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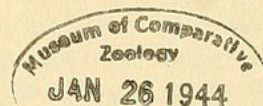
Nos. 7 and 8

## CANADIAN FORMS OF THE MEADOW MOUSE (*Microtus pennsylvanicus*)<sup>1</sup>

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35,343



THIS IS A REVIEW of the nine races of the Meadow Mouse (also called Meadow Vole or Field Mouse, *Microtus pennsylvanicus*) that occur in Canada.

They are:

*M. p. acadicus* Bangs

ACADIAN MEADOW MOUSE

*pennsylvanicus* (Ord)

EASTERN MEADOW MOUSE

*enixus* Bangs

LABRADOR MEADOW MOUSE

*labradorius* Bailey

UNGAVA MEADOW MOUSE

*fontigerus* Bangs

QUEBEC MEADOW MOUSE

*drummondi* (Aud. and Bach.)

DRUMMOND MEADOW MOUSE

*aphorodemus* Preble

BARREN GROUND MEADOW MOUSE

*insperatus* J. A. Allen BEAN or

BADLANDS MEADOW MOUSE

*modestus* (Baird)

SAWATCH MEADOW MOUSE

The Meadow Mouse belongs to a group that is widespread in the northern hemisphere of the old and the new world, but this species is American only. Wide ranging in the United States, it occurs over most of Canada excepting the northern part of Keewatin, northeast Mackenzie District, the Arctic islands, and the coastal area of British Columbia.

Bailey in his monograph on the voles of the genus *Microtus* (1900, *North American Fauna*, No. 17) recognized seven of the nine forms dealt with here. In 1902 Preble (*North American Fauna*, No. 22, p. 53) described

another of them, *aphorodemus*, from the Keewatin District, and in 1920 Bailey described the other *wahema*, from Montana and it was soon found to occur in the prairies of southern Canada, but Allen's name *insperatus* antedates it. Dale in 1940 (*Jour. Mammal.*, 21, pp. 332-340) reviewed the British Columbia mice of this species and recognized four races in the province, describing two new forms *rubidus* and *funebis*, and re-instating an old name *microcephalus* of Rhoads, but our material does not substantiate this treatment.

Of the nine subspecies recognized here, Bailey considered two, *enixus* and *drummondi* as separate species, and Preble described *aphorodemus* as a species. The form *drummondi* was soon considered a subspecies as Bailey's description had indicated it was. Anderson in 1937 (in *Canada's Western Northland*, Ottawa) considered *aphorodemus* a subspecies of *pennsylvanicus*, and the original description had indicated that this was the case. The form *enixus*, was shown to be of subspecific rank by Davis in 1936 (*Jour. Mammal.*, 17:290).

*Microtus pennsylvanicus* has been held up as an example of an animal that does not conform to the rule that animals from the northern part of the range of the species are larger than those from the southern part, and this has been correlated with its tunneling or burrowing habits. However the case is not as simple as that. The northern race *drummondi* is smaller than such southern races as *pennsylvanicus* and *modestus*. But within the population included in *drummondi* those from the lower Mackenzie are larger than those from the more southern Wood Buffalo Park. The race *aphorodemus* from Keewatin is considerably larger than *drummondi* that

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occurs in Manitoba to the south. The race *enixus* is not smaller than the more southern *pennsylvanicus*, though the still more northern *labradorius* is smaller. Thus it seems that in part this species decreases in size northward, and in part it increases in size.

In working out the status of the forms of this vole, a number of difficulties presented themselves. Color seems to be a good character for *acadicus* and *insperatus*, but the seasonal range of color in *drummondi*, due to moult and wear, is great as shown by our excellent series from Wood Buffalo Park, (see under *drummondi*). When it is considered that moult may occur at different times of the year in different places, and frequently a specimen is much greyer or redder than the rest of a series taken at the same time and place, and that many localities are represented by but a few specimens from a single month, it is seen that color must be used with care in separating races.

The question of when the mice of this species reach their full size is a difficult one. Breeding evidence is of no value, as the females can breed at the age of 25 days (Bailey, 1924, *Journ. Agr. Research*, 27, p. 528). Whether or not the skull is ridged is apparently an age character, but there is some geographical variation in this, *modestus* apparently exhibiting this in its highest development. It becomes necessary to judge whether or not lack of ridging is an age or a geographical character. The race *fontigenus* was considered to have a smooth skull, until additional specimens showed that adults have ridged skulls.

Though adults from one locality may be more or less uniform in size, occasional exceptions occur, as in specimens of *drummondi* from Wood Buffalo Park; one has a length of 183 mm. while the next largest has a length of 159 mm. (see under *drummondi*). A. B. Howell (1923, *Jour. Mammal.*, 4, pp. 35, 36) has suggested that the size reached by voles may vary from year to year.

There is sometimes considerable variation in the relative length and breadth of the brain case. Young skulls, in addition to lacking the ridges of the adults, also show other differences. The skull is more arched, the nasals are relatively shorter, and there is a tendency toward a less complex molar enamel pattern.

Frequently the larger part of a series is of young animals. This perhaps is correlated

with their short life span of 18-22 months (Hamilton, 1942, *Amer. Naturalist*, 76, pp. 216-218). Rarely is a series almost entirely adult, as in the Grand Manan series. These factors make measurements unsatisfactory for comparison.

In the following I have listed all the material with skulls I have examined. But for one reason or another, including factors such as age or broken skulls, it has been impossible to identify every individual. The identifications are of populations. In the very nature of subspecies that overlap through intergradation or individual variation this must be so.

Where one subspecies intergrades into another, the populations do not always smoothly intergrade, but there may be examples that are closer to one form, others that are closer to the other, as well as intermediates. This is shown by our specimens of *enixus* and *labradorius* from Ungava; by *insperatus* and *drummondi* from the southern prairies; by *drummondi* and *aphorodemus* from Churchill. Snyder (1938 reprint from *Trans. Roy. Can. Inst.*, XXII, p. 175) reports a similar condition in the western Rainy River area of Ontario, where *drummondi* and *pennsylvanicus* intergrade.

To Dr. R.M. Anderson I am indebted for the opportunity of discussing with him problems that arose in the preparation of this paper. The Carnegie Museum of Pittsburg, through Mr. J. Kenneth Douth, kindly loaned material from the Labrador Peninsula, and the Royal Ontario Museum of Zoology, through Mr. Stuart C. Downing, material from northwestern Ontario, and I wish to express my thanks to these institutions and gentlemen.

#### *Microtus pennsylvanicus acadicus* Bangs

##### ACADIAN MEADOW MOUSE

*Microtus pennsylvanicus acadicus* Bangs, 1897, *Amer. Nat.*, XXXI, pp. 239, 240. - Digby, Nova Scotia.

*Diagnosis* — The pale coat, with a yellowish or clay colored tinge in both the brownish summer and the greyer winter pelage is the most distinctive character.

*Measurements* — Specimens from various parts of Nova Scotia: total length (10) 172-184 (av. 177.2 mm.); tail (10) 43-57 (av. 50.3); hind foot (10) 19-23 (av. 22.0); skull, basal length (10) 24-26.5 (av. 25.07); zygomatic breadth (10) 14.5-16 (av. 15.15).

Grand Manan: t.l. (10) 168-194 (av. 188.6); t. (10) 41-51 (av. 49.9); h.f. (10) 23-24 (av. 23.8); skull, b.l. (7) 25-27.5 (av. 26.4); z. b. (7) 15-17 (av. 15.9).

*Distribution.* — Nova Scotia, Prince Edward Island, Grand Manan Island, and probably southern New Brunswick.

*Remarks.* — Occasional specimens in a series of *pennsylvanicus* from Bathurst show an approach to this form. We have no adequate material from Prince Edward Island but Bailey (1900, p. 19) examined 40 specimens from there and reported that they exhibited the characters of this race in an accentuated degree. The Grand Manan specimens, while very similar in color to Nova Scotia specimens are somewhat larger (see measurements). The large size of Grand Manan specimens has already been commented on by Copeland and Church (1906, *Proc. Biol. Soc. Wash.*, 19, pp. 121-126). This suggests that an island race may be separable, but it is inadvisable to name it until adequate material is available from southern New Brunswick.

*Material examined.* — NOVA SCOTIA: Shelburne Co., 22; Annapolis Co., 14; Kings Co., 8; Guysborough Co., 4; Victoria Co., 30; Inverness Co., 3. PRINCE EDWARD ISLAND: Mt Herbert, 2. NEW BRUNSWICK: Grand Manan, 19. Total 102 specimens.

*Microtus pennsylvanicus pennsylvanicus* (Ord)  
EASTERN MEADOW MOUSE

*Mus pennsylvanica* Ord, 1815, *Guthrie's Geography*, 2nd American edition, II, p. 292. — Meadows below Philadelphia, Pennsylvania.

*Diagnosis.* — Distinguished from *acadicus* by being somewhat darker in color, brownish replacing yellowish tinge in the pelage.

*Measurements.* — Northern New Brunswick: total length (10) 169-195 (av. 182.5 mm.); tail (10) 54-65 (av. 61.5); hind foot (10) 21.4-24 (av. 22.5); skull, basal length (10) 24.5-26.5 (av. 25.7); zygomatic breadth (10) 14.5-16 (15.4).

Pancake Bay, Ontario: t.l. (6) 160-189 (av. 169); t. (6) 40-55 (av. 46.8); h.f. (6) 21-22 (av. 21.3); skull, b.l. (6) 24-26 (av. 25.2); z.b. (6) 14-15.2 (av. 14.7).

*Distribution.* — Northeastern United States, north New Brunswick, Quebec south of the St. Lawrence River, including Gaspé, southern Ontario north to Ottawa, Algonquin

Park, Nipissing and the east end of Lake Superior; west of the Great Lakes it intergrades with *drummondi* on the southern edges of Manitoba and southwestern Ontario.

*Remarks.* — The relationship with *acadicus* is shown by the series from near Bathurst, northeast New Brunswick, of which a few specimens show an approach to *acadicus* in color. Gaspé specimens have usually been referred to *fontigenus* though Goodwin (1929, *Jour. Mammal.*, 10, p. 223, 224) considers them not typical and our specimens are better referred to *pennsylvanicus*. In the northwest part of the range in Canada this species intergrades with *fontigenus* as is shown by our Ottawa specimens. Miller (1897, *Proc. Boston Soc. Nat. Hist.*, 28, pp. 14, 15) records this form at North Bay. That this form becomes smaller in the western part of its Canadian range, as also does *fontigenus*, is shown by the Pancake Bay (Lake Superior) specimens (see measurements above). Although some of the specimens from the Rainy River area (Snyder, 1938, reprint from *Trans. Roy. Can. Inst.*, XXII, pp. 174-175) and our extreme southern Manitoba material shows that occasional specimens referable to *pennsylvanicus* occur, most of the material is closer to *drummondi* and these are evidently areas of intergradation between *pennsylvanicus* from the south and *drummondi* from the north.

*Material examined.* — NEW BRUNSWICK: Charlotte Co., 2; Victoria Co., 1; York Co., 1; Madawaska Co., 18; Gloucester Co., 43. QUEBEC: Gaspé Peninsula, 13; Bonaventure Island, 1; St. Lambert, 1 (approaching *fontigenus*); Hatley, 1. ONTARIO: Dundas Co., 3; Carleton Co., 25; Frontenac Co., 5; Peterborough Co., 1; York Co., 15; Halton Co., 1; Waterloo Co., 6; Middlesex Co., 1; Elgin Co., 5; Essex Co., 7; Algonquin Park, 5; Sudbury District, 3; Algoma District (Pancake Bay) 21. PENNSYLVANIA: Ardmore, 3; (nearly topotypical). NEW JERSEY: Ocean Co., 2; CONNECTICUT: Cos-cob, 1. Total 182 specimens.

*Microtus pennsylvanicus enixus* Bangs  
LABRADOR MEADOW MOUSE

*Microtus enixus* Bangs, 1896, *Amer. Nat.*, XXX, pp. 1051, 1052. — Hamilton Inlet (North Shore), Labrador.

*Diagnosis.* — Distinguished from *pennsylvanicus* and *acadicus* by the darker summer pelage; by the average slightly lighter molars; by the average larger, longer and wider

incisive foramen; and by the skull being flatter and less arched.

*Measurements.* — Hamilton Inlet (5 adults): total length 163-195 (av. 182.2 mm.); tail 51-64 (av. 58.6); hind foot 21-22 (av. 21.6); skull, basal length 24.75-27.00 (av. 26.10); zygomatic breadth 15-16.75 (av. 16.05). Charlton Island, James Bay: skull b.l. 25.5, 25.5, 26.5; z.b. 15.5, 15.75, 15.75.

*Distribution.* — Across the Ungava Peninsula from James Bay to Hamilton Inlet and Hebron, Labrador.

*Remarks.* — Windsor and Nain specimens compare well with Hamilton Inlet specimens, as do the three adults from Charlton Island; two Davis Inlet specimens show the protruding incisors of *labradorius*, apparently bridging the gap between the two forms by individual variation. A Hebron specimen shows some approach to *labradorius* but is closer to *enixus*. Except for the three Charlton Island specimens the material from the east side of James Bay is too poor for comparison but none of them have the projecting incisors of *labradorius* and presumably are this form. Some specimens from Richmond Gulf have projecting incisors, others do not, suggesting intergrading between the two forms in this area.

This form was described as a species, and Bailey in his monograph of 1900 considered it a distinct, well marked species. Davis in 1936 (*Jour. Mammal.*, 17, pp. 290, 291) showed that *enixus* was a race of *pennsylvanicus*. Comparison of the five adults from Hamilton River with series of other races shows that the differences are relative, and through individual variation overlap with other forms. The flattened skull indicates relationship with *labradorius*, the range of size in the audital bullae overlaps that in *fontigenus*. The characters separating it from *pennsylvanicus* are only average and Bailey in 1900 pointed out it was close to this form. The most important reasons for considering it a species were its relationship with *labradorius* that are discussed under the next form.

*Enixus* was described as a large form and so considered by Bailey (*op. cit.*, p. 24) with a total length of 189.4 mm. The measurements of the present material are not dissimilar. But Davis (*l.c.*) gives its size as small; total length 152.1 mm., tail 46.8 and hind foot 21.6, averaged from 10 topotypical specimens. Howell's suggestion (*l.c.*) as to the

possibility of these mice reaching a different size in different years comes to mind.

*Material examined.* — LABRADOR: Hamilton River, 5; Windsor, 2; Nain, 5 (all Carnegie Museum), and Davis Inlet, 2 (approaching *labradorius*); Hebron, 2 (1 Carnegie Museum). QUEBEC: Charlton Island, 9; near Cape Jones, 1; Fort George, 2; Cape Hope Islands, 1.

*Microtus pennsylvanicus labradorius* Bailey  
UNGAVA MEADOW MOUSE

*Microtus pennsylvanicus labradorius* Bailey, 1898, *Proc. Biol. Soc. Wash.*, XII, p. 88. — Fort Chimo.

*Diagnosis.* — Distinguished from *enixus* by the more projecting upper incisors, the shorter, less projecting nasals, and the slightly smaller incisive foramen, a tendency toward an interior point on the first upper molar, and slightly smaller size.

*Measurements.* — Ungava Bay: Two skins apparently adults, have the following measurements: total length 167, 167; tail 46, 50; hind foot, 21, 21; skull measurements of adults are: basal length (4) 25-26.5 (av. 26.38); zygomatic breadth (5) 15-16.5 (av. 15.9).

*Distribution.* — Northern Ungava from Port Burwell, Hudson Strait, westward and south to Great Whale River, on east side of Hudson Bay. Its extension inland is unknown.

*Remarks.* — Our material shows that this form reaches a larger size than Bailey (*op. cit.* p. 22) indicated.

Comparison of seven adults of *labradorius* from Ungava Bay with the five adults of *enixus* from Hamilton River shows that the differences between these forms is less than has been supposed. The projection of the incisors of *labradorius* is the most prominent character, and in this the Ungava Bay series shows some variation, but they do not fall into two series, nor do they suggest that both *enixus* and *labradorius* are represented. Rather it suggests that this character is relative, and there is an approach to overlap by individual variation.

The three (of 12) Chimo specimens that Bailey (*l.c.*) referred to *enixus*, and the two of my specimens with projecting incisors from Davis Inlet mentioned under *enixus* also allow of this interpretation.

Our material from the east side of Hudson Bay is mostly poor, with skulls badly broken, but two from Great Whale River and one

from Richmond Gulf have the protruding incisors of this form, while two from Richmond Gulf and one from Second River have this character less pronounced, indicating intergrading with *enixus* in this area.

*Material examined.* — QUEBEC: Port Burwell, 2; George River, 1; Chimo, 13 (4 of these Carnegie Museum coll.); Mouth Koksoak River, 3 (Carnegie Mus. coll.); Port Harrison, 1; Richmond Gulf, 3; Great Whale River, 2; Second River, 1. Total 26 specimens.

*Microtus pennsylvanicus fontigenus* (Bangs)

QUEBEC MEADOW MOUSE

*Microtus fontigenus* Bangs, 1896, *Proc. Biol. Soc. Wash.*, X, pp. 48, 49. — Lake Edward, Quebec.

*Diagnosis.* — Distinguished from *labradorius* by the less flattened, more arched skull, by the incisors not projecting, the nasals not being shortened, by the slightly heavier molars, the audital bullae being slightly larger, and by the lesser tendency for the development of an inner posterior point on the first upper molar.

From *pennsylvanicus* (and *acadicus*) very lightly distinguished by the darker pelage, the average more slender rostrum, and the average larger audital bullae.

*Measurements.* — Lake Edward: total length, 150-158 mm.; tail 45, 45.5; hind foot 20.5, 21.5; skull, basal length, 25.5; zygomatic breadth 15.5. Labelle Co.: t.l. (10) 180-192 (av. 186.5 mm.); t. (10) 42-56 (av. 49.3); h.f. (10) 20-24 (av. 21.6); skull, b.l. (8) 25-27 (av. 26.1); z.b. (8) 14.75-16 (av. 15.5). Moisie Bay specimens are slightly smaller, and in all apparently adult specimens the total length is 160-183.

*Distribution.* — Quebec, north of the St. Lawrence from Natashkwan, Saguenay County, westward to Gatineau County, and across Ontario north of the range of *pennsylvanicus* to the north shore of Lake Superior. The northern limits of the range remain to be worked

out.

*Remarks.* — This is a lightly differentiated form, intergrading with *pennsylvanicus*, *enixus*, and *drummondi*.

That it is not a small form is shown by the Labelle Co. specimens; the skull is ridged even in one of our Lake Edward topotypes.

Moisie Bay and Natashkwan specimens are slightly greyer and smaller than Labelle County specimens; Snyder records this form from Lake Abitibi (1928, *Univ. of Toronto Studies, Biol. Series* No. 32, p. 12 of reprint); Miller records it from the north shore of Lake Superior (1897, *Proc. Boston Soc. Nat. Hist.*, pp. 14, 15), and Dymond records it from Lake Nipigon (1928, *Trans. Royal Can. Inst.*, 16, p. 245). Apparently there is a progressive diminution in size westward in Ontario until specimens are referable to *drummondi*.

*Material examined.* — QUEBEC: Natashkwan, 8; Havre St. Pierre, 2; Moisie Bay, 12; Lake Edward, 2; near Quebec City, 2; Labelle County, 77; Gatineau Co., 14. ONTARIO: Kapuskasing, 2. Total 119 specimens.

*Microtus pennsylvanicus drummondi*

(Audubon and Bachman)

DRUMMOND MEADOW MOUSE

*Arvicola drummondi* Audubon and Bachman, 1854, *Quad. N. Am.*, III, pp. 166, 167. - Rocky Mountains, vicinity of Jasper House, Alta.

*Diagnosis.* — Distinguished from the above forms by its smaller size, and from all but *fontigenus* by the larger audital bullae; otherwise the skull is very like that of *pennsylvanicus*.

*Measurements.* — Jasper Park, Alberta: total length, (7) 140-163 mm. (av. 147.1); tail, (7) 33-45 (av. 36); hind foot, (7) 18-19.5 (av. 18.7); skull, basal length, (7) 23-24.5 (av. 23.6); zygomatic breadth, (7) 13.75-14.75 (av. 14.1).

ADDITIONAL MEASUREMENTS (mm.)

|                                                               | External Measurements |              |      |           | Skull           |              |                   |
|---------------------------------------------------------------|-----------------------|--------------|------|-----------|-----------------|--------------|-------------------|
|                                                               | Number Measured       | total length | tail | hind foot | Number Measured | basal length | zygomatic breadth |
| Jasper Park .....                                             | 7                     | 147.1        | 36   | 18.7      | 7               | 23.6         | 14.1              |
| Mt. Brilliant, B. C. ....                                     | 4                     | 156.5        | 41.8 | 20        | 6               | 24.9         | 14.6              |
| Atlin, B. C. ....                                             | 7                     | 155.8        | 44.5 | 19.1      | 7               | 23.5         | 14.2              |
| Wood Buffalo Park .....                                       | 10                    | 149.7        | 42.2 | 19.8      | 10              | 24           | 14.1              |
| Fort Rae <sup>1</sup> .....                                   | 10                    | 169.5        | 44.6 | 19.3      |                 |              |                   |
| Aklavik .....                                                 |                       |              |      |           | 2               | 24.5         | 14                |
| North Manitoba<br>Churchill, Ilford,<br>Thicket Portage ..... | 10                    | 164          | 50.9 | 18.9      | 10              | 24.7         | 14.3              |
| N. W. Ontario<br>Fort Severn .....                            | 10                    | 162.7        | 42.3 | 19.9      | 8               | 24.5         | 14.5              |
| Lake Attawapiskat .....                                       | 4                     | 153.8        | 43.8 | 19        | 4               | 23.8         | 14.5              |
| S. W. Ontario<br>Rainy River <sup>2</sup> .....               | 23                    | 169          | 43   | 19        |                 |              |                   |
| Thunder Bay .....                                             | 7                     | 158.1        | 45   | 19.7      | 3               | 24.5         | 14.5              |
| South Sask.<br>(Lost Mt. and<br>McDonald Lakes) .....         | 10                    | 163          | 43   | 19.6      |                 |              |                   |

1. —From Preble 1909, No. Amer. Fauna, No. 27, p. 187.  
2. —Snyder, 1938, Trans. Royal Can. Inst., XXII, p.175.

That considerable variation in size occurs in a population is shown by a single Wood Buffalo Park specimen that measures t.l. 183 mm.; t. 52; h.f. 20; skull, b.l. 25.25; z.b. 14.5, while the next largest has a length of 159 mm., and the next ten average 149.7 mm. in length.

*Distribution in Canada.* — British Columbia, at Crow's Nest Pass and north from Jasper and the mountains above Bella Coola, to the mouth of the Mackenzie, eastward to Churchill and Fort Albany, and southward to Lake Attawapiskat, Thunder Bay, Rainy River and southern Manitoba, and all Saskatchewan, except the extreme southwest, and all Alberta except the extreme southeast.

*Remarks.* — This race, as here understood includes a number of populations that differ considerably from toptotypical material. To lump them all together is admittedly unsatisfactory, but seems preferable to naming or

recognizing races on characters that may later prove due to intergrading with other races or to seasonal pelages.

A series of fifty specimens from Wood Buffalo Park (north Alberta and south Mackenzie) distributed over the year from March to October shows the great seasonal change in pelage that may occur. Four July specimens are very dark and blackish; eleven August specimens are more yellowish; thirteen September specimens are much greyer, evidently molting into winter pelage; six October specimens are in long, dense winter pelage with a pronounced yellowish grey appearance; twelve March and April specimens are similar, but somewhat more reddish brown, probably the result of wear; the four June specimens are moulting into dark summer pelage. Occasional specimens are much greyer or redder than the majority of specimens.

With the possibility in mind that moult may occur at different times in different places, and the fact that various series, while differing from each other, represent populations of which we have samples from but a single season, it seems advisable to use color of coat with care in recognizing races.

The Wood Buffalo Park specimens are slightly darker than comparable specimens from Jasper Park; Wisteria and Hazelton specimens (central British Columbia, May-Aug.) are similar to Jasper Park specimens. An Atlin series is very slightly redder (*rubidus* of Dale, 1940, *Jour. Mammal.*, 21, p. 339); a series from Mt. Brilliant (central British Columbia) is dark compared with Jasper material, and slightly larger. They evidently represent intergradation with *modestus*. Racey and Cowan (1926 *Rept. Prov. Museum for 1925, Province of B. C.*, p. 22) record this form near Alta Lake. Aklavik winter specimens are much like Wood Buffalo winter specimens in pelage. They have slightly more projecting incisors than more southern animals, suggesting an approach to the condition in *labradorius*. Preble (1908, *North Amer. Fauna*, No. 27, p. 187) pointed out that northern Mackenzie specimens are large, especially Fort Rae material; these he considers as intergrading with *aphorodemus*. Bailey (1900, *N. Amer. Fauna*, No. 17, p. 23), had already commented on the large size of these northwestern animals.

In northern Manitoba *drummondi* intergrades with *aphorodemus*; (Preble, 1902, *North Amer. Fauna*, No. 22, p. 52, and National Museum of Canada material from Churchill); toward the east it intergrades with *fontigenus*, as shown by the large size of material from this area. Specimens from Fort Albany, James Bay are referable to *drummondi*; farther east, Charlton Island specimens are referable to *enixus* and intergradation with that form may occur.

In southern Manitoba *drummondi* intergrades with *pennsylvanicus* (Bailey, 1926, *North Amer. Fauna*, No. 46, p. 93) and we have some specimens from as far south as Turtle Mts., that are typical *drummondi*, as well as larger specimens. Eastward into southwestern Ontario *drummondi* intergrades with *pennsylvanicus* (Snyder, 1938, *Trans. Roy. Can. Inst.*, XXII, pp. 174, 175 for the western Rainy River area).

In southern Saskatchewan the National Museum material shows *drummondi* extends to Big Muddy Lake, McDonald Lake on the Souris River and Last Mountain Lake, though

slightly larger; and intergrades with the pale *insperatus* in the Cypress Hills area and southward. In southern Alberta it intergrades with *insperatus* in the vicinity of Eagle Butte and Lodge Creek. For the larger size of this mixed population see under *insperatus*. Specimens from the Waterton Lakes Park are slightly greyer than more northern animals, but are definitely *drummondi*.

Thus we have a wide distribution, with considerable variation, correlated in part at least with intergradation with related forms. *Drummondi* intergrades with at least five other subspecies. Until recently *drummondi* often has been listed as a species, though in 1900 (*N. Amer. Fauna*, No. 17, p. 23) Bailey showed its characters were only relative, and in 1920 (*Jour. Mammal.* 1, p. 71) treated it as a subspecies of *pennsylvanicus* as had Hollister in 1913 (*Can. Alpine Jour.*, Special No. p. 23).

*Material examined.* — ONTARIO: Fort Albany, 10; Lake Attawapiskat (Kenora Dist.) 4<sup>1</sup>; Fort Severn, 12<sup>1</sup>; Favorable Lake (Kenora Dist.), 4<sup>1</sup>; Thunder Bay (Lake Superior), 11. MANITOBA: Norway House, 6; Churchill, 27; Herchmer, (H. B. Ry., Mi. 412), 1; Bird, (H. B. Ry. Mi. 349), 2; Ilford (H. B. Ry. Mi. 286), 4; Thicket Portage (H.B. Ry., Mi. 165), 6; Cormorant Lake (H. B. Ry., Mi. 42), 2; Wasagaming, 4; Norwood, 1; Brandon, 1; Shoal Lake, 1; Oak Lake, 2; Riding Mountain Park, 1; Swan River, 1; Junction Antler, 1; Max Lake (Turtle Mountain), 4. SASKATCHEWAN: Indian Head, 7; Glen Ewen, 7; Big Muddy Lake, 1; McDonald Lake, 17; Watrous, 1; (specimens from the extreme southwest of the province show intergrading with *insperatus*, and are listed under that form). ALBERTA: Athabaska Lake, 1; Lac la Nonne, 2; Belvedere, 1; Edmonton, 1; Jasper, 46; Little Sandhill Creek, Red River, 1; Bearberry Creek, near Sundre, 13; Dried Meat Lake, 2; Mountain Park, 6; Islay, 3; Banff, 4; Waterton Lakes Park, 7; (specimens from the extreme southeast of the province, intergrading with *insperatus* are listed under that form). WOOD BUFFALO PARK, (Alta. and Mackenzie Dist.), 45. BRITISH COLUMBIA: Vanderhoof, 1; Hazelton, 3; Wisteria, 11; Mt. Brilliant, Rainbow Mts., 20; Atlin, 7; Crow's Nest Pass, 1. YUKON: Teslin Lake, 15. MACKENZIE DISTRICT: Fort Simpson, 1; Fort Good Hope, 1; Aklavik, 4; Crystal Island, Artillery Lake, 1; Thelon River, 2. Total 324 specimens.

1. —Specimens from Royal Ontario Museum of Zoology.

*Microtus pennsylvanicus aphorodemus* Preble  
BARREN GROUND MEADOW MOUSE

*Microtus aphorodemus* Preble, 1902, *No. Amer. Fauna*, No. 22, p. 53 - near mouth of Thewiaza River, Keewatin.

*Diagnosis.*—Like *drummondi* but larger; skull heavier; rostrum proportionately heavier; color dark yellowish bistre as in *drummondi* usually with an admixture of yellowish tipped hairs imparting a coarse, grizzled appearance (from original description).

*Measurements.* — (average of 6 adults from the type locality), total length, 182 mm.; tail, 49; hind foot, 20.3; skull of type, basal length 28; zygomatic breadth 16.5 (Preble *l.c.*).

*Distribution.* — Probably the barren grounds of Keewatin District, known from the type locality, and known to intergrade with *drummondi* at Churchill, Manitoba.

*Remarks.* — Though described as a species, the original description indicated the subspecific relationship with *drummondi*, and Anderson (1937, in *Canada's Western Northland*, King's Printer, Ottawa), considers it a race of *pennsylvanicus*. Preble (*l.c.*) records that Fort Rae specimens show an approach to this form, though still referable to *drummondi*. Nine of our considerable series from Churchill show an approach to this form, and might be considered as belonging to this race.

*Material examined.* — MANITOBA; Churchill, 9.

*Microtus pennsylvanicus insperatus* J.A. Allen  
BADLANDS MEADOW MOUSE;

BEAN MEADOW MOUSE

*Microtus insperatus* J.A. Allen, 1894, *Bull. Amer. Mus. Nat. Hist.*, 6, p. 347. - Custer Black Hills, South Dakota.

*Diagnosis.* — Differs from *pennsylvanicus* in the slightly smaller size; from *drummondi* by larger size; and average proportionally smaller audital bullae; differs from both of the above in the pelage being paler and greyer.

*Measurements.* — Type, total length, 178 mm.; tail, 43; hind foot, 20; skull, basal length, 27; zygomatic breadth, 15.4 (from original description). Adults from the Cypress Hills and Eagle Butte area of Saskatchewan and Alberta, t.l. (10) 160-185 (av. 171.7); t., (10) 41-54 (av. 47.8); h.f., (10) 20-21.5 (av. 20.9); skull, b.l., (8) 24-26.75 (av. 25.5); z.b., (8) 14-15.25 (av. 15.1).

*Distribution.* — Extends from the United States into extreme southwestern Saskatchewan and extreme southeastern Alberta, intergrading with *drummondi* over most of its range in Canada.

*Remarks.* — Anderson, 1943, *Can. Field-Nat.*, 57, p. 92 has shown that *insperatus* rather than *wahema* Bailey is the name for this form. Two specimens from Sweet Grass Hills, Alberta, are grey and plainly referred to this race (identified as *wahema*, not typical by Bailey). From the other localities listed below the material shows some grey pelaged specimens approaching *insperatus*, some brown pelaged specimens approaching *drummondi*, and intermediates. Some of the greyer specimens have been identified as *wahema*, not typical, while some of the browner pelaged specimens have been identified as *drummondi* not typical, by Vernon Bailey. Greene (1926, *Can. Field-Nat.*, 40, pp. 142, 143) recorded this form from Swift Current.

*Material examined.* — MONTANA: Glendive, 1. ALBERTA: Eagle Butte, 8; Sweet Grass Hills, 2; Milk River, 2; Lodge River, 6. SASKATCHEWAN: Cypress Hills, 11; Battle Creek, 3; Crane Lake, 2; Valmarie, 2; Eastend, 6; Lonesome Butte, 14. Total 57 specimens.

*Microtus pennsylvanicus modestus* (Baird)  
SAWATCH MEADOW MOUSE

*Arvicola modestus* Baird, 1857, *Mamm. N. Amer.*, 1 p. 535, 536. - Cochetopa (Sawatch) Pass, Colorado.

*Diagnosis.* — Old specimens have more heavily ridged skulls than have other forms; differs from *drummondi*, the only form with which it comes in contact in Canada in its larger size, and relatively narrower skull; similar to *pennsylvanicus* and *fontigenus*, but has more abruptly down turned nasals, and is darker than the former, and with average larger bullae.

*Measurements.* — Newgate, total length (7) 161-174 (av. 168 mm.); tail, (7) 44-51 (av. 45); hind foot, (7) 20-21 (av. 20.8); skull, basal length, (7) 25.25-26.25 (av. 25.6); zygomatic breadth, (7) 14.5-15.75 (av. 15.0). Princeton-Keremeos area: t.l. (7) 165-180 (av. 174.6); t. (7) 45-53 (av. 49.1); h.f. (7) 19-21 (av. 20.1); skull, b.l. (3) 25.75-27 (av. 26.8); z.b. (3) 15.5-16 (av. 15.8).

*Distribution.* — Extends from the United States into southern British Columbia east of the Cascades, north at least to Lake

Windermere, intergrading northward with *drummondi*.

**Remarks.** — Dale (1940, *Jour. Mammal.*, 21, pp. 332-340) has recognized two races of this species in south British Columbia, *microcephalus* and *funnebris*, both larger than *drummondi*. Neither are distinguished in the descriptions from *modestus*, though under *funnebris* it is said that in its large size and dark color it approaches specimens of *modestus* from southern Idaho. I have seen no topotypical *modestus* but in 1931 Dr. Anderson went into the question of the identity of the south British Columbia meadow mice, and has allowed me to use his notes made at the time. In the U.S. National Museum he compared a large series from the Okanagan, Columbia and Kootenay valleys with 53 topotypical *modestus*, and could see little difference between them. Crowe (1943, *Bull. Amer. Mus. Nat. Hist.*, 80, p. 404) says that a series of 26 specimens from Invermere (Lake Windermere) are typical of the race [*modestus*] to the south in all respects.

Comparing a series of more than 40 skins from Creston, Newgate and Yahk, which I assume are the same form as Cranbrook skins that Dale includes in *microcephalus*, with about 45 skins from the Princeton-Hedley area; 23 from Rossland, two specimens from Penticton, and 16 from Pend d'Oreille River that

should be in part at least *funnebris*, I cannot separate them on color characters, and in size it seems that this form reaches its extreme size in Canada in the southwest part of its range here, and decreases in size westward and over a wide area northward. Dale lists Anahim Lake measurements as (av. 16 specimens) t.l. 150.4; t. 41.5; skull, b.l. 26.7; z.b. 14.9. My specimens from nearby Mt. Brilliant are considerably smaller, and I have included them in *drummondi*. Dale's Indian-point Lake specimens are also small, (average 9 specimens) t.l. 144; t. 39; skull, b.l., 25.7; z.b. 14, evidently intergrading with *drummondi*.

There is considerable variation in the size and color of populations represented in our material, that I tried unsuccessfully to correlate with altitude. Rather it appears that many individual populations in this area have slightly different characters of less than taxonomically useful value.

**Material examined.** — BRITISH COLUMBIA: Princeton, 12; Hope-Princeton summit, 3; Hedley, 10; Fairview Summit, 4; Fairview-Keremeos Summit, 9; Penticton, 2; Oliver, 2; Westbridge, 7; Mouth Salmon River, 1; Rossland, 23; Creston, 14; Erickson, 1; Pend d'Oreille, 16; Yahk, 7; Goatfell, 2; Newgate, 16; Morrissey, 2; McGillivray Creek, 1.

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## A NEW GENUS OF CONULARIDS<sup>1</sup>

By G. WINSTON SINCLAIR

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**THE FOSSIL SPECIES** *Conularia loculata* Wiman (1894, *Geol. Inst. Uppsala*, Bull. 2, p. 113) is distinguished from other conularids by its small size, smooth surface, and slender, bifid internal septa. For shells of this type the new generic name *Eoconularia* is

proposed, with *Eoconularia loculata* (Wiman) as genotype. Wiman's species was from the Silurian of the Island of Gotland. A new species which seems to be congeneric has been found in the Trenton at Ottawa, and a form from the Upper Ordovician at Toronto, also new, is being referred to the genus with some doubt.

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