles collected by Dr. Abbott are members of the genus *Microtus*.

Subgenus **PHAIOMYS** Blyth.

1863. *Phaiomys* Blyth, Journ. Asiat. Soc. Bengal, xxxii, p. 89. Type  
*Phaiomys leucurus* Blyth = *Arvicola blythi* Blanford.

The subgenus *Phaiomys* is represented in Dr. Abbott's collection by one species only.

**Microtus blythi** Blanford.

1863. *Phaiomys leucurus* Blyth, Journ. Asiat. Soc. Bengal, xxxii, p. 89. (Not *Arvicola leucurus* Gerbe, 1862.)  
1875. *Arvicola blythi* Blanford, Journ. Asiat. Soc. Bengal, xlv, pt. ii, p. 107.  
1891. *Microtus blythi* Blanford, Fauna of British India, Mammalia, p. 432.

*Type locality*.—Between Spiti and Pankong lake, eastern Kashmir.

*Specimens collected by Dr. Abbott*.—Thirty-four (twenty skins, fourteen in formalin). The specimens were all taken in Ladak, where Dr. Abbott found the species the most abundant vole, common on all grassy plains bordering lakes and streams between the

altitudes of 14,000 feet and 16,000 feet. The following are the exact localities represented:

Tsokr Chumo (lake), 15,000 feet.

Rupchen, Rupshu, 15,000 feet.

Ooti, Rupshu, 15,500 feet.

Rupshu, 16,000 feet.

Hanle district, 16,000 feet.

Banks of Hanle river, 15,000 feet.

Chibra, Hanle river, 14,000 feet.

West side of Pognor lake, 16,000 feet.

Above Tsomoriri lake, 16,000 feet.

Karzok, Tsomoriri, altitude not stated.

*Color*.—The series of skins shows no considerable variation in color. In summer pelage the back is light woodbrown, strongly tinged with yellowish, and very faintly darkened by an even sprinkling of long blackish hairs, which in many specimens are more noticeable on neck and region behind shoulders than elsewhere. Sides clear buff; belly like sides, but paler and irregularly clouded by the appearance on the surface of the dark underfur. Tail pale buff, slightly paler below. Feet dirty white. The autumn coat, which is beginning to appear in specimens taken late in August and early in September, is slightly less yellow. Half-grown young are duller and browner than the adults. These immature specimens show a more strongly contrasted (though actually duller) buffy lateral area.

*Feet*.—Both palms and soles are 5-tuberculate. On the soles a rudimentary sixth tubercle is distinguishable in two quarter-grown individuals preserved in formalin.

*Mammæ*.—On the label of an adult female taken above Tsomoriri, July 31, 1897, Dr. Abbott records the number of mammaræ as four pectoral and four inguinal. I find a like number in each of two females preserved in formalin.

*Skull*.—The series of fifteen perfect adult skulls shows the slight range of individual variation usually met with in species of *Microtus*. The most variable characters appear to be the form of the interparietal, the extent of the constriction near the middle of the nasals, the extent of the forward projection of the upper incisors, and the size of the audital bullæ. The development of the audital

bullæ appears to be less in the females, since I find it possible to select the majority of the female skulls in the series by reference to this character alone.

Average measurements of five fully adult skulls: greatest length, 29 (28.4–30); basal length, 27.9 (27.6–28.8); basilar length, 26.7 (26–27.4); zygomatic breadth, 18.5 (18–19); mastoid breadth, 15.2 (15–15.6); interorbital constriction, 4; nasals, 7.7 (7.4–8); diastema, 9.3 (9–9.6); palatal length, 15.7 (15–16); occipital depth (in median line), 8.1 (7.6–8.6); fronto-palatal depth (at middle of molar series), 9.1 (9–9.4); mandible, 18.5 (18–19); maxillary toothrow (alveoli), 7; mandibular toothrow (alveoli), 7.

*Teeth.*—The enamel pattern is remarkably constant. The last loop of the posterior upper tooth is occasionally somewhat more abruptly curved than usual on the outer side so that the last salient angle is cut off as a rudimentary closed triangle. The variation necessary to bring about this result is, however, very trifling. In the front lower molar the exact form of the anterior loop varies slightly, but in none of the twenty specimens is a fourth triangle isolated.

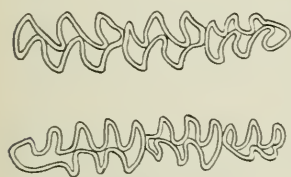


FIG. 1. Enamel pattern of *Microtus blythi*. ( $\times 6$ .)

*Remarks.*—This species is very closely related to *Microtus strauchi* Büchner. A specimen of the latter from northern Thibet agrees with *M. blythi* in all particulars except its conspicuously shorter tail.

*Measurements.*—The measurements of nineteen specimens of *Microtus blythi* are given in the following table:

*Measurements of Microtus blythi.*

(In millimetres.)

LOCALITY.	Number.	Sex.	Head and Body. <sup>1</sup>	Tail Vertebra. <sup>1</sup>	Hind Foot (with claws).	Hind Foot (without claws).	Ear from Meatus.	Width of Ear.
Tsokr Chumo, Ladak.....	84,032	♂	123.8	34.9	22	20	11	12
Tsokr Chumo, Ladak.....	84,035	♂	120.7	31.8	23	20.4	12	12
Tsokr Chumo, Ladak.....	84,036	♂	117.5	31.8	23	20	10	10
Rupchen, Rupshu, Ladak..	84,042	♂	....	....	23	21	12	10.4
Chibra, Hanle river, Ladak.	84,045	♂	117.5	38	22	19.6	11.4	11
West side of Pognor lake, Ladak.....	84,048	♂	117.5	35	22	19.8	11	11
Ooti, Rupshu, Ladak.....	84,052	♂	130	31.8	21	19	11.4	11
Tsokr Chumo, Ladak.....	84,031	♂	117.5	31.8	22	20	11	10.6
Tsokr Chumo, Ladak.....	84,033	♂	121	31.8	21	18.8	12.6	12
Tsokr Chumo, Ladak.....	84,034	♂	114	31.8	21.8	19	11.4	11
Tsokr Chumo, Ladak.....	84,037	♂	117	38	23	20.4	12	12
Rupshu, Ladak.....	84,040	♂	117	31.8	20	18	11	10
Rupchen, Rupshu, Ladak..	84,041	♂	102	31.8	22	20	10	10
Hanle district, Ladak.....	84,046	♂	117	31.8	21	18.4	10.4	10
Hanle district, Ladak.....	84,047	♂	121	31.8	20.4	18.8	11	11
West side of Pognor lake, Ladak.....	84,049	♀	129	29	20.4	18	11	10
Ooti, Rupshu, Ladak.....	84,051	♀	....	....	22	19	10	11
Above Tsomoriri lake, La- dak.....	84,055	♀	114	35	21	18.6	11	10.6
Banks of the Hanle river, Ladak.....	84,044	..	121	31.8	20	18	10	10

Subgenus **MICROTUS** Schrank.

1798. *Microtus* Schrank, Fauna Boica, i, p. 72. Type by elimination  
*Microtus terrestris* Schrank = *Mus arvalis* Pallas.

Dr. Abbott collected two species of the subgenus *Microtus*, one in eastern Turkestan, the other in the Pamir. Neither has hitherto been described.

***Microtus ravidulus* sp. nov.**

Type adult ♀ (skin and skull), No. 62,159, United States National Museum, collected at Okchi, valley of the Aksai (altitude, 7000 feet), eastern Turkestan, November 7, 1893, by Dr. W. L. Abbott.

<sup>1</sup> Collector's measurement.

*General characters.*—In general appearance much like *Microtus arvalis* from Braunschweig, Germany, but tail shorter, fur longer and coarser, color paler, and skull longer and narrower. Enamel pattern as in *M. arvalis*. Mammaræ, 8; plantar tubercles, 6; hip glands conspicuous.

*Fur and Color.*—The fur is harsh and coarse, that on middle of back about 12 mm. in length. It is everywhere dark slaty plumbeous at base.

Ground color of dorsal surface buff, faintly tinged with wood-brown and coarsely 'lined' with blackish brown. Sides clear pale buff. Ventral surface creambuff much darkened, especially anteriorly, by the plumbeous bases of the hairs. Tail indistinctly bicolor, soiled whitish below, brownish above. Feet dirty white.

*Feet.*—Palms with five tubercles, soles with six; all well developed. Soles densely hairy behind tubercles.

*Mammaræ.*—Mammaræ eight, four pectoral and four inguinal, as usual in the subgenus *Microtus*.

*Skull.*—The skull of *Microtus ravidulus*, though of the same type as that of *M. arvalis* from Germany, is readily distinguishable by its slightly greater length, and by the narrowness and great depth of the braincase. The form of the braincase is much like that of *M. (Pedomys) austerus*. Interorbital constriction narrow, the constricted region unusually long. Zygomatic arches not widely flaring, the outer borders nearly parallel (not strongly convergent anteriorly as in *M. arvalis*) in the region opposite post-orbital processes. Rostrum heavier than in *M. arvalis*, but not conspicuously different in form. Audital bullæ slightly larger than in *M. arvalis*. Mandible similar to that of *M. arvalis*, but larger and with more slender angular process.

Average measurements of three adult skulls: greatest length, 26.3 mm. (26–26.6); basal length, 25.1 (25–25.4); basilar length, 23.4 (23–23.6); zygomatic breadth, 14.4 (14–14.6); mastoid breadth, 11.6 (11.4–12); interorbital constriction, 3; nasals, 7; diastema, 8; palatal length, 14; occipital depth, 8; fronto-palatal depth (at middle of molar series), 8.1 (8–8.4); mandible, 16.1 (16–16.4); maxillary tooth row (alveoli), 6; mandibular tooth row (alveoli), 6.

*Teeth.*—The teeth of *Microtus ravidulus* are relatively slightly

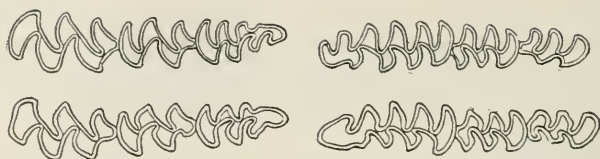


FIG. 2. Enamel pattern of *Microtus ravidulus* (upper figures) and *M. pamirensis* (lower figures). ( $\times 6$ .)

larger than in *M. arvalis*, but the enamel pattern in the two species is identical.

*Specimens examined*.—Five, all from the type locality.

*Remarks*.—Although a member of another subgenus, *Microtus ravidulus* bears a strong superficial resemblance to *M. blythi*. The colors of the two species are almost precisely the same, but *M. ravidulus*, aside from its subgeneric characters, can be distinguished by the dark dorsal surface of the tail, coarser fur, and more conspicuous dark ‘lining’ of back.

The four skins show no important variations in color.

*Microtus ravidulus* is closely related to *M. tianschanicus* Büchner from the Juldus Valley. In size, color and cranial characters the two species apparently agree perfectly; but the five specimens of *M. ravidulus* have the front lower molar of *M. arvalis* instead of the very peculiar tooth described and figured by Büchner as occurring without exception in the seven specimens of *M. tianschanicus* collected by Przewalski. In only one of the latter is there a faint trace of a fourth outer salient angle; and this tooth is specially figured as abnormal. Although both animals occur on the south side of the great Tianschan mountain chain, they are some four hundred miles apart, and probably completely insulated by the Chalyk and Bescham mountains, which would undoubtedly act as barriers to austral species.

Dr. Abbott tells me that this vole was abundant in the grain fields of the comparatively low, fertile valley about Okchi. It occurred together with a species of *Cricetulus*, and one or both of the animals laid up abundant underground stores, each containing about a pint of barley heads. Strangely enough, this habit was not known to the owners of the fields.

<sup>2</sup> Wissensch. Resultate der von N. M. Przewalski nach Central-Asien untern. Reisen, Zoolog. Theil, Bd. i, Säugethiere, p. 107, 1889.



*Measurements.*—The measurements of four adult specimens of *Microtus ravidulus* are given in the following table:

*Measurements of Microtus ravidulus.*

LOCALITY.	Number.	Sex.	Head and Body. <sup>3</sup>	Tail Vertebre. <sup>3</sup>	Hind Foot (with claws).	Hind Foot (without claws).	Ear from Meatus.	Width of Ear.
Okchi, valley of the Aksai, eastern Turkestan.....	62,157	♂	105	29	18.4	16.8	11	11.4
Okchi, valley of the Aksai, eastern Turkestan.....	62,158	♀	121	32	18	16	10	11
Okchi, valley of the Aksai, eastern Turkestan.....	62,159 <sup>4</sup>	♀	121	38	18	16.4	11	12
Okchi, valley of the Aksai, eastern Turkestan.....	62,160	♀	121	32	18	16.6	12	13

*Microtus pamirensis* sp. nov.

*Type* adult ♂ (skin and skull), No. 62,161, United States National Museum, collected at Tagdumbash, Pamir (altitude 12,000 feet), June 18, 1894, by Dr. W. L. Abbott.

*General characters.*—Size medium; tail short; ears moderate, scarcely overtopping fur; color uniform pale brown above, whitish below; skull heavily built and angular; upper incisors conspicuously protruding; two anterior triangles in first lower molar open; posterior loop of back upper molar nearly straight.

*Fur and color.*—The fur is full and soft, that on middle of back about 12 mm. in length. It is everywhere slategray at base.

Color of dorsal surface light broccolibrown, very uniform and only inconspicuously sprinkled with darker hairs. Ventral surface grayish white, strongly clouded anteriorly by the dark bases of the hairs. Feet whitish. Tail whitish with a very inconspicuous dusky dorsal stripe.

*Feet.*—The soles and palms were slit open by the collector, so that it is impossible to determine the number and position of the tubercles. Claws as in typical members of the subgenus *Microtus*.

*Skull.*—The skull of *Microtus pamirensis* is unlike that of any other true *Microtus* with which I am acquainted. In superficial

<sup>3</sup> Collector's measurement.

<sup>4</sup> Type.

appearance it strongly suggests an approach to *Phaiomys*. This is due chiefly to the protruding upper incisors and the short, strongly cuneate nasals. The whole skull is angular and heavily built, much broader than that of *M. arvalis*, from Germany, though of about the same length. Nasals shorter than in *M. arvalis*, and much broader anteriorly. Zygomatic arches strongly flaring anteriorly, nearly parallel in region opposite postorbital processes. Interparietal rectangular, the anteroposterior breadth about half the lateral breadth. Braincase squarish in outline, broader than in *M. arvalis*, but of about the same depth. Interorbital constriction relatively less narrow than in *M. arvalis*, but constricted region of about the same length. Palate normal, the lateral pits well developed, though shallower than in *M. arvalis*. Audital bullæ about the same size as in *M. arvalis*, but flatter. Incisive foramen considerably broader anteriorly than posteriorly.

Measurements of type skull: greatest length, 25; basal length, 14.6; basilar length, 14; zygomatic breadth, 16; mastoid breadth, 12.4; interorbital constriction, 3.8; length of nasals, 7; anterior breadth across nasals, 3.6; posterior breadth across nasals, 1; diastema, 8.8; palatal length, 14.4; occipital depth, 8; frontopalatal depth (at middle of molar series), 8; mandible, 17; maxillary toothrow (alveoli), 6.8; mandibular toothrow (alveoli), 6.6.

*Teeth.*—Attention has already been called to the strongly projecting upper incisors. The molars are heavier than in *M. arvalis*. In general appearance the enamel pattern is less compact than in *M. arvalis*, while the details in the two species differ considerably. The posterior upper molar contains an anterior transverse loop, a small outer closed triangle, a larger one on the inner side, and a long terminal longitudinal loop provided with a well-developed salient angle on each side anteriorly. Behind each of these salient angles is a rounded reëtrant angle. As the inner of these salient angles and its corresponding reëtrant angle are the more strongly developed as well as the more posterior in position the terminal loop is bowed very slightly inward. It is, however, essentially straight as compared with the corresponding region in *M. arvalis*. Middle upper molar tetramerodont. The front lower molar contains the same elements as in *M. arvalis*, but the two anterior triangles open freely into the terminal loop. This character may prove to be individual, though I am inclined to believe that it is



normal. The enamel pattern of the remaining teeth is like that of *M. arvalis*.

*Specimens examined*.—Dr. Abbott collected only one specimen of this species.

*Remarks*.—*Microtus pamirensis* differs too widely from any described form to require detailed comparison.

*Measurements*.—Head and body, 105; tail vertebræ, 34; pencil, 4; hind foot with claws, 18; hind foot without claws, 16; ear from meatus, 12; width of ear, 13.8.

**Subgenus HYPERACRIUS** Miller.

1896. *Hyperacrius* Miller, North American Fauna, No. 12, p. 54.  
July 23, 1896. Type *Arvicola fertilis* True.

During his first and second visits to Kashmir, Dr. Abbott collected the five specimens that subsequently formed the basis of the descriptions of *Microtus fertilis* and of the subgenus *Hyperacrius*. During his last expedition he obtained another specimen which differs so considerably from those previously collected that it must be regarded as the representative of an undescribed species. The three species of *Hyperacrius* now known may be recognized by the following characters:

**KEY TO SPECIES OF HYPERACRIUS.**

Hind foot (with claws) 19; upper tooth row 7.

*M. aitchisoni* Miller.<sup>5</sup>

Hind foot (with claws) 16–18; upper tooth row 6.

Ear from meatus 10–11. . . . . *M. fertilis* (True).

Ear from meatus 7.8. . . . . *M. brachelix* sp. nov.

***Microtus fertilis* (True).**

1894. *Arvicola fertilis* True, Proc. U. S. National Museum, xvii, p. 10.  
May 8, 1894.

1896. *Microtus fertilis* Miller, North American Fauna, No. 12, p. 55.  
July 23, 1896.

*Type locality*.—Pir Panjal range, Kashmir. Altitude, 8,500 feet.

*Specimens collected*.—Dr. Abbott has taken no specimens of this species in addition to the original series of five skins procured during his first and second visits to Kashmir. These were taken at the following localities:

Pir Panjal range, 8,500 feet.

<sup>5</sup> Proc. Biolog. Soc. Washington, xi, p. 141. May 13, 1897. From Gulmerg, Kashmir. Type in British Museum.

Kaj Nag mountains, 8,000 feet.

Krishnagunga valley, 7,000 feet.

Central Kashmir, 12,000 feet.

This species occurs in the mountain parks well below timber line. From the information given me by Dr. Abbott I should suppose that its faunal position is lower boreal. In the middle boreal and upper boreal it is replaced by members of the subgenera *Phaiomys* and *Alticola*.

*Color*.—The five skins show no marked variation in color. In all, the entire dorsal surface is a fine grizzle of dull woodbrown and sealbrown, the result of which is a general tint not far from sepia.

Such variation as occurs is due to slight differences in the balance between the component colors. On the sides and belly the sealbrown disappears, and the woodbrown changes to a yellowish clay color, varying slightly in intensity and in the amount of clouding due to the dark bases of the hairs. Tail obscurely bicolor, sepia above, dirty whitish beneath. Feet dusky sepia, varying considerably in depth; occasionally almost blackish.

*Skull*.—Three skulls show little variation beyond that due to differences in age. The skull of the type is the oldest and most

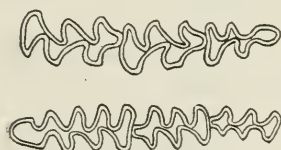


FIG. 3. Enamel pattern of *Microtus fertilis*. ( $\times 6$ .)

angular. It measures: greatest length, 24.6; basal length 24; basilar length, 23; zygomatic breadth, 16; mastoid breadth, 12.4; interorbital constriction, 3.8; length of nasals, 8; anterior breadth across nasals, 3.2; posterior breadth across nasals, 0.5; diastema, 9; palatal length, 14; occipital depth, 7; fronto-palatal depth (at middle of molar series), 7; mandible, 16; maxillary toothrow (alveoli), 6.4; mandibular toothrow (alveoli), 6.2.

*Measurements*.—For measurements, see table, p. 291.

*Microtus brachelix* sp. nov.

*Type* young adult ♀ (skin and skull), No. 63,445, United States National Museum, collected at Nagmarg, Kashmir (altitude, 9,000 feet), November 15, 1895, by Dr. W. L. Abbott.

*General characters*.—Precisely similar to *Microtus fertilis* (True), but with much smaller ears.

*Fur and color*.—In length and quality of fur as well as in color

the types of *Microtus fertilis* and *M. brachelix* resemble each other so exactly that it would be difficult to find two skins more perfectly alike.

*Ears*.—The ears are small, much overtopped by the surrounding fur, while in *M. fertilis* they are about equal to the fur in length. The reduction in height is especially noticeable along the upper edge of the anterior border, which is reduced to the merest rim.

*Skull and teeth*.—In cranial and dental characters *Microtus brachelix* agrees perfectly with *M. fertilis*.

*Remarks*.—I should hesitate to separate *Microtus brachelix* from *M. fertilis* on the single character of the size of the ears, did not the five specimens of the latter show perfect uniformity among themselves. Even in a half-grown specimen of *M. fertilis* the ears are much larger than in the type of *M. brachelix*.

*Measurements*.—The measurements of the type of *Microtus brachelix* and of five specimens of *M. fertilis* are given in the following table:

*Measurements of Microtus fertilis and M. brachelix.*

(In millimetres.)

NAME.	LOCALITY.	Number.	Sex.	Head and Body. <sup>5</sup>	Tail Vertebrae. <sup>6</sup>	Hind Foot (with claws).	Hind Foot (without claws).	Ear from Meatus.	Width of Ear.
<i>Microtus fertilis</i> .....	Pir Panjal mountains, Kashmir.....	20,148	♂	86	35	16	14	10	10
<i>Microtus fertilis</i> .....	Krishnagunga valley, Kashmir.....	21,690	♂	105	25	17	15	9.8	9
<i>Microtus fertilis</i> .....	Kaj Nag mountains, Kashmir.....	59,293	♂	108	..	16.6	14.6	10	9.6
<i>Microtus fertilis</i> .....	Central Kashmir....	20,146	♀	114	21	17	15	10	9
<i>Microtus fertilis</i> .....	Pir Panjal mountains, Kashmir.....	20,147 <sup>7</sup>	♀	114	27	17	15.6	11	11
<i>Microtus brachelix</i> .....	Nagmarg, Kash- mir.....	63,445 <sup>7</sup>	♀	95	35	18	16	7.8	9.

Subgenus **ALTICOLA** Blanford.

1884. *Alticola* Blanford, Journ. Asiat. Soc. Bengal, 1, pt. ii, p. 84.

Type *Arvicola stoliczkanus* Blanford.

Seven species of the compact and well-defined subgenus *Alticola*

<sup>6</sup> Collector's measurement.

<sup>7</sup> Type.

have thus far been described, two of them based on material obtained by Dr. Abbott during his first visit to Baltistan and Kashmir. While in Ladak during 1893 and 1897 Dr. Abbott secured two additional species, both of which appear to be undescribed. The species now known, with their type localities, are as follows:

1. *MICROTUS ROYLEI* (Gray). (Kashmir.)

1842. *Arvicola roylei* Gray, Ann. and Mag. Nat. Hist., x, p. 265. December, 1842.

1891. *Microtus roylei* Blanford, Fauna of British India, Mammalia, p. 430.

2. *MICROTUS STOLICZKANUS* Blanford. Ladak, near headwaters of the Yarkand river.

1875. *Arvicola stoliczkanus* Blanford, Journ. Asiat. Soc. Bengal, xliv, pt. ii, p. 107.

1891. *Microtus stoliczkanus* Blanford, Fauna of British India, Mammalia, p. 430.

3. *MICROTUS STRACHEYI* (Thomas). Kumaun.

1880. *Arvicola stracheyi* Thomas, Ann. and Mag. Nat. Hist., 5th ser. vi, p. 322. October, 1880.

1891. *Microtus stracheyi* Blanford, Fauna of British India, Mammalia, p. 431.

4. *MICROTUS BLANFORDI* (Scully). Gilgit.

1880. *Arvicola blanfordi* Scully, Ann. and Mag. Nat. Hist., 5th ser., vi, p. 399. November, 1880.

1891. *Microtus blanfordi* Blanford, Fauna of British India, Mammalia, p. 432.

5. *MICROTUS WYNNEI* Blanford. Murree.

1880. *Arvicola wynnei* Blanford, Journ. Asiat. Soc. Bengal, xlix, pt. ii, p. 244.

1891. *Microtus wynnei* Blanford, Fauna of British India, Mammalia, p. 431.

6. *MICROTUS MONTOSUS* (True). Central Kashmir.

1894. *Arvicola montosa* True, Proc. U. S. National Museum, xvii, p. 11. May 8, 1894.

7. *MICROTUS ALBICAUDA* (True). Braldu valley, Baltistan.

1894. *Arvicola albicauda* True, Proc. U. S. National Museum, xvii, p. 12. May 8, 1894.

1896. *Microtus albicauda* Miller, North American Fauna, No. 12, p. 54. July 23, 1896.

8. *MICROTUS CRICETULUS* sp. nov. Banks of the Tso Kyun, Ladak.

9. *MICROTUS ACROPHILUS* sp. nov. (Ladak side of Kara Korum Pass.)

These nine species may be distinguished by the following characters:

KEY TO SPECIES OF *ALTICOLA*.<sup>8</sup>

Under parts dark.

m 3 with 4 salient angles. . . . . *Microtus wyneui*.

m 3 with 6 salient angles.

Hind foot, 22 mm. . . . . *Microtus roylei*.

Hind foot, 20 mm. . . . . *Microtus montosa*.

Under parts whitish.

Back bright ferruginous brown . . . . *Microtus stoliczkanus*.

Back gray or pale fawn.

Tail vertebrae over 45 mm. . . . . *Microtus blanfordi*.

Tail vertebrae under 40 mm.

m 3 with 6 salient angles.

m 1 with 10 salient angles. . . . . *Microtus stracheyi*.

m 1 with 8 salient angles. . . . . *Microtus albicauda*.

m 3 with 5 salient angles.

Teeth heavy; posterior loop of m 3 forming much less than half of crown. . . . . *Microtus acrophilus*.

Teeth light; posterior loop of m 3 forming at least half of crown. . . . . *Microtus ericetulus*.

*Microtus montosus* (True).

1894. *Arvicola montosa* True, Proc. U. S. National Museum, xvii, p. 11. May 8, 1894.

*Type locality*.—Central Kashmir. Altitude, 11,000 feet.

*Specimens collected*.—Dr. Abbott obtained only one specimen of this species, the type, a half-grown male.

*Remarks*.—*Microtus montosus* is very doubtfully distinct from *M. roylei*, also from Kashmir. The type and only known specimen is young—scarcely more than half-grown—so that its true characters cannot be determined with certainty; but I am unable to see that it differs from *M. roylei*, as described by Blanford, in any way not to be accounted for by its immaturity.

<sup>8</sup> In part compiled from Blanford's papers on the group.



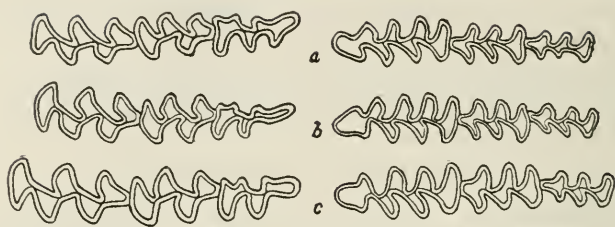


FIG. 4. Enamel pattern of *Microtus albicauda* (a), *M. cricetulus* (b), and *M. acrophilus* (c). ( $\times 6$ .)

***Microtus albicauda* (True).**

1894. *Arvicola albicauda* True, Proc. U. S. National Museum, xvii, p. 12. May 8, 1894.

1896. *Microtus albicauda* Miller, North American Fauna, No. 12, p. 54. July 23, 1896.

*Type locality*.—Braldu valley, Baltistan.

*Specimens collected*.—Dr. Abbott took only one specimen of *Microtus albicauda*.

*Skull*.—The skull of the type measures: greatest length, 26.4; basal length, 24.4; basilar length, 23; zygomatic breadth, 15; mastoid breadth, 13.4; interorbital constriction, 4.4; length of nasals, 7.8; anterior breadth across nasals, 3.8; posterior breadth across nasals, 1.8; diastema, 7.8; palatal length, 12.6; occipital depth, 7.6; fronto-palatal depth (at middle of molar series), 7; mandible, 16; maxillary tooth row (alveoli), 6.6; mandibular tooth row (alveoli), 6.4.

*Remarks*.—*Microtus albicauda* is apparently most closely related to *M. stracheyi* and *M. cricetulus*. With both of these it agrees in color and in general size. From the former it is separable by its simpler m 1, from the latter by its more complex m 3, longer tail and more lightly built skull. From *M. blanfordi* it is distinguishable at a glance by its shorter, more closely haired, entirely white tail.

*Measurements*.—For measurements of *Microtus albicauda* see table, p. 298.

***Microtus cricetulus* sp. nov.**

*Type* adult ♂ (skin and skull), No. 84,043, United States National Museum, collected on the banks of the Tso Kyun, Ladak (altitude, 16,000 feet), August 11, 1897, by Dr. W. L. Abbott.

*General characters*.—Similar to *Microtus albicauda* (True), but with more heavily built skull and much shorter tail.



*Fur and color.*—Fur full and soft, that on middle of back 10 mm. to 13 mm. in length.

Dorsal surface pale smokegray, strongly tinged with woodbrown and faintly darkened by a sprinkling of blackish hairs. Ventral surface of body and back of feet pure white, irregularly clouded by the plumbeous bases of the hairs. A narrow lateral line extending down hind legs to ankles, crossing buttocks, and including whole of tail, pale creambuff. Front legs white.

*Ears.*—The ears are well developed, slightly overtopping the fur. They show no peculiarities in form.

*Feet.*—Palms with five tubercles, soles with six; all well developed. Soles densely furred behind tubercles.

*Skull.*—The skull of *Microtus cricetulus* is in all respects that of a typical *Alticola*. The brain case is rounded in outline when viewed from above, the interorbital region is broad, with a distinct median furrow, and the nasals are very large. Postorbital processes small but distinct. Viewed from the side, the skull is strongly cuneate in outline, owing to the nearly flat dorsal profile, deep brain case, prominent audital bullæ, and slender rostrum. It differs from the skull of *M. albicauda*, its nearest ally, in slightly larger size, a little more highly arched brain case, and in the larger size and more anterior position of the rostral protuberances. The nasal branches of the premaxillaries are narrower than in *M. albicauda*. They terminate on a line with the posterior extremity of the nasals, while in *M. albicauda* they extend considerably behind the nasals.

Measurements of type skull: greatest length, 28; basal length, 26.6; basilar length, 25; zygomatic breadth, 16; mastoid breadth, 13.4; interorbital constriction, 4; length of nasals, 9; anterior breadth across nasals, 4; posterior breadth across nasals, 2; diastema, 9; palatal length, 13.4; occipital depth, 8; fronto-palatal depth (at middle of molar series), 7; mandible, 17; maxillary tooth row (alveoli), 6; mandibular tooth row (alveoli), 6.

*Teeth.*—Both upper and lower incisors are very pale yellow on their anterior faces, contrasting strongly with the deep orange incisors of *M. albicauda*. Molars noticeably heavier than in *M. albicauda*, but enamel pattern, with a single exception, exactly the same. In *M. albicauda* the inner base of the posterior loop of the back upper molar is produced into a conspicuous salient angle. In

*M. cricetulus* this angle is completely absent, no trace of it appearing in any of the four specimens. The character, however, may prove to be inconstant when large series of specimens are available for comparison.

*Specimens examined*.—Four, from the following localities in Ladak:

Banks of the Tso Kyun, Rupshu, 16,000 feet.

Above Kiangchu Maidar, Rupshu.

Rupshu, 16,000 feet.

*Measurements*.—For measurements of *Microtus cricetulus* see table, p. 298.

*Microtus acrophilus* sp. nov.

*Type* adult ♀ (skin and skull) No. 62,162, United States National Museum, collected on the Ladak side of the Kara Korum Pass (altitude 17,000 feet) July 25, 1893, by Dr. W. L. Abbott.

*General characters*.—Closely related to *Microtus stoliczkanus* Blanford, but with shorter tail and much paler color.

*Fur and color*.—Fur full and soft, about 15 mm. long on middle of back. Basal two-thirds of hairs slaty plumbeous, slightly paler than in *Microtus albicauda* and *M. cricetulus*. On the dorsal surface the plumbeous basal area is followed by a broad band of pinkish buff which gives the general tone to the pelage. Throughout the dorsal surface the fur is sprinkled with longer dark brown hairs, but these are nowhere conspicuous. The buff is brightest on the head and lumbar region, paler and grayer across shoulders, along sides and on rump. Belly snowy white, much clouded by the plumbeous under fur. Feet and tail dirty white.

*Ears*.—The ears are of about the same size as in *M. cricetulus*, but owing to the longer surrounding fur they appear much shorter and less conspicuous.

*Feet*.—Palms 5-tuberculate; soles 6-tuberculate. All tubercles very large. Soles densely hairy behind tubercles.

*Mammæ*.—Mammæ eight, four pectoral and four inguinal.

*Skull*.—The skull of *Microtus acrophilus* is similar in general form to that of *M. albicauda* and *M. cricetulus*, but is slightly larger than either, and much more massively built. Zygomatic arches shorter, and rostrum broader and deeper than in *M. albi-*

*cauda* or *M. cricetulus*. Nasal branches of premaxillaries narrow, scarcely reaching posterior edge of nasals. Mandible larger than in *M. cricetulus*, but with much more slender angular process.

Measurements of type skull: greatest length, 28; basal length, 27; basilar length, 25.4; zygomatic breadth, 16.4; mastoid breadth, 13; interorbital constriction, 5; length of nasals, 8.8; anterior breadth across nasals, 3.8; posterior breadth across nasals, 2; diastema, 8.8; palatal length, 14; occipital depth, 8.4; fronto-palatal depth (at middle of molar series), 7.4; mandible, 18; maxillary tooththrow (alveoli), 7; mandibular tooththrow (alveoli), 6.8.

*Teeth*.—Incisors pale yellow as in *M. cricetulus*. Molars much heavier than in *M. cricetulus*, but enamel pattern exactly similar.<sup>9</sup> The salient angles are, however, less acute, and the terminal loop of the posterior upper molar forms less than half of the length of the tooth crown instead of slightly more than half as in *M. albi-cauda* and *M. cricetulus*.

*Specimens examined*.—Dr. Abbott took only one specimen of *Microtus acrophilus*. On the label he writes: "Vast numbers inhabit the cliff of conglomerate at sides of the nullah, issuing forth at evening. Country absolutely destitute of vegetation."

*Remarks*.—This species is closely related to *Microtus stoliczkanus*, but is readily distinguishable by its short tail and very pallid color.

*Measurements*.—The measurements of the type of *Microtus acrophilus* are given in the accompanying table:

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<sup>9</sup> The front lower molar in each jaw is imperfect anteriorly.

Table of Measurements of Specimens of *Alticola*.

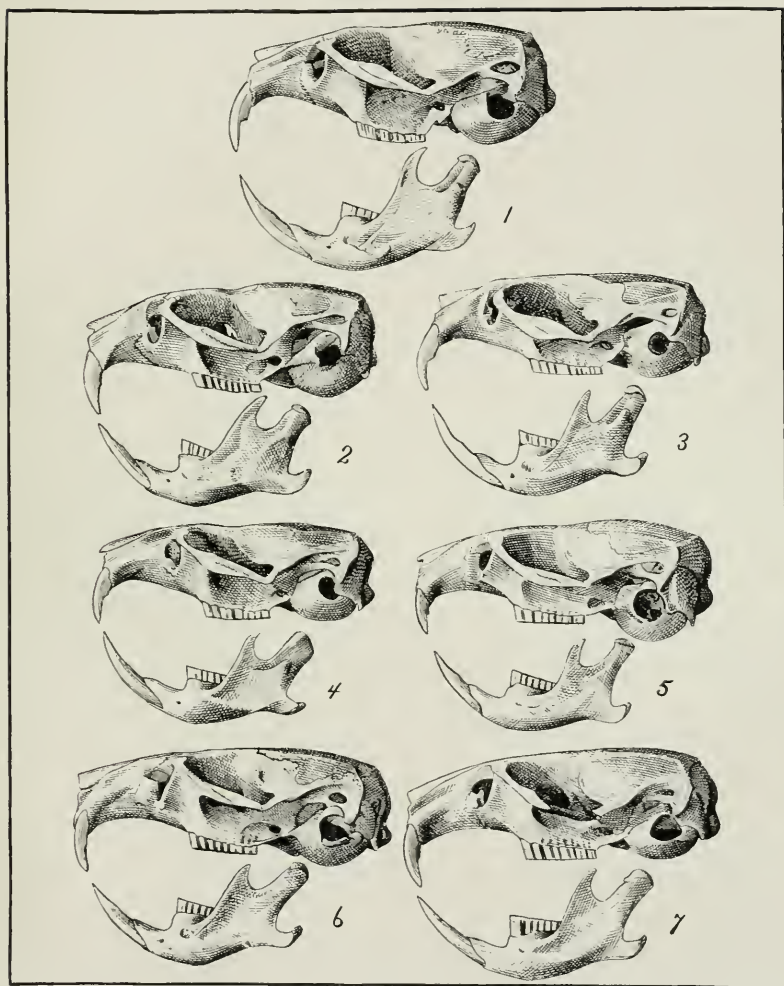
NAME.	LOCALITY.	Number.	Sex.	Head and Body. <sup>11</sup>	Tail Vertebrae. <sup>11</sup>	Hind Foot (with claws).	Hind Foot (without claws).	Ear from Meatus.	Width of Ear.
<i>Microtus montosus</i> .....	Central Kashmir...	20,145 <sup>10</sup>	♂	92 32		20	18	11	11.5
<i>Microtus albicauda</i> .....	Braldu valley, Baltistan.....	20,393 <sup>10</sup>	♀	108 32 <sup>12</sup>		19.8	18	14	13
<i>Microtus cricetulus</i> .....	Rupshu, Ladak....	84,038	♂	111 22		19	17.6	14.6	14
<i>Microtus cricetulus</i> .....	Rupshu, Ladak....	84,039	♀	121 22		19.8	18	14	14
<i>Microtus cricetulus</i> .....	Banks of Tso Kyun, Ladak.....	84,043 <sup>10</sup>	♂	127 22 <sup>13</sup>		20	18.6	14	14
<i>Microtus cricetulus</i> .....	Above Kiangchu Maidar, Ladak..	84,050	♀	111 22		19.6	17.6	14.4	14
<i>Microtus acrophilus</i> .....	Ladak side of Kara Korum pass.....	62,162 <sup>10</sup>	♀	121 18.6 <sup>14</sup>		20	19	14.6	14

## EXPLANATION OF PLATES XI AND XII.

(All figures  $\times 1\frac{1}{2}$ .)

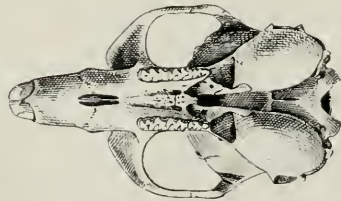
- Fig. 1. *Microtus (Phaiomys) blythi* Blanford.  
(No. 84,036, U. S. National Museum.)
- Fig. 2. *Microtus (Microtus) ravidulus* sp. nov.—Type.  
(No. 62,159, U. S. National Museum.)
- Fig. 3. *Microtus (Microtus) pamirensis* sp. nov.—Type.  
(No. 62,161, U. S. National Museum.)
- Fig. 4. *Microtus (Hyperacrius) fertilis* (True)—Type.  
(No. 35,510, U. S. National Museum.)
- Fig. 5. *Microtus (Alticola) albicauda* (True)—Type.  
(No. 63,816, U. S. National Museum.)
- Fig. 6. *Microtus (Alticola) cricetulus* sp. nov.—Type.  
(No. 84,043, U. S. National Museum.)
- Fig. 7. *Microtus (Alticola) acrophilus* sp. nov.—Type.  
(No. 62,162, U. S. National Museum.)

<sup>10</sup> Type. <sup>11</sup> Collector's measurement. <sup>12</sup> Pencil 12. <sup>13</sup> Pencil 12. <sup>14</sup> Pencil 10.

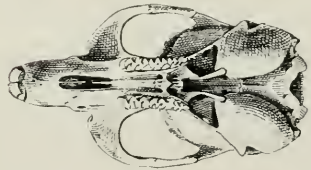


MILLER ON VOLES OF CENTRAL ASIA.

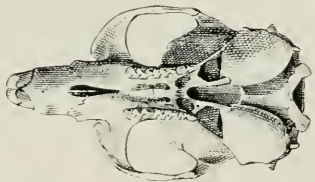




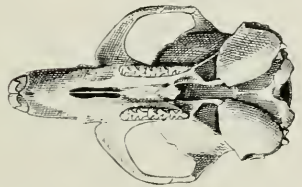
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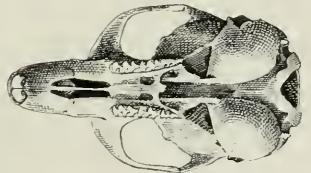
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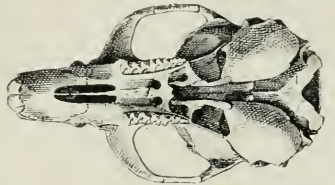
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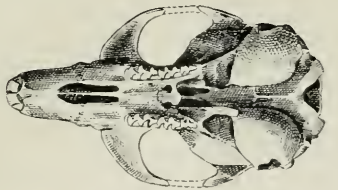
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5



6



7

