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Peromyscus zarhynchus.

By David A. McClellan and Duke S. Rogers

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Peromyscus zarhynchus Merriam, 1898

Long-nosed Mouse

Peromyscus zarhyncus Merriam, 1898:117. Type locality "Tumbala, Chiapas, Mexico."

Peromyscus zarhynchus cristobalensis Merriam, 1989:117. Type locality "San Cristobal, Chiapas, Mexico."

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciurognathi, Superfamily Muroidea, Family Muridae, Subfamily Sigmodontinae, genus *Peromyscus* (Carleton, 1984; Musser and Carleton, 1993). The genus *Peromyscus* includes 53 extant species divided into seven species groups (Carleton, 1989). *P. zarhynchus* is a member of the *P. mexicanus* species group together with *P. grandis, P. guatemalensis, P. gymnotis, P. mexicanus, P. stirtoni,* and *P. yucatanicus* (sensu Carleton, 1989; Rogers and Engstrom, 1992). The long-nosed mouse is monotypic (Huckaby, 1980; Osgood, 1909).

DIAGNOSIS. *Peromyscus zarhynchus* is one of the largest members of the genus *Peromyscus* (total length rarely <260 mm; greatest length of skull usually >35.0 mm). Cranial features of *P. zarhynchus* are: "Skull very large and long with exceedingly elongated rostrum; small audital bullae; weak and slender zygomata; zygomata narrow anteriorly, and only slightly notched by anteorbital slit, which is drawn out on side of rostrum as in *Megadontomys*" (Merriam, 1898:117). Overall, the skull of the long-nosed mouse is similar to that of *Megadontomys nelsoni* in size and shape, but differs by having a longer rostrum (with relatively narrow, nonflared nasals) and correspondingly long incisive foramina, a narrower interorbital constriction, and comparatively smaller, more delicate cheek teeth. "It does not require close comparison with any known species" (Merriam, 1898:117).

With the exception of *P. guatemalensis*, *P. zarhynchus* can be distinguished easily from other *Peromyscus* distributed in Chiapas, Mexico (*P. aztecus*, *P. levipes*, *P. mexicanus*) by its large size. *P. guatemalensis* approaches the long-nosed mouse in size but is distributed in the southern portion of the state and does not co-occur with *P. zarhynchus* (Hall, 1981; Huckaby, 1980).

Aside from overall size, *P. zarhynchus* resembles other members of the *P. mexicanus* species group (sensu Carleton, 1989), most of which are indistinguishable with regard to qualitative features of the cranium and dentition, mammae number, stomach morphology, glans penis, and the complement of male accessory glands (Carleton, 1973; Hooper and Musser, 1964; Huckaby, 1973, 1980; Linzey and Layne, 1969). Within the *P. mexicanus* species group, *P. grandis*, *P. guatemalensis*, and *P. zarhynchus* comprise a highly similar morphological cluster that was once treated as an allopatric subspecies of the single taxon *P. zarhynchus* (Huckaby, 1973). In view of the consistency in size and pelage differences, however, all three have been maintained as distinct species in subsequent taxonomic reviews (Carleton, 1989; Huckaby, 1980).

Peromyscus zarhynchus co-occurs with *P. mexicanus* in the northern portion of its range, but can be distinguished by its larger size. Length of hind foot of *P. zarhynchus* throughout its range is 31-35 mm and length of skull is 34.5–37.0 mm. Length of hind foot for *P. mexicanus* from southern México is 24–29 mm and length of skull is 29.5–34.1 mm (Huckaby, 1980).

GENERAL CHARACTERS. *Peromyscus zarhynchus* (Fig. 1) is a large mouse with large, almost naked ears, and a long, essentially naked tail. The hind feet are long and relatively narrow. Overall pelage color is dark. "Upper parts dusky, becoming seal brown on sides (sometimes chestnut fulvous on flanks); under parts whitish, the plumbeous basal fur showing through; pectoral region strongly washed with chestnut, the chestnut suffusion sometimes spreading over belly; tail (skin) dusky above, yellowish white below; fore and hind feet whitish, the latter slightly clouded" (Merriam, 1898:117; see Ridgway, 1912 for standards of pelage color).

Specimens from the type locality (Tumbalá, Chiapas) may appear slightly darker in color than specimens from other localities, perhaps due to moister habitat. In addition, adult specimens from the vicinity of Rayón, Chiapas have a pronounced ochraceous-tawny ventral coloration. No other geographic variation has been reported (Huckaby, 1973, 1980).

The mean and range (in parentheses) of external and cranial measurements (in mm) from a series of specimens (n = 40) collected from Cerro Tzontehuitz, Chiapas, Mexico are: length of head and body, 140 (130–153); length of tail, 146 (129–165); length of hind foot, 32.8 (31–35); length of skull, 36.4 (34.5–37.0); length of rostrum, 11.6 (10.7–14.4); length of braincase, 15.9 (15.0–16.9); width of interorbital constriction, 5.3 (4.9–5.6); width of braincase, 14.9 (14.2–15.6); length of incisive foramen, 7.9 (5.0–8.6); length of molar row, 5.4 (5.0–5.6); length of interpterygoid fossa, 6.5 (5.8–7.3); width between upper molars, 3.8 (3.4–4.3); width of interpterygoid fossa, 2.4 (2.1–2.7); width of upper molar, 1.6 (1.5–1.7—Huckaby, 1980; Fig. 2). No sexual dimorphism in either external or cranial measurements has been reported.

DISTRIBUTION. Range limits are not definitely known. *P. zarhynchus* has been collected from several locations in Chiapas, Mexico (Fig. 3; Carleton, 1989; Hall, 1981; Huckaby, 1980), including mountain slopes surrounding the towns of Tumbalá (1,680 m), San Cristóbal (2,900 m), Pueblo Nuevo = Pueblo Nuevo Solistahuacan (1,680 m), Rayón (1,000–1050 m), Cerro Huitepec, and on Cerro Tzontehuitz (2,900 m). These localities support several allopatric populations living in cloud forests in north-central Chiapas (Booth, 1957; Huckaby, 1980; van Coeverden de Groot, 1995). Long-nosed mice exist sympatrically with *P. mexicanus* near Tumbalá and Rayón, but are absent along the ridges north and east of Comitán, probably due to an absence of habitat (Huckaby, 1980). No fossils of *P. zarhynchus* are known.

FORM AND FUNCTION. The dental formula of *Peromyscus zarhynchus*, like most other species in the Superfamily Muroidea, is i 1/1, c 0/0, p 0/0, m 3/3, total 16. Features of the skull include unexpanded nasals; nonbeaded supraorbital ridges; molars with mesolophid and ectolophid typically present and complete,

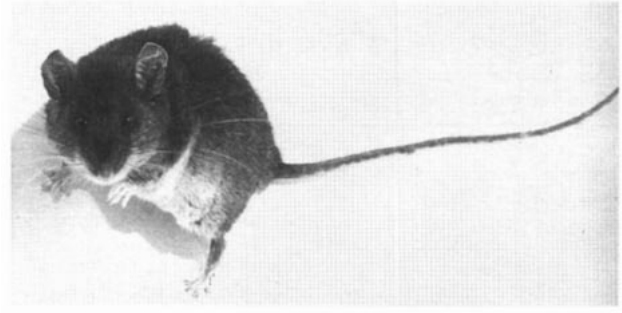

FIG. 1. *Peromyscus zarhynchus* from 6.0 km SE (by road) Rayón, Chiapas, Mexico.

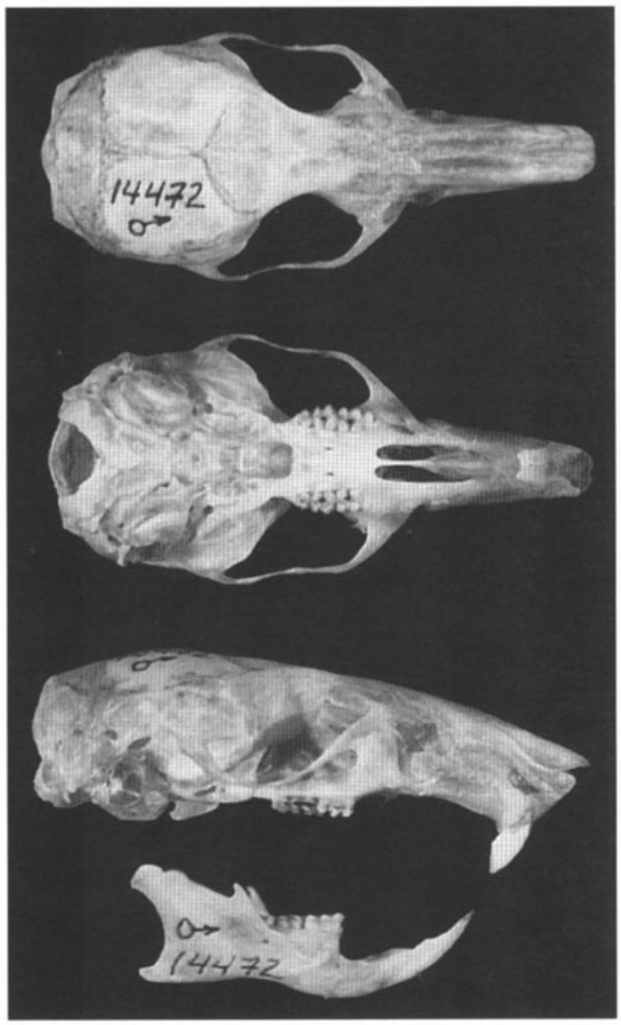

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Peromyscus zarhynchus* from Cerro Tzontehuitz, 13 km NE San Cristóbal de las Casas, Município Chamula, Chiapas, Mexico (Monte L. Bean Life Science Museum, Brigham Young University 14472). Greatest length of cranium is 37.5 mm.

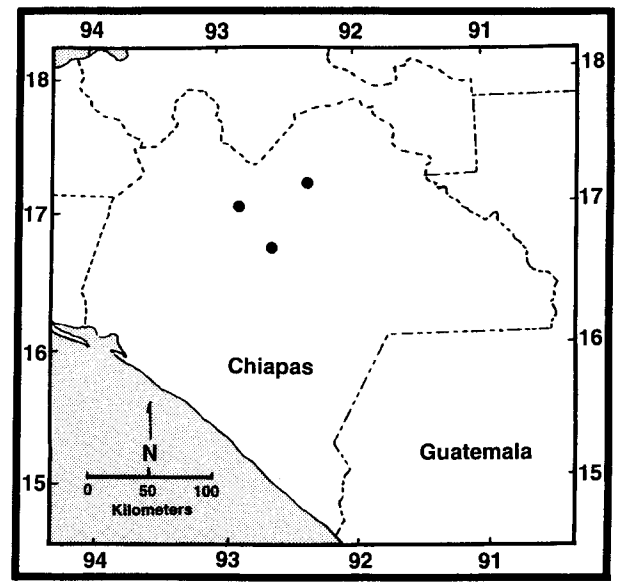

FIG. 3. Localities at which *Peromyscus zarhynchus* has been collected in Chiapas, Mexico.

and anterocone of M1 undivided (Huckaby, 1980; Osgood, 1909). Other anatomical characters include no pectoral mammae; a bilocular stomach with a fully developed pouch; a relatively long glans penis distinguished by a long protractile tip, large spines, and undivided dorsal lappets; a cylindrical baculum with a large cartilaginous tip that lacks distal enlargement (Carleton, 1973; Huckaby, 1980; Linzey and Layne, 1969).

Peromyscus zarhynchus has spermatozoa that are of the hooked type common to other *Peromyscus*. Compared to other *Peromyscus*, the sperm head is short and narrow, the midpiece is longer, and the tail is proportionally shorter (Linzey and Layne, 1974).

ONTOGENY AND REPRODUCTION. Eleven of 15 females collected in December from the vicinity of Rayón, in Chiapas, Mexico, were nulliparous. Of the remaining four, one had a single scar on the left uterine horn and three mice had two and three scars on the right and left horns, respectively. Testes measurements (length by width) of 15 males collected in December were: 9 by 5 mm (n = 3), 8 by 5 mm (n = 1), 6 by 4 mm (n = 1), 5 by 3 mm (n = 1), 4 by 3 mm (n = 1), and 4 by 2 mm (n = 8—Rogers, unpubl. data).

Embryo counts from 14 field-caught *P. zarhynchus* ranged from one to four ($\bar{X}$ = 2). Sizes of two captive-reared litters were one and four, respectively (Lackey, 1976).

ECOLOGY. Little information about the life history of *P. zarhynchus* is available. This species is known from two zones in the Chiapan Highlands biotic province. The first is the Humid Upper Tropical Subzone, which has an upper limit of 1,750 m in the vicinity of Tumbalá and Rayón, Chiapas. Small mammals taken in association with *P. zarhynchus* from the vicinity of Rayón include *Marmosa mexicana*, *Heteromys desmarestianus*, *Oryzomys rhabdops*, *O. saturatior*, *Oligoryzomys fulvescens*, *Peromyscus mexicanus*, *Reithrodontomys mexicanus*, and *R. sumichrasti* (Musser and Carleton, 1993).

This mouse also occurs at higher elevations in the Canadian Zone near San Cristóbal and Cerro Tzontehuitz, Chiapas (Goldman, 1951). Species collected with *P. zarhynchus* on Cerro Tzontehuitz, include *Microtus guatemalensis*, *Oryzomys rhabdops*, *Peromyscus boylii* (= *P. levipes*, Musser and Carleton, 1993; Schmidly et al., 1988), *Reithrodontomys microdon*, *R. sumichrasti*, and *R. tenuirostris* (Rogers et al., 1983; Smith and Jones, 1967).

The long-nosed mouse is parasitized by *Polyplax auricularis*, a species of Anoplura (Emerson, 1971). In addition, two species of mites (*Androlaelaps circularis* and *A. fahrenholzi*) were found on specimens of *P. zarhynchus* from Cerro Tzontehuitz (Bassols, 1981).

GENETICS. The diploid karyotype of *P. zarhynchus* consists of 48 chromosomes (Fig. 4) with a fundamental number of 58. Compared to the proposed primitive karyotype for *Peromyscus* (2n = 48, FN = 52), which consists of acrocentric autosomes except for numbers 1, 22, and 23 (Greenbaum and Baker, 1978), *P. furvus*, *P. guatemalensis*, *P. gymnotis*, *P. mexicanus*, *P. yucatanicus*, and *P. zarhynchus* share additional inversions of chromosomes 2, 3, and 9 (Rogers et al., 1984; Smith et al., 1986). This chromosomal configuration also characterizes some members of the *P. melanophrys*, *P. boylii*, and *P. megalops* species groups (Smith et al., 1986; Stangl and Baker, 1984).

Eight *P. zarhynchus* from the vicinity of Rayón, Chiapas, were assayed for variation at 28 presumptive genetic loci. Two alleles were detected for nucleoside phosphorylase, manose phosphate isomerase, and phosphoglucomutase-2. The remaining 25 loci were monomorphic. Genetic distance values (Rogers, 1972) between the long-nosed mouse and other species of the *P. mexicanus* group examined (sensu Carleton, 1989) were low, ranging from 0.04 (*P. zarhynchus* and *P. yucatanicus*) to 0.14 (*P. zarhynchus* and *P. gymnotis*—Rogers and Engstrom, 1992).

Variation in restriction sites within three mtDNA genes (*ND 3*, *ND 4L*, and *ND 4*) was examined among three samples of *P. zarhynchus*: 6 km E (by road) Rayón (n = 20), Cerro Huitepec (n = 5), and Cerro Tzontehuitz (n = 3). Four mtDNA haplotypes unique to *P. zarhynchus* were found. Sequence divergence among the three samples averaged 1.22% (range from 0.34% to 2.12%—van Coeverden de Groot, 1995).

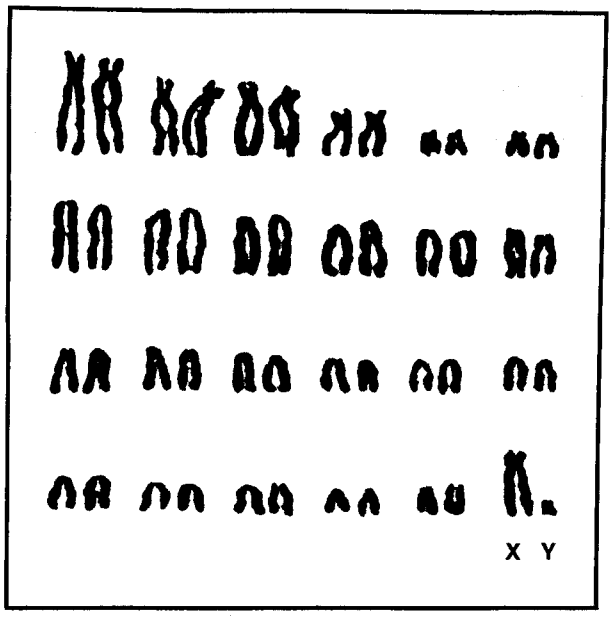

FIG. 4. Karyotype of male *Peromyscus zarhynchus* from 6.0 km SE (by road), Rayón, Chiapas, Mexico.

REMARKS. Morphological and biochemical characters (Huckaby, 1980; Rogers and Engstrom, 1992) clearly align *P. zarhynchus* with "core" species (*P. grandis*, *P. guatemalensis*, *P. gymnotis*, and *P. mexicanus*; sensu Carleton, 1989). This interpretation is not supported by mtDNA restriction site comparisons. *P. zarhynchus* forms a clade with some populations of *P. grandis*, but other samples of *P. grandis* are closer, phylogenetically, to some populations of *P. mexicanus*.

The long-nosed mouse also is known as the Chiapan deer mouse. Derivation of the specific epithet is from the Greek *za* meaning very or pronounced and *rynchos* meaning nose or snout (Brown, 1954). M. D. Carleton, E. Arellano, and F. X. González provided comments on an earlier draft of this manuscript.

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D. A. MCCLELLAN, MUSEUM OF ZOOLOGY, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LOUISIANA 70893; DUKE S. ROGERS, DEPARTMENT OF ZOOLOGY AND MONTE L. BEAN LIFE SCIENCE MUSEUM, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH, 84602.