

METHODS USEFUL IN DISTINGUISHING MICROTINES SYMPATRIC WITH THE SUBGENUS *PEDOMYS*

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ABSTRACT

While conducting a taxonomic review of the voles of the subgenus *Pedomys* an unexpectedly large number of other microtines were found in various collections misidentified as the prairie vole, *Microtus ochrogaster*. Methods are discussed that will allow separation of the prairie vole from *Synaptomys cooperi*, *M. pennsylvanicus*, *M. montanus*, *M. mexicanus*, and *M. pinetorum*. A dichotomous key is also presented.

INTRODUCTION

There are few mammals that can be confused with members of the subgenus *Pedomys* but some of these are so morphologically similar that misidentifications can be found in many museum collections. Hall and Cockrum (1953:448) placed the pine voles in the genus *Microtus* due to the cranial similarity between *Microtus ochrogaster* and the pine vole, *M. pinetorum*, although they presented no written, statistical, or pictorial evidence. This same method of classification was used by Hall and Kelson (1959:749) who stated that the similarity of these two species in eastern Kansas justified the designation of the pine vole as *Microtus pinetorum*. Other species occasionally misidentified are: *Synaptomys cooperi*, *M. pennsylvanicus*, *M. montanus*, and *M. mexicanus*.

METHODS

A total of 6052 specimens of microtines inhabiting the Great Plains were examined for external and cranial characters useful for identification. Total length (TL), tail length (TAIL), hind foot length (HF), and ear length (EAR) were taken from museum tags. The following cranial characters were measured with dial calipers to the nearest 0.05 millimeter (mm):

ZYGOMATIC BREADTH—the greatest width across the zygomata.

CONDYLOBASILAR LENGTH—from the anterior edge of the alveoli of the incisors to the anterior edge of the foramen magnum.

INTERORBITAL BREADTH—the least width between the orbits across the dorsal surface of the skull.

DEPTH OF BRAINCASE—the greatest height of the braincase to the ventral surface between the auditory bullae.

RESULTS

Synaptomys cooperi, the southern bog lemming, is occasionally misidentified as *Microtus ochrogaster*. The skins of these two species are distinctly different as the prairie vole has a more hispid dorsal surface than the southern bog lemming, and the total length and tail length of the prairie vole are considerably longer than those of *S. cooperi*. In the area of sympatry the total

TABLE I. *External measurements for Microtus ochrogaster (1) and Synaptomys cooperi (2)**

LOCALITY		TOTAL LENGTH		TAIL		HIND FOOT		EAR		TAIL/HIND FOOT	
		1	2	1	2	1	2	1	2	1	2
Indiana	N	11	26	11	26	11	24	11	24		
	M	143.36	114.50	32.00	19.12	18.91	17.80	10.18	10.99	1.69	1.07
	SD	8.37	5.55	3.95	2.30	1.76	0.90	2.23	1.74		
Illinois	N	78	23	78	23	79	23	79	20		
	M	146.47	127.73	33.14	17.52	19.24	18.61	12.77	10.75	1.72	0.96
	SD	9.02	9.05	3.30	2.41	0.80	2.37	1.10	1.25		
Kansas	N	153	9	153	9	153	9	153	9		
	M	145.52	134.44	33.42	24.33	19.41	19.98	11.92	11.33	1.72	1.23
	SD	9.46	6.69	3.76	2.69	0.96	0.67	1.10	1.32		
Kentucky	N	14	11	14	11	15	11	14	9		
	M	145.93	118.36	32.57	17.91	18.67	17.91	12.50	12.67	1.74	1.00
	SD	7.17	8.07	3.11	2.81	0.90	3.15	2.28	0.50		
Ohio	N	33	25	33	25	34	25	34	0		
	M	132.82	114.84	31.33	18.88	17.26	17.68	11.14	—	1.81	1.07
	SD	8.78	4.84	2.93	1.33	0.71	0.24	0.74	—		

*N = sample size, M = mean, SD = standard deviation, all measurements are in millimeters.

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length of *M. ochrogaster* ranges from a mean of 132.8 to 146.5 mm while that of *S. cooperi* ranges from a mean of 114.6 to 134.4 mm (Table I). The tail length of the prairie vole ranges from a mean of 32.0 to 33.4 mm as compared to that of *S. cooperi* which ranges from a mean of 17.9 to 24.3 mm. The ratio of tail length to hind foot length also separated these two species, as the ratio for *M. ochrogaster* ranges between 1.69 and 1.81 while that of *S. cooperi* ranges between 0.96 and 1.23. Cranially these two species can be separated by examining their teeth. The anterior surface of the upper incisors are not grooved in the prairie vole as they are in the southern bog lemming. The molar pattern of the prairie vole reveals a series of poorly shaped triangles while the molar pattern of *S. cooperi* consists of a series of prismatic triangles (Fig. 1).

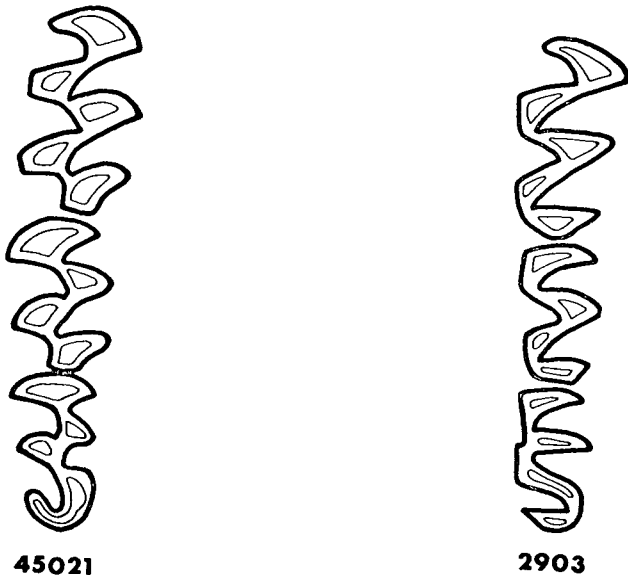


FIG. 1. Left upper molar toothrow of *Microtus ochrogaster* (left) and *Synaptomys cooperi* (right). Number = University of Illinois, Museum of Natural History (UIMNH). 12X.

Microtus ochrogaster and the meadow vole, *M. pennsylvanicus*, are morphologically similar but readily distinguishable throughout the areas where they are sympatric. The dorsal pelage of the prairie vole is a light brownish-black hispid in the western portion of its range and a dark brownish-black hispid in the eastern areas, while the dorsal pelage of the meadow vole is dark brownish-black hispid throughout its entire range. The prairie vole has a more hispid appearance due to the presence of more blond tipped hairs and the hair has a coarse texture as compared to the meadow vole. *Microtus pennsylvanicus* has six plantar tubercles on each foot while the prairie vole has only five, although a few specimens of *M. ochrogaster* have been found to have six plantar tubercles. The ventral pelage of the prairie vole is an ochraceous color throughout most of its range but in Ohio, eastern Indiana, and north central Kentucky the ventral pelage is usually white as is that of the meadow vole throughout its entire range. The crania of these two species are readily distinguish-

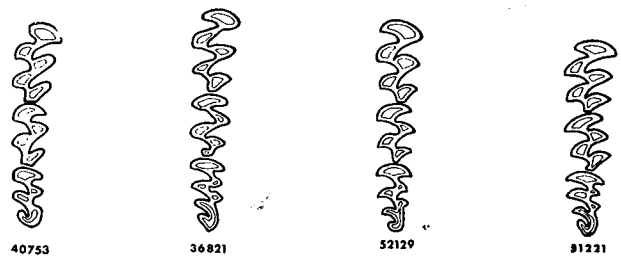


FIG. 2. Left upper molar toothrow of *Microtus pinetorum* (left), *M. pennsylvanicus* (left, center), *M. mexicanus* (right, center), and *M. montanus* (right). Number = UIMNH number. 5X.

able upon examination of the second upper molar (M2) as *M. ochrogaster* lacks the posterior loop that is present in the meadow vole (Fig. 2). The pattern of the triangles of the third upper molar (M3) can also be used to separate the prairie vole and the meadow vole as the complexity of the posterior portion of M3 is much reduced in the prairie vole, and the meadow vole has four closed triangles in M3 as compared to the three closed triangles in the prairie vole.

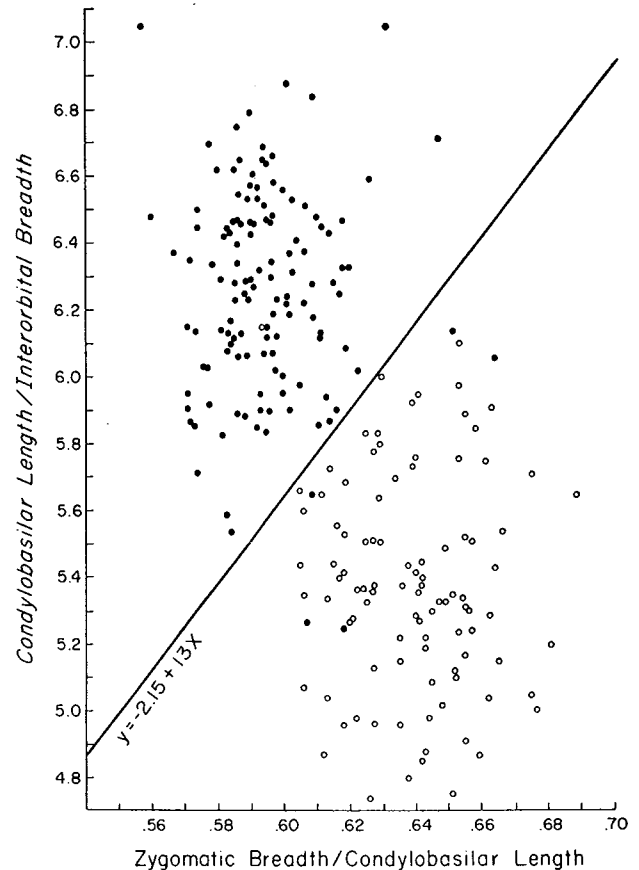


FIG. 3. Scattergram showing the separation of the skulls of *Microtus ochrogaster* and *M. pinetorum* by using the ratios Condylbasilar Length/Interorbital Breadth plotted against Zygomatic Breadth/Condylbasilar Length. Solid circles represent *M. ochrogaster*, open circles represent *M. pinetorum*.

Microtus ochrogaster is readily separable for both *M. mexicanus* and *M. montanus* by using dentition alone. The pattern of M3 is simpler in the prairie vole, having three closed triangles plus a posterior irregular section, while both *M. mexicanus* and *M. montanus* have four closed triangles and a more complex irregular section at the posterior end of M3 (See Fig. 2). In areas where *M. mexicanus* and *M. ochrogaster* are sympatric (northeastern New Mexico) these two species can be separated by examining the external measurements of subadult and adult individuals. The prairie vole has a total length ranging from 135 to 161 mm, a tail length from 30 to 37 mm, and a hind foot length from 20 to 23 mm. The Mexican vole has a total length from 93 to 144 mm, a tail length from 22 to 30 mm, and a hind foot length from 17 to 20 mm. Although these three characters overlap, only one specimen of the 153 examined could not be positively identified when using all three characters together, but examination of M3 clarified this specimen's identification.

Specimens of *Microtus ochrogaster* and *M. pinetorum* are seldom confused when skins are preserved. The prairie vole has a hispid appearance due to the blond tipped hairs dispersed along the dorsal surface which is lacking in the pine vole. There is a considerable amount of difficulty separating the skulls of these

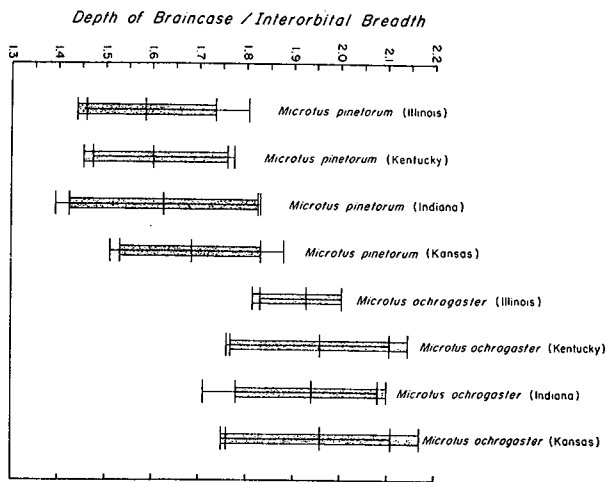


FIG. 4. Graph showing the ratio of Depth of Braincase/Interorbital Breadth of *Microtus ochrogaster* and *M. pinetorum*. For both species in each state the medial horizontal line represents the mean, the two horizontal lines terminating the stippled area represent two standard deviations either side of the mean, and the two horizontal lines connecting the medial vertical line represent the ranges.

two species. The critical area within the area of sympatry of these two species is eastern Kansas. The patterns of the molars of these two species are extremely similar (See Figs. 1 and 2) but a series of three skull ratios can be used to separate 98.71 per cent of the specimens used in this study and 98.11 per cent of those specimens from eastern Kansas. When the ratios of zygomatic breadth/condylobasilar length and condylobasilar length/interorbital breadth are plotted against each other 97.43 per cent of the specimens can be separated accurately and within eastern Kansas 92.45 per cent of the specimens can be separated (Fig. 3). The ratio of depth of braincase/interorbital breadth separated 96.23 per cent of the specimens examined with *M. ochrogaster* having a ratio of 1.80 or larger and *M. pinetorum* less than 1.80 (Fig. 4).

KEY TO SPECIES OF MICROTINES SYMPATRIC

WITH *Microtus ochrogaster*

- 1.a. Upper incisors grooved, molar pattern of prismatic triangles, total length 114.6 to 134.4 mm, tail length 17.9 to 24.3 mm, dorsal pelage coloration brown, ventral pelage white, ratio of tail length to hind foot length 0.96 to 1.23, mammae 6 *Synaptomys cooperi*
- 1.b. Upper incisors not grooved, molar pattern of irregularly shaped triangles 2
- 2.a. M3 with four closed triangles 3
- 2.b. M3 with three closed triangles 5
- 3.a. M2 terminating posteriorly in a closed or nearly closed loop, six plantar tubercles, dorsal pelage a brownish-black hispid, ventral pelage white to gray, tail usually twice as long as hind foot, mammae 8 *Microtus pennsylvanicus*
- 3.b. M2 not terminating posteriorly with a closed or nearly closed loop 4
- 4.a. Total length 128 to 180 mm, tail length 31 to 47 mm, hind foot length 18.5 to 21 mm, dorsal pelage a dark brownish-black, ventral pelage white to gray, mammae 8 *Microtus montanus*
- 4.b. Total length 93 to 144 mm, tail length 17 to 20 mm, dorsal pelage a dark cinnamon brown, ventral pelage light ochraceous, mammae 4 *Microtus mexicanus*
- 5.a. Dorsal pelage not hispid, brown to rust brown, ventral pelage ochraceous, tail short, mammae 4 *Microtus pinetorum*
- 5.b. Dorsal pelage hispid, light to dark brownish-black, hind foot less than half the length of the tail, ventral pelage usually ochraceous but white to gray in Ohio, eastern Indiana, and north central Kentucky, usually five plantar tubercles, mammae 6 *Microtus ochrogaster*

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