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# NOTEWORTHY KARYOTYPES OF RODENTS FROM DURANGO, MEXICO

JOHN A. PEPPERS, MEREDITH J. HAMILTON, RAUL MUNIZ-MARTINEZ, JOAQUIN ARROYO-CABRALES, AND ROBERT D. BRADLEY

Herein, we report karyotypes for 10 species of rodents. Among these are karyotypes that to our knowledge have not been described for six subspecies. In addition, we make noteworthy comments on the karyotypes of four other species. These specimens were obtained from localities in central and southeastern Durango, Mexico, including the Mexican Plateau and the Sierra Madre Occidental and its foothills.

## METHODS AND MATERIALS

Wild-caught rodents were sacrificed and somatic cell suspensions were prepared from bone marrow using methods described by Baker et al., (1982). Five metaphase spreads were examined for each individual and the diploid number (2n) and fundamental number (FN) were determined for each taxon. Voucher specimens are deposited in the Museum, Texas Tech University and the Instituto Politecnico National.

Specimens examined.— *Dipodomys phillipsii ornatus* - 5.8 km N, 2.1 km E Vicente Guerrero, 1937 m (3 males: TK 48698, TK 48699, TK 48713; 1 female: TK 48714); 2.8 km S, 3.8 km W Vicente Guerrero, 1950 m (2 males: TK 48808, TK 48810; 1 female: TK 48809); *Perognathus flavus medius* - 5.8 km N, 2.1 km E Vicente Guerrero, 1937 m (3 males: TK 48538, TK 48703, TK 48705; 3 females: TK 48701, TK 48702, TK 48704); 2.8 km S, 3.8 km W Vicente Guerrero, 1950 m (2 males: TK 48811, TK 48813); *Chaetodipus nelsoni nelsoni* - 1.5 km SE Los Herreras, 1964 m (1 male: TK 48536); *Peromyscus maniculatus labecula* - 5.8 km N, 2.1 km E Vicente Guerrero, 1937 m (1 male: TK 48719; 3 females: TK 48716, TK 48717, TK 48718); 2.8 km S, 3.8 km W Vicente Guerrero, 1950 m (2 females: TK 48814, TK 48815); *Reithrodontomys megalotis megalotis* - 2.8 km S, 3.8 km W Vicente Guerrero, 1950 m (4 males: TK 48817, TK 48818, TK 48821, TK 48825; 3 females: TK 48820, TK 48822, TK 48823); 1.5 km SE Los Herreras, 1964 m (1 male: TK 48564); *Reithrodontomys fulvescens griseoflavus* - 1.5 km SE Los Herreras, 1964 m (3 males: TK 48562, TK 48591, TK 48593; 2 females: TK 48563, TK 48592), 15 km N Los Herreras, 1780 m (5 males: TK 48615, TK 48723, TK 48726, TK 48844, TK 48846; 4 females: TK 48724, TK 48725, TK 48845, TK 48847); *Baiomys taylori paulus* - 5.8 km N, 2.1 km E Vicente Guerrero, 1937 m (3 males: TK 48690, TK 48694, TK 48695; 4 females: TK 48689, TK 48691, TK 48692, TK 48696); 2.8 km S, 3.8 km W Vicente Guerrero, 1950 m (2 males: TK 48805, TK 48807; 1 female: TK 48806),

1.5 km SE Los Herreras (3 males: TK 48841, TK 48842, TK 48843; 1 female: TK 48840); *Sigmodon ochrognathus* - 15 km N Los Herreras, 1780 m (2 females: TK 48608, TK 48609); *Thomomys umbrinus chihuahuae* - 1.5 km SE Los Herreras, 1964 m (1 male: TK 48502; 1 female: TK 48517); *Spermophilus variegatus rupestris* - 1.5 km SE Los Herreras, 1964 m (1 male: TK 48560; 2 females: TK 48559, TK 48561).

## RESULTS AND DISCUSSION

*Dipodomys phillipsii ornatus.*— This karyotype (2n = 72, FN = 138) possesses 34 biarmed pairs (12 small submetacentric and 22 large to small subtelocentric) and one small acrocentric pair and is the same as reported by Stock (1974). The X chromosome is submetacentric and the Y chromosome is small and acrocentric. Specimens examined by Stock (1974) were from 1.3 mi. W Bledos, San Luis Potosi. Our specimens from 300 kilometers to the west, on the opposite side of the Mexican Plateau, suggest that this karyotype is unchanged throughout a large portion of the species distribution.

*Perognathus flavus medius.*— This represents the first reported karyotype of this subspecies. The karyotype (2n = 50, FN = 86) possesses 19 large to small biarmed pairs and five pairs of small acrocentric chromosomes. The X chromosome is submetacentric and the Y chromosome is small and metacentric. This karyotype is identical to those of *P. f. flavus* and *P. f. gilvus* described by Lee and Engstrom (1991), Patton (1967), and Williams (1978).

*Chaetodipus nelsoni nelsoni.*— This represents the first reported karyotype for this subspecies. It is identical to cytotype B reported by Patton (1970), Lee (1990), Lee et al. (1991), and Patton and Rogers (1993) for *C. n. canescens*. The karyotype (2n = 48, FN = 58) possesses six biarmed pairs and 17 pairs of large to small acrocentric chromosomes. The X chromosome is large and metacentric and the Y chromosome is small and acrocentric.

*Peromyscus maniculatus labecula.*— This represents the first reported karyotype for this subspecies. It is identical to karyotypes reported by Bradshaw and Hsu (1972), and Bowers et al. (1973) for other subspeciesof *P. maniculatus*. The karyotype (2n = 48, FN = 82) possesses 18 pairs of biarmed chromosomes, ranging in size from large to small, and five pairs of large to small acrocentric chromosomes (Fig. 1). The X chromosome is large and submetacentric and the Y chromosome is small and metacentric.

*Reithrodontomys megalotis megalotis.*— This karyotype is identical to that reported by Robbins and Baker (1980), and Hood et al. (1984) for populations

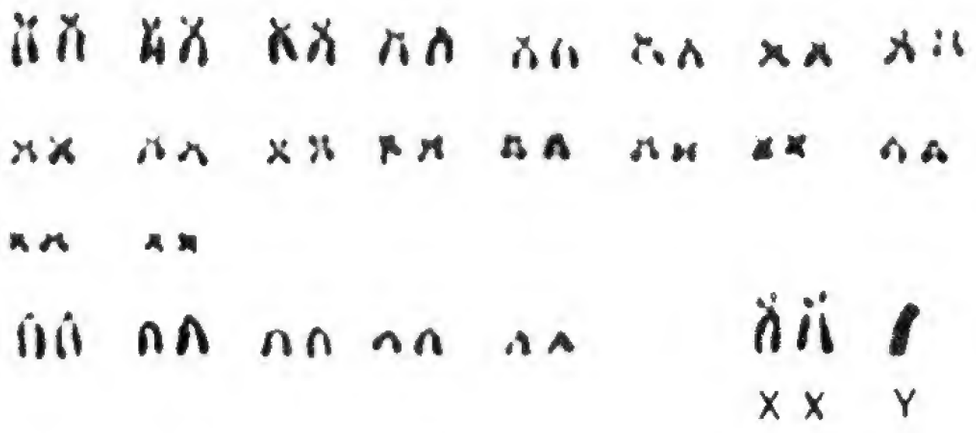


Figure 1. Nondifferentially stained karyotype of a female *Peromyscus maniculatus labecula* (TK 48717) and the Y chromosome of a male *P. m. labecula* (TK 48719) from Durango, Mexico.

of this subspecies in the southern United States and by Engstrom et al. (1981) for populations from central Mexico. The autosomal karyotype (2n = 42, FN = 80) is completely biarmed with nine pairs of medium sized metacentric, eight pairs of medium to small submetacentric, and three pairs of large subtelocentric chromosomes. The X chromosome is large and submetacentric and the Y chromosome is medium and subtelocentric. As described by Blanks and Shellhammer (1968), we also document the presence of supernumerary chromosomes. Blanks and Shellhammer (1968) reported one to seven supernumerary chromosomes, in this study, the number ranged from one to four.

*Reithrodontomys fulvescens griseoflavus.*— This karyotype (2n = 50, FN = 48-50) is similar to the karyotype (2n = 50, FN = 48-49) reported by Carleton and Myers (1979), Robbins and Baker (1980), and Engstrom et al. (1981). The karyotype possesses an entirely acrocentric complement with the exception of one to two medium sized biarmed chromosomes. The two individuals (FN = 50) reported herein provide the first example of this cytotype.

*Baiomys taylori paulus.*— This represents the first reported karyotype for this subspecies. The karyotype (2n = 48, FN = 46) possesses 23 large to small acrocentric pairs of chromosomes. The X chromosome is medium and subtelocentric and the Y chromosome is small and subtelocentric. This karyotype is identical to that reported by Hsu and Benirschke (1967) and Yates et al. (1979) for *B. t. analogous.*

*Sigmodon ochrognathus.*— This karyotype (2n = 52, FN = 68) possesses 9 medium to small biarmed chromosomes and 16 large to small acrocentric chromosomes. The X chromosome is a medium to large biarmed chromosome and the Y chromosome is small and acrocentric. This karyotype is identical to that reported by Elder and Lee (1985) for specimens from Arizona and Texas indicating that individuals from central Mexico have the same karyotype as individuals from the northern portion of this species range.

*Thomomys umbrinus chihuahuae.*— The karyotype of (2n = 78, FN = 108) possesses 16 pairs of large to medium biarmed and 22 pairs of acrocentric elements ranging in size from large to small (Fig. 2). The X chromosomes is large and biarmed and the Y chromo-

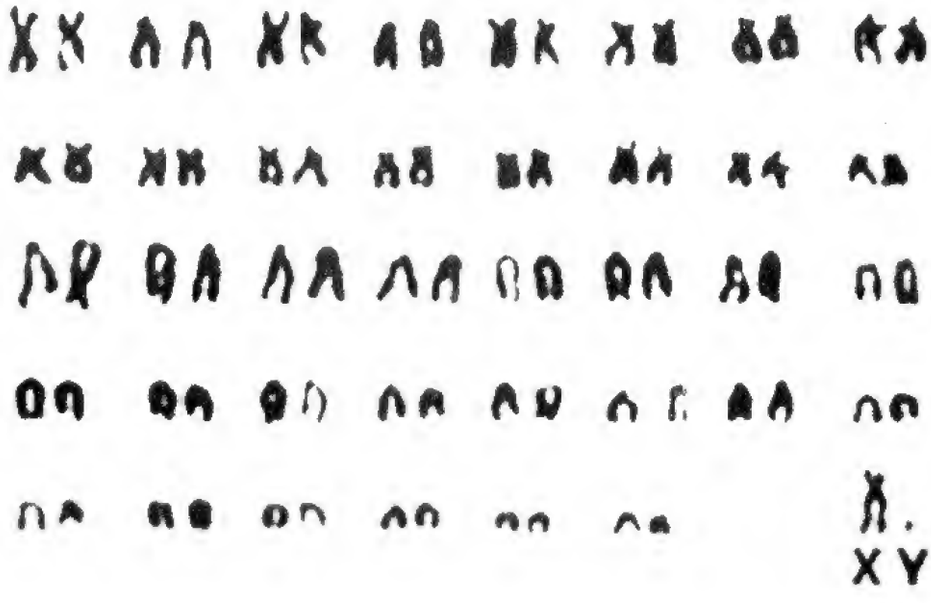


Figure 2. Nondifferentially stained karyotype of a male *Thomomys umbrinus chihuahuae* (TK 48502) from Durango, Mexico.

some is an extremely small acrocentric chromosome. Hafner et al. (1987) reported on karyotypes of several populations of *Thomomys* from Mexico, however, it is unclear whether any of the populations examined in their study represent *T. u. chihuahuae*. They examined one population (23) near the boundary separating *T. u. chihuahuae* and *T. u. evexus* (2n = 76, FN = 64) and two populations (24 and 25) near the boundary separating *T. u. chihuahuae* and *T. u. musculus* (2n = 76, FN = 116; 2n = 76, FN = 114 respectively). Subspecies boundaries are those of Hall (1981). Our population, from 1.5 km SE Los Herreras, Durango is from the central portion of the range for *T. u. chihuahuae*. If we interpret this population to be representative of *T. u. chihuahuae*, then either the populations reported by Hafner et al. (1987) are indicative of the other subspecies or *T. u. chihuahuae* is extremely polymorphic in regard to its karyotype. Interestingly, Hafner et al. (1987) reported an individual with 2n = 78, FN = 108 from Boca del Monte, Puebla. This population is representative of either *T. u. orizabae* or *T. u. umbrinus* and is over 500 km SE of our Durango site.

*Spermophilus variegatus rupestris*.— This represents the first reported karyotype for this subspecies. The karyotype (2n = 38, FN = 72) possesses a complete biarmed autosomal compliment. There are 18 large to small biarmed pairs (Fig. 3). The X chromosome is a large biarmed chromosome and the Y chromosome is small and acrocentric. This karyotype is identical to that reported by Nadler (1966) for *S. variegatus grammurus*.

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Figure 3. Nondifferentially stained karyotype of a male *Spermophillus variegatus rupestris* (TK 48560) from Durango, Mexico.

cial thanks to biologists Javier de la Maza Elvira and Jose Maria Reyes for granting collecting permits for Durango. The Museum of Texas Tech University and the Department of Biological Sciences, Texas Tech University provided financial support. R. J. Baker kindly allowed us to use karyotyping and chromosome facilities in his laboratory.

## LITERATURE CITED

Baker, R. J., M. W. Haiduk, L. W. Robbins, A. Cadena, and B. F. Koop. 1982. Chromosome studies of South American bats and their systematic implications. Pp. 303-327 *in* Mammalian Biology in South America (M. A. Mares and H. H. Genoways, eds.). Spec. Publ. Ser., Pymatuning Lab. Ecol., Univ. Pittsburgh, 6:1-539.

Blanks, G. A., and H. S. Shellhammer. 1968. Chromosome polymorphism in California populations of harvest mice. J. Mamm., 49:726-731.

Bowers, J. H., R. J. Baker, and M. H. Smith. 1973. Chromosomal, electrophoretic, and breeding studies of deer mice (*Peromyscus maniculatus*) and black-eared mice (*P. melanotis*). Evol., 27:378-386

Bradshaw, W. N., and T. C. Hsu. 1972. Chromosomes of *Peromyscus* (Rodentia: Cricetidae) III. Polymorphism in *Peromyscus maniculatus*. Cytogen., 11: 436-451.

Carleton, M. D., and P. Myers. 1979. Karyotypes of some harvest mice, genus *Reithrodontomys*. J. Mamm., 60:307-313.

Elder, F. F. B., and M. R. Lee. 1985. The chromosomes of *Sigmodon ochrognathus* and *S. fulviventer* suggest a realignment of *Sigmodon* species groups. J. Mamm., 66:511-518.

Engstrom. M. D., R. C. Dowler, D. S. Rogers, D. J. Schmidly, and J. W. Bickham. 1981. Chromosomal variation within four species of harvest mice (*Reithrodontomys*). J. Mamm., 62:159-164.

Hafner, M. S., J. C. Hafner, J. L. Patton, and M. F. Smith. 1987. Macrogeographic patterns of genetic differentiation in the pocket gopher *Thomomys umbrinus*. Syst. Zoo., 36:18-34.

Hall, E. R. 1981. The Mammals of North America. John Wiley and Sons, New York.

Hood, C. S., L. W. Robbins, R. J. Baker, and H. S. Shellhammer. 1984. Chromosomal studies and evolutionary relationships of an endangered species, *Reithrodontomys raviventris*. J. Mamm., 65:655-667.

Hsu, T. C. and K. Benirschke. 1967. An atlas of mammalian chromosomes. Springer-Verlag, New York, 1: Folio 12.

Lee, T. E., Jr. 1990. Geographic distribution of the cytotypes of *Chaetodipus nelsoni canescens* (Rodentia: Heteromyidae). Southwestern Nat., 35:454-455.

Lee, T. E., and M. D. Engstrom. 1991. Genetic variation in the silky pocket mouse (*Perognathus flavus*) in Texas and New Mexico. J. Mamm., 72:273-285.

Lee, T. E., Jr., M. D. Engstrom, and J. W. Bickham. 1991. Banded chromosomes of four species of pocket mice (Rodentia: Heteromyidae). Texas J. Sci., 43:33-38.

Nadler, C. F. 1966. Chromosomes of *Spermophilus franklini* and taxonomy of the ground squirrel genus *Spermophilus*. Sys. Zool., 15:199-206.

Patton, J. L. 1967. Chromosomes and evolutionary trends in the pocket mouse subgenus *Perognathus* (Rodentia: Heteromyidae). Southwestern Nat., 12:429-438.

Patton, J. L. 1970. Karyotypes of five species of pocket mice, genus *Perognathus* (Rodentia: Heteromyidae) and a summary of chromosomal data for the genus. Mammal. Chromo. Newsl., 11:3-8.

Patton, J. L., and D. S. Rogers. 1993. Cytogenetics. Pps. 236-258 *in* Biology of the Heteromyidae (H. H. Genoways and J. H. Brown, eds.), Spec. Publ., American Society of Mammalogists, 10:1-719.

Robbins, L. W., and R. J. Baker. 1980. G- and C-band studies on the primitive karyotype for *Reithrodontomys*. J. Mamm., 61:708-714.

Stock, A. D. 1974. Chromosome evolution in the genus *Dipodomys* and its taxonomic and phylogenetic implications. J. Mamm., 55:505-526.

Williams, D. F. 1978. Karyological affinities of the species groups of silky pocket mice (Rodentia, Heteromyidae). J. Mamm., 59:599-612.

Yates, T. L., R. J. Baker, and R. K. Barnett. 1979. Phylogenetic analysis of karyological variation in three genera of peromyscine rodents. Syst. Zool., 28:40-48.

*Addresses of Authors:*

**JOHN A. PEPPERS**

*Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409-3131*
*e-mail: bjjap@ttacs.ttu.edu*

**MEREDITH J. HAMILTON**

*Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078*
*e-mail: mjhamilton@okway.okstate.edu*

**RAUL MUNIZ -MARTINEZ**

*Instituto Politechico Nacional,Centro, Interdisciplinario de Investigacion para el Desarrollo Integral Regional Unidad Durango, Vicente Guerrero, Durango, Mexico 34890*

**JOAQUIN ARROYO-CABRALES**

*Laboratorio de Paleozoologia, Subdireccion de Laboratorios y Servicios Academicos, Instituto Nacional de Antropologia y Historia, Distrito Federal, Mexico 06060*
*e-mail: acc@xanum.uam.mx*

**ROBERT D. BRADLEY**

*Department of Biological Sciences and Museum of Texas Tech University, Lubbock, Texas 79409-3131*
*e-mail: izrdb@ttacs.ttu.edu*

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It was through the efforts of Horn Professor J Knox Jones, as director of Academic Publications, that Texas Tech University initiated several publications series including the Occasional Papers of the Museum. This and future editions in the series are a memorial to his dedication to excellence in academic publications. Professor Jones enjoyed editing scientific publications and served the scientific community as an editor for the Journal of Mammalogy, Evolution, The Texas Journal of Science, Occasional Papers of the Museum, and Special Publications of the Museum. It is with special fondness that we remember Dr. J Knox Jones.

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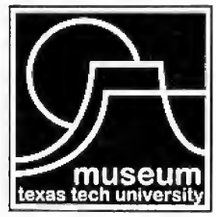


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