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A New Subspecies of the Meadow Vole (*Microtus pennsylvanicus*) from Northwestern Chihuahua, Mexico

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Specimens of *Microtus*, recently collected in the Mexican state of Chihuahua by a field party from Nevada Southern University, at Las Vegas, Nevada, represent a highly localized relict population which belongs to the *Microtus pennsylvanicus* group and which has differentiated significantly from the nearest adjacent populations of this group. This relict population in Chihuahua should be recognized as a distinct subspecies.

Microtus pennsylvanicus has not been reported from Mexico. The nearest record and the most southern record for *M. pennsylvanicus* in New Mexico is 7 miles southwest of Aragon, Socorro County, at 1970 meters in elevation (Anderson, 1961). This is approximately 256 miles north and slightly west of the type locality of the new subspecies. The New Mexican relict population is known only from two specimens, both of which show significant differentiation from other populations in New Mexico (Anderson, 1961). Anderson referred them to the subspecies *Microtus pennsylvanicus modestus* (Baird) and considered it possible that the population is now extinct. Other populations of *M. pennsylvanicus*, referable to the subspecies *M. p. modestus* and *M. p. aztecus*, occur in northern New

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Mexico (Hall and Kelson, 1959). These two subspecies include the most closely related known populations, both morphologically and geographically, and are used as a basis of comparison for the subspecies herein described.

The Mexican meadow voles were collected from a marsh along a small stream which drains from a hot spring, Ojo del Galeana. This marsh extends as a small strip, not more than 150 meters in width at any point, along the stream for a distance of about 3 kilometers. The vegetation is dominated by sedges and rushes which are commonly immersed in water for a depth of several centimeters. Small moist mats or hummocks of vegetation rise above the level of the water. Most of the specimens of *Microtus* were collected in traps set in areas covered by water. Specimens of *Reithrodontomys megalotis*, *Reithrodontomys montanus*, *Sigmodon hispidus*, and *Peromyscus maniculatus* were collected from the marsh in the same traplines as *Microtus*. *Sigmodon fulviventor*, *Peromyscus leucopus*, and the above species with the exception of *Microtus*, were found in the adjacent abundant cover of dry grass.

The marsh and spring areas are surrounded by mesquite grassland, characteristic of much of the countryside at lower elevations. Specimens of *Reithrodontomys montanus*, *Reithrodontomys megalotis*, *Reithrodontomys fulvescens*, *Peromyscus maniculatus*, *Neotoma albigula*, *Dipodomys merriami*, *Dipodomys ordii*, *Perognathus penicillatus*, and *Thomomys bottae* were taken in the nearby mesquite grassland. About 500 meters from the main spring on an arid, rocky hillside covered by grass, mesquite, cactus, and other desert scrubs, several additional species were collected. Rodents trapped at this site included *Reithrodontomys megalotis*, *Reithrodontomys fulvescens*, *Peromyscus eremicus*, *Neotoma albigula*, *Dipodomys merriami*, *Dipodomys ordii*, *Dipodomys spectabilis*, and *Perognathus penicillatus*.

Microtus, on the basis of limited trapping, seems to be restricted to the marsh.

In the following description, all measurements are in millimeters. Measurements of skulls, except for the depth of the braincase, were taken with dial calipers, as described by Cockrum (1962). The depth of the braincase was taken as described by Anderson (1954). Capitalized color terms are from Ridgway (1912). Specimens are in the collection of the Biology Museum, Nevada Southern University, at Las Vegas, except for the holotype and two paratypes, which are in the American Museum of Natural History.

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***Microtus pennsylvanicus chihuahuensis*, new subspecies**

TYPE: A.M.N.H. No. 208653, skin, skull, and partial skeleton of an adult female from 3 miles southeast of Galeana, northwestern Chihuahua, Mexico, at an elevation of approximately 1400 meters; collector, Roger A. Mauer, original number 601; December 20, 1964; skin in good condition, skull complete.

In addition to the holotype there are 31 paratypes (skins and skulls).

DIAGNOSIS: Member of the *M. pennsylvanicus* group as evidenced by posterior loop on M²; size large (see measurements); pelage soft, color dark brown; tail proportionally long, almost unicolorous; hind feet large, darkly pigmented on ventral surface; skull large and wide; nasal wide; bullae inflated; tooth rows elongated.

DESCRIPTION OF TYPE: Color of hair on upper parts near Mummy Brown, but so completely suffused with black as to be virtually obscured; under parts with little wash of grayish; forefeet and hind feet lighter in color but still heavily pigmented.

MEASUREMENTS OF TYPE: Total length, 176; length of tail, 54; hind foot, 22. Skull: Condylbasilar length, 30.2; nasal length, 9; greatest width of nasals, 3.6; zygomatic breadth, 18.9; depth of braincase, 8.7; interparietal length, 4.4; interparietal width, 8.7; tympanic bulla, length, 6.9; tympanic bulla, width, 6.9; upper tooth row, length (alveolar), 8.3; lower tooth row, length (alveolar), 7.5.

Additional measurements of *M. p. chihuahuensis* are given in table 1.

COMPARISONS: Geographically, the nearest subspecies of *Microtus pennsylvanicus* are *M. p. modestus* and *M. p. aztecus*.

From *Microtus p. modestus*, *M. p. chihuahuensis* differs as follows: pelage shorter, softer, and darker; skull longer; braincase deeper; zygomatic breadth wider; nasals wider; interparietal shorter and wider; tympanic bulla large, especially in width; tooth rows longer. *Microtus p. chihuahuensis* has a larger, broader skull (see ratios of total length divided by skull measurements).

Most of the differences seen between *Microtus p. chihuahuensis* and *M. p. modestus* exist between *M. p. chihuahuensis* and *M. p. aztecus*. *Microtus p. chihuahuensis* is larger and has a much wider zygomatic breadth than *M. p. aztecus*.

TABLE 1
 MEASUREMENTS (IN MILLIMETERS) OF ADULT SPECIMENS OF *Microtus pennsylvanicus chihuahuensis*, *Microtus pennsylvanicus modestus*,
 AND *Microtus pennsylvanicus aztecus*
 (In parentheses are the numbers of specimens from each locality.)

	<i>chihuahuensis</i>		<i>modestus</i> , New Mexico			<i>aztecus</i>		
	Av.	Max.	Ojo del Galeana, Chihuahua (27)	Colfax Co. ^c (9)	Taos Co. ^b (7)	Mora Co. ^b (2)	San Juan Co. ^c New Mexico (8)	
	Min.	Max.	Av.	Av.	Av.	Min.	Max.	
Total length	175.4	199	161.3	180.1	190.5	144	164.7	177
Tail, length	46.8	57	41.8	43.6	49.0	33	41.7	36
Hind foot, length	22.6	25	20.8	20.9	20.9	19	21.9	20
Skull, condylobasilar length	28.62	30.2	27.22	26.56	27.85	25.1	28.14	27.0
Nasal, length	8.07	7.1	7.67	8.16	8.10	7.2	8.5	8.03
Nasals, greatest width	3.75	3.3	3.44	3.23	3.25	3.1	3.7	3.06
Zygomatic breadth	17.50	18.8	15.18	16.02	16.10	14.0	17.2	15.34
Mastoid breadth	—	—	12.28	12.90	13.15	11.5	13.3	12.80
Braincase, depth	8.60	8.1	—	8.42	8.45	8.3	9.0	8.45 ^d
Interparietal length	4.06	3.4	4.19	4.26	4.55	3.5	5.1	5.10
Interparietal width	8.16	7.3	—	7.88	7.67	7.4	8.4	7.85 ^d

TABLE 1—(Continued)

	<i>chihuahuensis</i>			<i>modestus</i> , New Mexico			<i>aztecus</i>					
	Ojo del Galeana, Chihuahua (27)			Colfax Taos Co. (7)			Mora Co. (2)			San Juan Co. New Mexico (8)		
	Av.	Min.	Max.	Av.	Min.	Max.	Av.	Min.	Max.	Av.	Min.	Max.
Interparietal width/interparietal length	2.07	1.7	2.5	—	1.74	1.72	1.61	1.92	1.40 ^d	1.30	1.5	
Tympanic bulla, length	9.99	8.4	10.8	—	8.40	9.05	7.4	9.4	9.45 ^d	9.2	9.7	
Tympanic bulla, width	7.09	6.7	7.8	—	6.10	6.35	5.5	6.5	6.10 ^d	6.0	6.2	
Upper tooth row, length	7.73	6.9	8.1	6.79	7.09	7.10	6.3	7.5	7.20	6.9	7.6	
Lower tooth row, length	7.57	6.9	8.0	—	6.86	7.10	6.6	7.5	7.30 ^d	7.0	7.6	
Total length/condylobasilar length	6.03	5.4	6.4	5.94	6.68	6.75	5.5	6.8	5.93	5.6	6.2	
Total length/zygomatic breadth	9.93	9.2	11.0	10.58	11.20	11.90	9.6	11.8	10.90	10.5	11.6	

^a Specimens on deposit at the University of Kansas Museum of Natural History.

^b Specimens on deposit at the Museum of Southwestern Biology, University of New Mexico.

^c Specimens on deposit at the Museum of Southwestern Biology, University of New Mexico, and United States National Museum, Biological Surveys Collection.

^d Measurements taken on only two specimens.

REMARKS: *Microtus p. chihuahuensis* exists as a highly localized relict population isolated from the nearest populations belonging to *M. pennsylvanicus* by areas covered by desert scrub and grassland vegetation that form a barrier to any genetic exchange.

During late Wisconsin time, about 17,000 years ago, populations of *Microtus pennsylvanicus* probably were distributed throughout the mountainous areas and areas lower than those now occupied in New Mexico and adjacent northern Mexico. Evidence based on pollen analysis clearly indicates a lowering of vegetation zones by several thousand feet at that time (Hafsten, 1961; Martin, 1963, 1964). Certain related problems concerning the Pleistocene zoogeography of the vertebrates of the southwest have been discussed by Blair (1958), and reviews of the late Pleistocene and post-pluvial ecology of the southwest were provided by Martin (1964), Martin and Mehringer (1965), and Mehringer (1965). Martin and Mehringer (1965) have summarized current fossil pollen studies pertaining to the southwest and concluded that the last major pluvial maximum occurred about 20,000 years ago and that pluvial conditions were nearing an end about 12,000 years ago. Desert grasslands and associated communities have been widespread since the end of the pluvial period (Martin, 1963; Mehringer and Haynes, 1965).

Desert grassland now provides an ecological barrier that separates the Chihuahuan relict and New Mexican populations of *Microtus pennsylvanicus*. The above paleoecological evidence suggests that the Chihuahuan population has been completely isolated for about 12,000 years. During this period of isolation significant differentiation from adjacent populations has developed. Certain features of this differentiation exist in some populations of *M. pennsylvanicus*. Southern populations of *M. pennsylvanicus* are usually darker than northern populations (Hall and Kelson, 1959). Anderson (1961) described a specimen from Aragon, New Mexico, having a longer, more massive skull than specimens from farther north. Some of the other characteristics seen in *M. p. chihuahuensis*, such as the relative proportions of the bones of the skull, may represent divergence from the basal stock. The small population may have been reduced further during normal population fluctuations. Such reduction might have contributed to genetic drift and to the fixation of non-adaptive characters in the population; for example, six of the 32 specimens examined have a small area of white hair on the dorsal posterior region of the head.

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