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VARIATION IN THE BLACKISH DEER MOUSE, PEROMYSCUS FURVUS

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RESUMEN

Seis clases de variación —estacional, individual, sexual secundaria, edad, microgeográfica y geográfica, son registrados para el ratón campestre negruzco del Oriente de México. La especie vive en las vertientes orientales de la Sierra Madre Oriental, principalmente en las elevaciones relativamente grandes, en áreas frías, húmedas, cubiertas con una densa vegetación herbácea, desde el Sur de San Luis Potosí hacia el Sur, 170 millas (260 Kms.) hasta Xico, en Veracruz. Las variaciones microgeográficas y geográficas son seleccionadas, discutidas e ilustradas con ejemplos. La intergradación es aceptada como criterio para subespecies y la carencia de ella como el criterio para especies. El aislamiento intermitente de áreas de habitat apropiado para ratones se considera ser la causa principal de la variación geográfica encontrada. El grado y clase de variación geográfica es tan ligera que el reconocimiento subespecífico no se garantiza. Consecuentemente, el ratón campestre negruzco es considerado como especie monotípica. Su nombre científico correcto es *Peromyscus furvus*. *Peromyscus latirostris* y *angustirostris* son sinónimos recientes de *Peromyscus furvus*.

RESUME

Six kinds of variation —seasonal, individual, secondary sexual, age, microgeographic, and geographic— are reported on for the blackish deer mouse of eastern México. The species lives on the eastern slopes of the Sierra Madre Oriental of eastern México, mostly at relatively high elevations, in cool, moist areas, supporting a dense ground-cover of herbaceous vegetation, from southern San Luis Potosí southward 170 miles to Xico in Veracruz. Microgeographic variations and geographic variations are distinguished, discussed, and illustrated by examples. Intergradation is accepted as the criterion for subspecies and lack of integradation as the criterion for species. Intermittent isolation of areas of habitat suitable for the mice is thought to be the principal cause of the geographic variation found. The degree and kind of geographic variation is so slight that subspecific recognition is not warranted. Consequently, the blackish deer mouse is regarded as a monotypic species. Its correct scientific name is *Peromyscus furvus*. *Peromyscus latirostris* and *Peromyscus angustirostris* are junior synonyms of *Peromyscus furvus*.

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In 1897 Allen and Chapman (p. 201) named the Blackish Deer Mouse, *Peromyscus furvus*, as a species from the state of Veracruz. In 1950 Dalquest (p. 8) named *Peromyscus latirostris* as a species from the state of San Luis Potosí, recognizing that its closest relative was *P. furvus*. In 1961 Hall and Alvarez (p. 203) named *Peromyscus angustirostris* as a species from an intermediate locality, in Veracruz, recognizing that its closest relatives were the two species previously named. In 1964 Musser (pp. 10-12) considered *P. angustirostris* to be a synonym of *P. furvus*, but did not appraise the taxonomic status of *P. latirostris*.

When preparing the present account my aims were to: (1) ascertain the nature of variation in the above-mentioned mice; (2) list the variations by categories (for example secondary sexual, clinal, geographic) and; (3) decide on appropriate taxonomic treattment —that is to say, which specific name(s), and subspecific names if any, should be applied to the mice.

A third more specimens (total of 144) from approximately twice as many localities were available to me as previously had been brought together. Specimens of all age-groups (juvenal, young, subadult, adult, and old) were studied but only 84 adults and six old individuals were relied on for assessing the taxonomic significance of variations found. These 90 specimens (55 males and 35 females) were distributed geographically (see Fig. 1) as follows: north of 21° North latitude, *latirostris*, northern (Xilitla) area, 13; south of 22°, *furvus*, southern (Jalapa) area, 27; between 21° and 22°, *angustirostris*, cen-

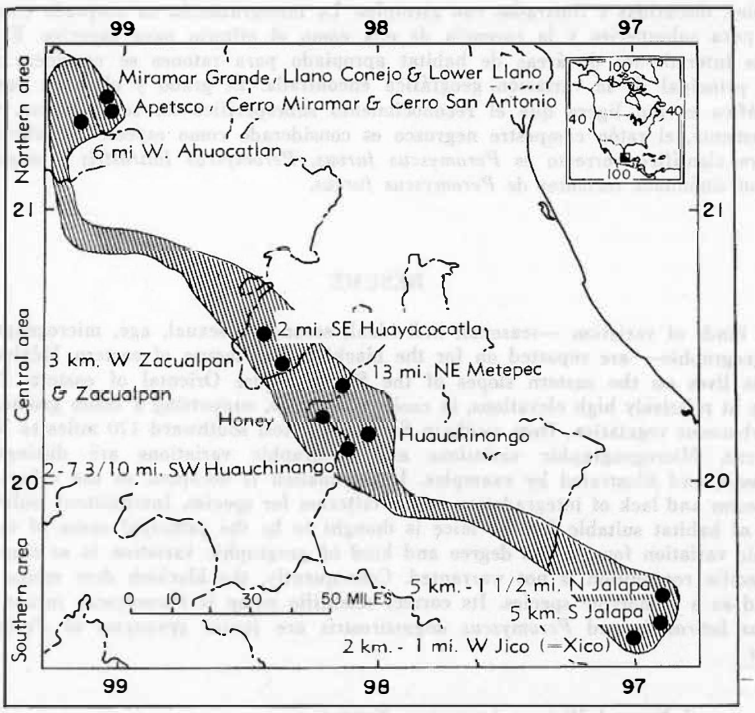

Fig. 1. Localities of occurrence and probable geographic range of *Peromyscus furvus*.

tral area, 50. For convenience in discussing specimens from the central area they are subdivided into two lots: (1) the Zacualpan population (specimens labeled in reference to Zacualpan and Huayacocotla), and (2) the Metepec population (specimens labeled in reference to Metepec, Honey, and Huauchinango).

The features chosen as indicative of adults were lingual cusps worn smooth and labial cusps showing considerable wear (labial cusp of M3 may persist). Old individuals were considered to be those in which the cusps were worn smooth (not more than one external re-entrant angle discernible, and in some specimens none).

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NATURE OF VARIATION

Seasonal variation accounts for the differences in color, as Musser (*op. cit.*) pointed out.

Individual variation stressed by Musser (*op. cit.*), especially in specimens of the Metepec population of the central area could account for many of the features originally thought to be distinctive of *P. angustirostris* (for instance deeper and wider first secondary fold in m^2) and for some of the features thought to be distinctive of *P. latirostris* (for example, lateral expansion of the nasals anteriorly).

Secondary sexual variation seems not to have been confused with any other kind of variation by persons who have studied the mice being considered. It is noteworthy that males average larger than females by about four per cent in extenal measurements and two por cent in linear measurements of the skull; in other kind of *Peromyscus* that I have studied, for instance, *Peromyscus crinitus* and *P. maniculatus*, females, on the average are the larger (see Hall, 1946:505, 513).

Age variation likewise seems not to have been confused with any other kind of variation by those who named *P. latirostris* and *P. angustirostris*. Musser (1964:111) may or may not have thought there had been such confusion. In either event, his description of variation according to age, in certain features, including wear on the teeth, for the mice under consideration, is accurate.

Microgeographic variation was mistaken for geographic variation by Hall and Alvarez (*op. cit.*) when they enumerated characters for distinguishing *angustirostris* as a species. A microgeographic character as here thought of is a feature, for example a U-shaped posterior border on the hard palate, characteristic of all individuals in an area, say, one mile square, but not characteristic of all individuals in other parts of the geographic range of a subspecies. A geographic character as here thought of is a feature, for example a V-shaped posterior border on the hard palate, characteristic of all individuals throughout an area of many square miles to which the term "population" can conveniently be applied. This line of thought presupposes a subjective hierarchy of variation: individual, microgeographic, population, and subspecific. A high incidence of occurrence of a character only in a small area, if arbitrary limits are set for incidence and for size of area, provides about the only feasihle means for distinguishing microgeographic variation from geographic variation (= population-variation and subspecific-vari-

ation). Mayr's (1966:297-334) account of variation can profitably be read by any person who has to categorize variation of the sort here being dealt with. Examples of microgeographic variation are large mesostyle and small cingulum on Ml of specimens from the type locality of *P. angustirostris* in the Zacualpan population; but, other larger series of specimens in the nearby Metepec population are not uniform in these features and some of the specimens are from little more than 10 miles distaut from the type locality of *P. angustirostris*. Theretore, it seems better to regard the characters of Ml in specimens from the type locality of *angustitrostris* as microgeographic, instead of geographic, variations, and it seems reasonable to lump the specimens from the Zacualpan and Metepec populations for the purpose of studying geographic variation.

Geographic variation clearly is to be seen in some features of the mice. For example, the largest specimens are from the northern area (see Table 1) but others from there are no larger than some specimens from each of the other areas. The smallest specimens are from the central area but others from there are no smaller than some specimens from each of the other areas (shortest hind foot is in the southern area). The average size of specimens from

TABLE 1

AVERAGE, MINIMUM AND MAXIMUM MEASUREMENTS, IN MILLIMETERS, OF ADULT AND OLD MALES OF *PEROMYSCUS FURVUS*

Total Length	*Length of tail*	*Length of hind foot*	*Basilar length*	*Incisive foramina*	*Diastema*
Northern (Xilitla) area, 11 individuals (2 old, 9 ad.)					
280	143	30	27.0	7.4	9.7
260	125	27	25.2	6.9	8.8
300	162	33	28.3	8.0	10.2
Central area (Zacualpan population) 8 (2 old, 6 ad.)					
257	131	29	25.6	7.0	9.2
236	122	28	24.3	6.0	8.3
275	145	30	27.4	7.7	10.7
Central area (Metepec population) 20 (1 old, 19 ad.)					
259	131	29	25.1	7.0	9.1
229	120	27	24.0	6.5	8.3
281	143	32	27.0	7.3	9.8
Southern (Jalapa) area, 16 (ad.)					
267	133	29	26.2	7.0	9.6
232	114	26	24.3	6.5	9.0
280	148	31	27.9	7.6	10.1

the southern area is intermediate. In form (shape as opposed to size), the cranium when viewed from above is squarish in most specimens from the central area but rounded in most specimens from the northern area and in those from the southern area. On the midline of the dorsum of the skull, the suture separating the frontals from the parietals, viewed posterodorsally, is U-shaped in all 13 specimens from the northern area, U-shaped in 41 and V-shaped in 7 from the central area, and V-shaped in 12 and U-shaped in 12 from the southern area. Although the shape of the fronto-parietal suture varies geographically, in the southern area it varies individually and is illustrative of other variations that do not lend themselves well to distinguishing subspecies because of inconstancy.

CAUSE OF VARIATION

Most of the individuals of the kind of mice being considered were captured in cool, moist areas supporting a dense ground-cover of herbaceous vegetation. Along the eastern face of the Sierra Madre Oriental most of such habitat occurs only at relatively high elevations. Between the northern (Xilitla) area and the central area, lower terrain for a distance of 75 miles has afforded little if any suitable habitat for these mice for a period of many years. Between the central area and the southern (Jalapa) area, 85 miles of lower terrain in dry years contains only small disconnected tracts of habitat suitable for these mice. The intermittent isolation of the three areas is thought to be the principal cause of the geographic variation described.

TAXONOMIC TREATMENT

Mammalogists of this decade, as most biologists know, apply two different specific names to a pair of kinds of mammals if in nature (as opposed to "in captivity") the kinds *consistently* differ and nowhere (geographically) intergrade. Inferentially they do not crossbreed in nature. The same mammalogists use instead two different subspecific names, as one means of cataloguing geographic variation, if intergradation occurs in nature between the two kinds. In an instance of this sort, because of the existence of the intergrades, the two kinds of course do not consistently differ. Even so, many mammalogists use subspecific names only if in one kind all individuals of at least one sex of at least one age of at least one population can be distinguished by means of morphological features from all corresponding specimens of at least one population of the other kind.

According to the criteria stated immediately above, it seems to be incorrect to treat the mice from the three areas (northern, central, and southern) as either species or subspecies. To recapitulate, in *P. latirostris* of the northern area, only half (50%) of the individuals are larger than the largest individuals, comparable as to sex and age, of the central population. Between *P. angustirostris* of the central area and *P. furvus* of the southern area less than 50 per cent can be distinguished on basis of size. Features other than size provide no better basis for separating the mice from the three areas. Consequently, the geographic variation detected seems best recorded by description or by measurements (see Table 1) and to be of merely population-grade, not subspecific-grade or specific-grade.

Therefore, *P. furvus*, the earliest names, will stand for the monotypic species and the two later names are synonyms of it.

Peromyscus furvus J. A. Allen and Chapman

1897. *Peromyscus furvus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:201, June 16, type from Jalapa, Veracruz.

1950. *Peromyscus latirostris* Dalquest, Occas. Papers Mus. Zool., Louisiana State Univ., 23:8, July 10, type from Apetsco, 2700 ft., near Xilitla, San Luis Potosí.

1961. *Peromyscus angustirostris* Hall and Alvarez, Proc. Biol. Soc. Washington, 74:203, August 11, type from 3 km. west of Zacualpan, 6000 ft., Veracruz.

Geographic range. Along eastern edge of Mexican Tableland from Cerro Conejo, San Luis Potosí, south to Xico, Veracruz. Occurs in cool moist areas having a dense ground-cover of herbaceous vegetation at elevations of more than 4000 feet. See Fig. 1.

Characters. Large for the genus (see Table 1); upper parts dark brown to blackish, approximating russet on sides; underparts grayish (much of slaty basal parts of hairs showing through whitish tipping); feet white; blackish brown marking on tarsal joint; tail either entirely blackish or irregularly bicolored and blotched underneath; skull (see Figs. 361 and 362 Hall and Kelson, 1959) narrow interorbitally; supraorbital border of frontals not beaded but in some specimens trenchant; nasals unusually broad anteriorly.

Specimens examined. Total number 144 (in each state arranged from north to south), as follows.

Hidalgo: 13 mi. NE Metepec (Highway 53), 660 ft., 28 (U. M.[1]).

Puebla: (U. M.): Honey, 1; Huauchinango, 1; 2 mi. SW Huauchinango, 6500 ft., 5; 2 mi. SW, 5500 ft., 1; 2 1/2 mi. SW, 7000 ft., 3; 5 7/10 mi. SW by road, 660 ft., 6; 7 3/10 mi. SW by road, 6800 ft., 4.

Querétaro (labeled S. L. P.): 6 mi. W Ahuacatlan, 5800 and 5600 ft., 2 (L. S. U.[2]).

San Luis Potosí (L. S. U. unless otherwise noted): Miramar Grande, 6000 ft., 6; Llano Conejo, 6000 ft., 3; Lower Llano, Conejo region, 2; Apetsco, 6 (4 M.U., 2 at K. U.[3]); Cerro Miramar, 3; Cerro San Antonio, 3.

Veracruz (K. U. unless otherwise noted): 2 mi. SE Huayacoc[o]tla (Highway 51), 6500 ft., 4 U. M.; 3 km. W Zacualpan, 6000 ft., 16; Zacualpan, 6000 ft., 7; 5 km. N Jalapa, 4500 ft., 6 (5 K. U., 1 U. M.); 1 1/2 mi. N Jalapa, 4500 ft., 1 U. M.; 5 km. S Jalapa, 1 U. M.; 2 km. W Jico, 4200 ft., 26; 1 mi. W Xico, 1340 m., 13 U. M.

[1] U. M. = University of Michigan Museum of Zoology.

[2] L. S. U. = Louisana State University Museum of Natural History.

[3] K. U. = University of Kansas Museum of Natural History.

LITERATURE CITED

Allen, J. A., and Chapman, F. M. On a collection of mammals from Jalapa and Las Vigas, state of Vera Cruz, Mexico. Bull. Amer. Mus. Nat. Hist., 9:197-208, June 16, 1897.

Dalquest, W. W. Records of mammals from the Mexican state of San Luis Potosí. Occas. Papers Mus. Zool., Louisiana State Univ., No. 23:1-15, July 10, 1950.

Hall, E. R. Mammals of Nevada. Univ. California Press, Berkeley, xi + 710 pp., frontispiece, 11 pls., 485 figs., 27 tables, July 1, 1946.

Hall, E. R., and Álvarez, T. A new species of mouse *(Peromyscus)* from northwestern Veracruz, Mexico. Proc. Biol. Soc. Washington, 74:203-206, August 11, 1961.

Hall, E. R., and Kelson, K. R. The mammals of North America. The Ronald Press, New York, 2 vols., xxx + 1083 + 19, illustrated, March 31, 1959.

Mayr, E. Animal species and evolution. Harvard Univ. Press, xvi + 797, illustrated, 1966.

Musser, G. G. Notes on geographic distribution, habitat, and taxonomy of some Mexican mammals. Occas. Papers Mus. Zool., Univ. Michigan, No. 636:1-22, June 17, 1964.

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