

NOTES ON THE ARCTIC RED-BACKED MICE.

BY GERRIT S. MILLER, JR.

“We challenge the proof that *Mus rutilus* is not a circumpolar species.” The view thus forcibly expressed by Dr. Elliott Coues twenty-one years ago¹ fairly represents current opinion in regard to the Arctic Red-backed Mice, at least so far as concerns those of Alaska and the Old World. From time to time during this period, *Evotomys rufocanus* has been recognized as a distinct form; but *Evotomys rutilus* is universally regarded as an exceptionally homogeneous and wide-ranging circumpolar species. Writing of the Red-backed Mice in 1897, Mr. Vernon Bailey says: “The only circumpolar species [of *Evotomys*] is the Arctic *E. rutilus*, which does not undergo any considerable change throughout the circumference of the Arctic zone.”²

A recent examination of the Arctic red-backed mice in the United States National Museum convinces me that the *Evotomys rutilus* of authors is far from the unvarying species that it has been represented. While the material at hand is too limited to form the basis of anything like a final revision, it clearly proves the distinctness of *Evotomys rufocanus*, and also the existence of three forms of so-called *rutilus*, one in the extreme north of Europe, one in Kamtschatka, and one in Alaska.

The *Mus rutilus* of Pallas came from Siberia immediately east of the Obi. As no specimens from this region are available for comparison, the question of the exact identity of the species must, for the time being, remain open. Geographical considerations lead me to apply the name *rutilus* provisionally to the most westerly of the Old World forms rather than to the one occurring in Kamtschatka. The latter is the *Arvicola vosnessenskii* of Polyakoff. Its identity with Richardson's *Arvicola rubricatus* from Bering Strait, is too uncertain to be worthy of serious consideration at present. The latter is described as slate color on the back, and nearly scarlet on the sides—a color pattern quite unknown in the genus *Evotomys*.

¹ Monogr. N. Am. Rodentia, p. 138.

² Proc. Biolog. Soc. Washington, XI, p. 113.

Even if it be assumed, as Baird has suggested,³ that the colors of the back and sides were accidentally transposed in Richardson's description, the case is not much helped, since no known member of the *rutilus* group has slate colored sides. Although Baird assumed that Richardson's animal came from Siberia, the statement in the original description that it "appears to be quite distinct from any American meadow mouse hitherto described," leads to the belief that the type locality was on the Alaskan side of the strait. The objections to applying the name to the Alaskan animal are, however, no less than in the case of the Kamtschatkan species.

The general characters of *Evotomys rufocanus*, and of the three species hitherto confused under the name *rutilus*, are given in the following synopsis:

Teeth large and heavy as in *Microtus* (never perfectly rooted?); molar rows about 6.5 mm.; posterior lower molar long, somewhat encapsulated; skull with prominent postorbital processes; sides clear gray (highly aberrant) *E. rufocanus*.

Teeth small and weak (perfectly rooted in adult); molar rows about 5 mm.; posterior lower molar short, not encapsulated; skull without prominent postorbital processes; sides strongly fulvous (typical *Evotomys*).

Skull narrow; rostral protuberances standing out conspicuously from root of zygoma (fig. 1 *a*); audital bullæ small; feet slender *E. wosnessenskii*.

Skull broad; rostral protuberances not standing out conspicuously from root of zygoma (fig. 1 *b*); audital bullæ large; feet broad.

Nasal bones short, contained 3½ times in greatest length of skull; tail 34–40 mm.; color generally chestnut

E. rutilus.

Nasal bones long, contained only 3 times in greatest length of skull; tail 20–30 mm.; color generally dull ferruginous. *E. alascensis*.

***Evotomys rufocanus* (Sundevall).**

1846. *Arvicola rufocanus* Sundevall, Oefv. Vet. Akad. Foerh., p. 122.

1897. *Evotomys rufocanus* Bailey, Proc. Biolog. Soc. Washington, XI, p. 122, May 13, 1897.

Skull.—The only skull of *Evotomys rufocanus* that I have at hand is badly damaged. Nevertheless it shows strong characters to dis-

³ Mam. N. Am., p. 551.

tinguish it from that of *E. rutilus*, or in fact from any other known member of the genus. The anterior edge of the squamosal is produced to form a very distinct postorbital process, quite as in many species of *Microtus*. The mandible is massively built and, like the skull, shows a degree of angularity more in keeping with *Microtus* than *Evotomys*. The palate, although damaged, appears to be that of typical *Evotomys*. Mr. Bailey says of this species: "*Evotomys rufocanus* (Sundevall) of northern Europe is remarkable for its large molars and almost microtine form of skull." He gives the following measurements of a skull from Lapland: basal length, 25 mm.; nasals, 7.6; zygomatic breadth, 15; mastoid breadth, 12.2; alveolar length of upper molar series 6.7.

Teeth.—The teeth of *Evotomys rufocanus* are chiefly remarkable for their large size and great strength. Their development relatively to the size of the skull is more in accord with the proportions normal in *Microtus* than in *Evotomys*. Apparently the molars do not develop as complete roots as in other species of *Evotomys*. The root of the lower incisor is nearly as long as in some species of *Microtus*, and the long back lower molar is encapsulated, though not conspicuously so. The enamel pattern (fig. 2 *d*) differs widely from that of *Evotomys rutilus* (fig. 2 *a*). Its most striking peculiarities are the simplicity of the posterior upper molar, and the shallow reentrant angles on the outer side of the posterior lower molar.

Color.—A specimen in fresh autumnal pelage has a well defined dorsal stripe of a color intermediate between the hazel and cinnamon rufous of Ridgway. This stripe begins between the eyes and extends back nearly to base of tail. Ears colored like dorsal stripe. Sides an indescribable grizzle of hair brown, whitish, black, and slate color. Whole under parts soiled buffy-white, darkened by the slaty bases of the hairs, which show through irregularly on the surface. Cheeks, muzzle, and sides of head similar to sides of body, but slightly darker. Tail sharply bicolor, brownish above, dirty white below. Feet dirty whitish.

General remarks.—Mr. Bailey has already called attention to the fact that *Evotomys rufocanus* "is the most divergent form of the genus known." So divergent is the animal that it may well be questioned whether it is to be regarded as a true *Evotomys*. Its heavy and apparently imperfectly rooted teeth more closely resemble those of many species of typical *Microtus* than they do the weak, perfectly rooted teeth of true *Evotomys*. The relationships of the

root of the lower incisor and the posterior lower molar, while not typical of either genus are clearly suggestive of *Microtus* rather than *Evotomys*. The palate structure, on the other hand, appears to agree with that of *Evotomys*. The question of the animal's true position cannot be answered until good series of specimens representing different ages are available for comparison.

***Evotomys vosnessenskii* (Polyakoff).**

1839. ?? *Arvicola rubricatus* Richardson, Zoölogy of Beechey's Voyage of the Blossom, p. 7 (Bering Strait).

1881. *Arvicola vosnessenskii* Polyakoff, Appendix to Volume XXXIX of the Memoirs of the St. Petersburg Academy of Sciences, p. 56 (text in Russian) Kamtschatka.

1884. *Arvicola vosnessenskii* Lataste, Ann. Mus. Civ. di St. Nat di Genova, XX, p. 28.

Skull.—The skull of *Evotomys vosnessenskii* as compared with that of *E. rutilus* and *E. alascensis* is slightly narrower and more depressed, though the differences in general form are not very striking. The anterior edges of the antorbital foramina are folded outward so as to form conspicuous swellings, which for want of a better name I have called rostral protuberances. These protuberances are apparently formed by the wall of a canal which takes a superficial downward course from the anterior edge of the antorbital foramen, and probably transmits a branch of the fifth nerve. In *Evotomys vosnessenskii* the rostral protuberances stand further forward from the bases of the zygomata than in *E. alascensis* (fig. 1). This

position as well as their large size makes them very conspicuous. Audital bullæ small, much smaller than in *E. rutilus* or *E. alascensis*, their greatest breadth about equal to alveolar length of maxillary tooth row. Mandible slender and lightly built, with weaker articular process and angular process than in the related species.

Measurements of an adult skull from Bering Island: greatest length, 24 mm.; basal length, 22.8; basilar length, 21; zygomatic breadth, 13.6; mastoid breadth, 11; interorbital constriction, 4; nasals, 7.8; incisive foramen, 5.6; diastema, 7.4; maxillary molar series (alveoli), 5; mandible, 13.8; mandibular molar series (alveoli), 5.

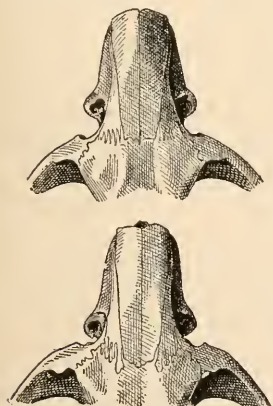


FIG. 1. Rostrum of *Evotomys vosnessenskii* (upper figure) and *E. alascensis* (lower figure). ($\times 3\frac{2}{3}$).

Teeth.—The teeth of *Evotomys wosnessenskii* (fig. 2 *b*) present no characters of special importance.

Ears.—The ears are slightly smaller than in *E. alascensis*, but not peculiar in form.

Feet.—The hind feet are slender and much less densely furred than in *E. alascensis*. The latter character at first sight appears to be due to season, as most of the National Museum specimens of *E. wosnessenskii* were taken in summer, while the Alaskan series is chiefly composed of October skins. Several of the Kamtschatkan specimens were, however, taken during the last week in September, and one as late as October 8th. In none of these does the hairiness of the hind foot closely approach the condition found in Alaskan specimens taken from three weeks to a month later.

Tail.—The tail is more slender than in *E. alascensis*, and less densely haired than in either *E. alascensis* or *E. rutilus*. The difference is fully apparent on comparison of specimens in winter pelage.

Color.—Autumnal specimens have the dorsal stripe a clear, deep, tawny, finely and inconspicuously sprinkled with black. Sides ochraceous buff. Belly dull whitish, faintly darkened by the slaty bases of the hairs. Summer adults are essentially similar, but immature specimens are much darker and duller.

Measurements.—For measurements of *Evotomys wosnessenskii* see table, page 366.

Specimens examined.—Total number of specimens examined 26, from the following localities:

Kamtschatka: Bering Island, 17; Kalakhtyrka, 1; Petropaulski, 6; no definite locality, 2.

General remarks.—*Evotomys wosnessenskii* is more distinct from *E. rutilus* and *E. alascensis* than either of these is from the other. Aside from its cranial characters it is easily distinguishable from its allies by its slender, thinly haired tail and feet.

Evotomys rutilus (Pallas).

1778. *Mus rutilus* Pallas, Nov. Sp., Quadr. Glir. Ord., p. 246 (Siberia, east of the Obi).

1874. *Evotomys rutilus* Coues, Proc. Acad. Nat. Sci. Philadelphia, p. 187, (part).

Skull.—In the north European *Evotomys* to which I have provisionally restricted the name *rutilus*, the skull closely resembles that of *E. alascensis*, except that the rostral protuberances are placed further forward, as in *E. wosnessenskii*, and the nasal bones are shorter relatively to the length of the skull. In *E. alascensis* the

nasal bones form about 33.3 percent of the occipitonasal length, while in *E. rutilus* they form about 28.5 percent only. The difference is due to the less backward extent of the nasals in *E. rutilus*, rather than to any actual shortening of the rostrum. Audital bullæ large and rounded as in *E. alascensis*, very different from those of *E. wosnessenskii*.

Measurements of an adult skull from Lapland: greatest length, 24 mm.; basal length, 22.4; basilar length, 20.6; zygomatic breadth, 13; mastoid breadth, 11.8; interorbital constriction, 4; nasals, 7; incisive foramen, 5; diastema, 7.4; maxillary molar series (alveoli), 5; mandible, 13.8; mandibular molar series (alveoli), 5.

Teeth.—The teeth of *Evotomys rutilus* (fig. 2 a) do not differ appreciably from those of *E. wosnessenskii* and *E. alascensis*.

Ears, feet and tail.—So far as can be judged from dry skins the ears of *Evotomys rutilus* do not differ appreciably in form from those of *E. alascensis* and *E. wosnessenskii*. They are, however, apparently a trifle larger than in the latter. Feet broad, as in the Alaskan form. Tail about as in *E. alascensis*, but considerably longer and somewhat less densely haired.

Color.—An adult male from northern Sweden taken in December and another specimen from same region but without date, agree very closely in color. Both have the dorsal stripe a clear bright chestnut, faintly darkened by a slight admixture of black-tipped hairs. The sides are ochraceous-buff, and the belly dirty white or cream color. Feet whitish; ears chestnut. Tail sharply bicolor, brownish, tinged with red above, dirty white below. Fur everywhere slaty plumbeous at base, this color appearing irregularly at surface on belly and sides. Two other undated skins from Lapland are slightly paler in color.

Measurements.—For measurements of *Evotomys rutilus* see table, page 366.

Specimens examined.—Four, from the following localities:

Lapland: no definite locality, 2.

Sweden: Karesuando, 1; no definite locality (northern Sweden), 1.

General remarks.—The Arctic red-backed mouse of northern Europe is readily distinguishable among the known Arctic forms⁴

⁴There are no less than five of these, *E. rutilus*, *E. wosnessenskii*, *E. alascensis*, *E. ungava*, and *E. proteus*. For descriptions of the last two, both of which are from Labrador, see Bailey, Proc. Biolog. Soc. Washington, XI, pp. 130, 131, and 137, May 13, 1897.

by its bright color, absence of any known dusky phase, relatively long tail, and small square skull with large audital bullæ, conspicuous rostral protuberances, and short nasal bones.

Evotomys alascensis sp. nov.

1839. ?? *Arvicola rubricatus* Richardson, Zoölogy of Beechey's Voyage of the Blossom, p. 7 (Bering Strait).

1877. *Evotomys rutilus* Coes, Monogr. N. Am. Rodentia, p. 136 (part).

1897. *Evotomys rutilus* Bailey, Proc. Biol. Soc. Washington, XI, p. 118 (part).

Type.—Adult ♂, number ^{14,359}/_{22,226} United States National Museum, collected at St. Michael's, Alaska, October 26, 1897, by E. W. Nelson. Original number, 96.

General characters.—See synopsis, page 359.

Skull.—The skull of *Evotomys alascensis* more closely resembles that of *E. rutilus* than it does that of its geographically nearer ally *E. vosnessenskii*. The brain case is broad and squarish in outline. Squamosals produced into very small, pointed postorbital processes. Audital bullæ large, their greatest breadth considerably more than alveolar length of maxillary molar series. Rostral protuberances (fig. 1 *b*) much closer to roots of zygomata than in either of the Old World species. The nasal bones (fig. 1) are longer than in either *E. rutilus* or *E. vosnessenskii*. This difference is not due to greater length of rostrum, but to greater backward prolongation of the nasal bones. The nasal branches of the premaxillaries also extend further back than in either of the Old World forms.

The skull of the type specimen measures: greatest length, 25 mm; basal length 22.6; basilar length, 21.8; zygomatic breadth, 13.4; mastoid breadth, 11.6; interorbital constriction, 4.6; nasals, 8; incisive foramen, 5; diastema, 7; maxillary molar series (alveoli), 5.2; mandible, 14; mandibular molar series (alveoli), 5.

Teeth.—The enamel pattern (fig. 2 *c*) is essentially as in Old World Arctic species.

Ears.—The ears do not differ in form from those of *E. rutilus* and *E. vosnessenskii*, but they are appreciably larger than in the latter.

Feet.—The front feet present no characters of importance. The hind feet, like those of *E. rutilus*, are short, broad, and very densely haired both above, on the sides, and below. On the sole the hair extends from the heel to the middle row of tubercles.

Color.—In the type the dorsal stripe is dull ferruginous sprinkled with black hairs, which, however, are very inconspicuous. Sides

ochraceous-buff, finely 'lined' with black. Belly clear buff, shading to grayish on the throat. Feet buffy-whitish; face mixed buffy and

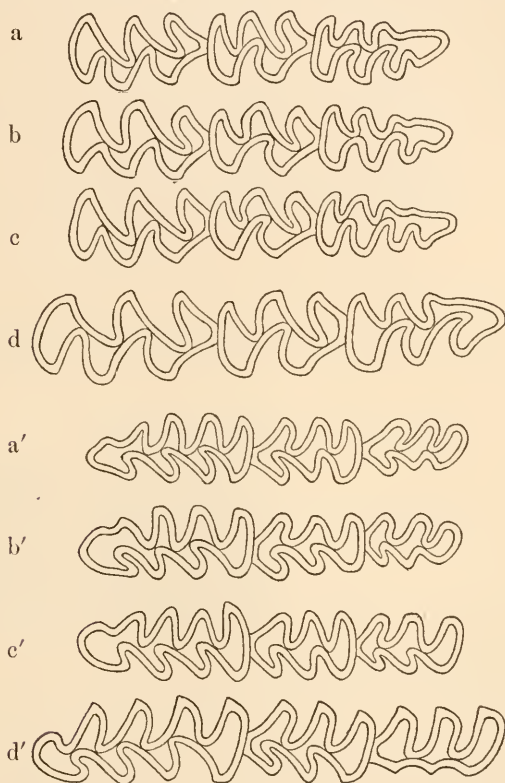


FIG. 2. Enamel pattern of *Eutamias rutilus* (a), *E. vosnessenskii* (b), *E. alascensis* (c), and *E. rufocanus* (d). Lower teeth below, upper teeth above. ($\times 10$).

reddish. Ears concolor with dorsal stripe. Tail sharply bicolor, buffy below, brownish tinged with red above.

A series of seventeen skins taken at St. Michaels, Alaska, during October and November show little variation in color. In some specimens there is less of the buff wash on the belly, but this is absent in one only. Several are much darker below than the type. In one immature individual the red of the dorsal stripe is much duller than in the adults.

Measurements.—For measurements see accompanying table.

MEASUREMENTS OF THREE SPECIES OF ARCTIC EVOTOMYS.

Name.	Locality.	Number.	Sex.	Total length.	Head and body.	Tail vertebre.	Pencil.	Hind foot.	Ear from meatus.
				mm.	mm.	mm.	mm.	mm.	mm.
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	15,330	♂	121	85	29	8	17	11
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	15,331	♂	132	90	32	5	18	11
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	15,333	♂	126	88	32	5	17	11.6
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	63,221	♂	143	—	35	5	17.5	—
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	63,223	♂	138	—	32	5.6	17.5	—
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	83,46.6	♂	—	84	22	5	16	12
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	83,497	♂	—	82	22.5	4	17	12.5
<i>E. voonnessenshi</i>	Bering Island, Kamtschatka.	83,999	♂	—	100	30	7	17	13
<i>E. voonnessenshi</i>	Petrovskii, Kamtschatka.	84,004	♂	132	—	23	6	17	—
<i>E. rutillus</i>	Northern Sweden.	21,372	♂	—	34	11	18	—	—
<i>E. rutillus</i>	Lappland.	405	♂	—	—	39	9	18.4	—
<i>E. alascensis</i>	Fort Yukon, Alaska.	59,924	♂	110	84	23	12	18	12.6
<i>E. alascensis</i>	St. Michaels, Alaska.	14,352	♂	—	28	9	18	—	—
<i>E. alascensis</i>	St. Michaels, Alaska.	14,354	♂	—	27	10.4	18.6	—	—
<i>E. alascensis</i>	St. Michaels, Alaska.	14,356	♂	—	—	—	11.6	—	—
<i>E. alascensis</i>	St. Michaels, Alaska.	14,358	♂	—	—	26	10	18	—
<i>E. alascensis</i>	St. Michaels, Alaska.	14,359	♂	—	24	10	18.4	—	—
<i>E. alascensis</i>	St. Michaels, Alaska.	14,363	♂	—	26	10	18	—	—
<i>E. alascensis</i>	St. Michaels, Alaska.	59,915	♂	130	91	30	11	19	12

Specimens examined.—Total number of specimens examined 21, from the following localities:

Alaska: Fort Yukon, 2; St. Michæls, 19.

General remarks.—*Evotomys alascensis* appears to be more closely related to the European *E. rutilus* than to the Kamtschatkan *E. wosnessenskii* or to any of the American species. It has the broad skull, large audital bullæ and broad feet of *E. rutilus*, but differs from both European and Kamtschatkan species in its long nasal bones, and in the position of the rostral protuberances.

I am permitted by the Secretary of the Smithsonian Institution to published this paper here.