

Peromyscus aztecus. By Luis Bernardo Vázquez, Guy N. Cameron, and Rodrigo A. Medellín

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***Peromyscus aztecus* (Saussure, 1860)**

Aztec Mouse

- H[esperomys]* *aztecus* Saussure, 1860:105. Type locality “Mexico, Veracruz, vicinity of Mirador.”
- Peromyscus oaxacensis* Merriam, 1898:122. Type locality “Cerro San Felipe, 10,300 feet, Oaxaca, Mexico.”
- Peromyscus hylcoetes* Merriam, 1898:124. Type locality “Patzcuaro, 8000 ft., Michoacán, Mexico.”
- Peromyscus spicilegus evides* Osgood, 1904:64. Type locality “Juquila, altitude 5,000 Oaxaca.”
- Peromyscus boylei aztecus* Osgood, 1909:156. Type locality “Mexico, Veracruz, vicinity of Mirador.”
- Peromyscus boylii cordillerae* Dickey, 1928:2. Type locality “Mt. Cacaguatique, 3,500 feet elevation, Departamento San Miguel, El Salvador.”
- Peromyscus hondurensis* Goodwin, 1941:1. Type locality “Muya, about 5 mi. N Chinacla, 300–400 feet, Oaxaca, Mexico.”
- Peromyscus hylcoetes yautepecus* Goodwin, 1955:4. Type locality “Santo Tomas Teipan, 7,000 feet, 12 kms San Bartolo Yautepec, Oaxaca, Mexico.”
- Peromyscus aztecus* Alvarez 1961:113. First use of current name combination.

CONTEXT AND CONTENT. Order Rodentia, suborder Sciuromnathi, family Muridae, subfamily Sigmodontinae, genus *Peromyscus* (Musser and Carleton 1993) within the *Peromyscus aztecus* species group (Carleton 1989). Five subspecies are recognized (Carleton 1979; Musser and Carleton 1993).

- P. a. aztecus* (Saussure, 1860), see above.
- P. a. cordillerae* Dickey, 1928, see above.
- P. a. evides* Osgood, 1904, see above.
- P. a. hylcoetes* Merriam, 1898, see above.
- P. a. oaxacensis* Merriam, 1898, see above.

DIAGNOSIS. *Peromyscus aztecus* (Fig. 1) differs from *P. boylii* in having a larger maxillary tooth row (4.7–5.0 mm versus 4.0–4.6 mm), brighter color on sides, an angular supraorbital border rather than rounded, bullae more pointed anteriorly and less inflated (Alvarez 1961; Alvarez et al. 1984), and hind foot longer, with hairs on the sole (Ceballos and Galindo 1984).

GENERAL CHARACTERS. Size is medium for species of the genus *Peromyscus*. Dorsal coloration of *P. aztecus* is pale ochre mixed with black, sides are reddish, underparts are light buff, and a black orbital ring is present. Feet are white, and usually a dusky streak extends from the tarsus to the metatarsus. Tail is bicolored, frequently with a white tip, and is about as long as the length of head and body (Alvarez et al. 1984; Ceballos and Galindo 1984; Goodwin 1969; Hall 1981; Jiménez-Almaraz 1993). The skull of the aztec mouse (Fig. 2) has an angular supraorbital border and bullae that point anteriorly, with the anterior half of the braincase nearly straight (Hall 1981).

The following ranges of external measurements (in mm, $n = 6$) for adults indicate the considerable variation in size within *P. aztecus*: total length 197–260; length of tail, 98–135; length of hind foot, 22.5–29; and length of ear, 15.5–21.5. Adult body mass ranges from 22 to 36 g (Carleton 1977, 1979; Ceballos and Galindo 1984; Glendinning 1989; Hall 1981; Jiménez-Almaraz 1993; Vázquez et al. 2000). Averages (ranges) of cranial measurements (in mm) are as follows ($n = 7$): zygomatic breadth, 15.5 (15.0–15.8); length of nasals, 13.5 (13.0–14.2); alveolar length of maxillary toothrow, 5.0 (4.7–5.3); greatest length of skull, 33.3 (32.7–33.7); length of rostrum, 13.8 (13.4–14.3); interorbital breadth, 5.1 (5.0–5.2); length

of incisive foramen, 6.2 (5.9–6.5); length of bullae, 5.5 (5.4–5.8—Alvarez et al. 1984). Carleton (1977, 1979) reported smaller measurements: zygomatic breadth, 14.8 (13.9–16.1); alveolar length of maxillary toothrow, 4.9 (4.4–5.1); greatest length of skull, 30.4 (28.8–32.6); length of rostrum, 10.3 (9.4–11.4); interorbital breadth, 4.8 (4.4–5.1); length of incisive foramen, 6.3 (5.6–6.7); length of bullae, 4.0 (3.7–4.3). *P. aztecus aztecus*, *P. a. cordillerae*, and *P. a. evides* are smaller, with less inflated bullae, sparsely haired tails, and more brightly colored pelage, compared with *P. a. oaxacensis*, which has moderately inflated bullae, more shady pelage, and a more sharply bicolored tail (Carleton 1989).

DISTRIBUTION. *Peromyscus aztecus* occurs at mid to high elevations in several mountain ranges in the highlands of Mexico, extending from southwestern Jalisco, Michoacan, and central Veracruz, Mexico, through the volcanic belt, the states of Mexico, Puebla, Morelos, Hidalgo, Guerrero, Oaxaca, and Chiapas, and into Central America (Fig. 3—Alvarez 1961; Alvarez del Toro 1977; Baker 1968; Burt 1961; Carleton 1979, 1989; Carleton et al. 1982; Goodwin 1941; Hall 1981; Hoffmann 1990; Iñiguez-Davalos and Santana 1993; Jiménez-Almaraz 1993; Ramírez-Pulido and Castro-Campillo 1994; Sullivan et al. 1997; Vázquez et al. 2000). *P. a. aztecus* occupies the Sierra Madre Oriental in Hidalgo, Puebla, and Veracruz. *P. a. cordillerae* has been found only from 2 localities in El Salvador (Carleton 1979). *P. a. evides* occurs in the Sierra Madre del Sur mainly in Guerrero and Oaxaca (Carleton 1979; Goodwin 1955, 1969; León-Paniagua and Romo-Vázquez 1991). *P. a. hylcoetes* occupies mid to high elevations in the transvolcanic belt and the Sierra Madre Occidental in the states of Jalisco, Colima, Michoacan, Estado de Mexico, Morelos, and the Distrito Federal (Carleton 1979; Hooper 1955; Iñiguez-Dávalos and Santana 1993; Vázquez et al. 2000). *P. a. oaxacensis* occurs in Mexico from the highlands of Oaxaca to the mountains of Chiapas and in Central America in Guatemala, Honduras, and northern El Salvador (Carleton 1979). Fossils for *P. aztecus* are unknown.

FORM AND FUNCTION. The penis of *P. aztecus* is comparatively short and broad (Carleton 1977; Hooper and Musser 1964). The glans penis is of medium size and vase shaped and is ca. one-third the length of the hind foot (Bradley and Schmidly 1987; Carleton 1977; Hooper and Musser 1964). The surface is covered by finely graded spines and marked by longitudinal furrows. Spines on the surface of the glans are of medium size, re-



FIG. 1. *Peromyscus aztecus* from Sierra de Manantlán, Jalisco, México. Photograph by R. A. Medellín.

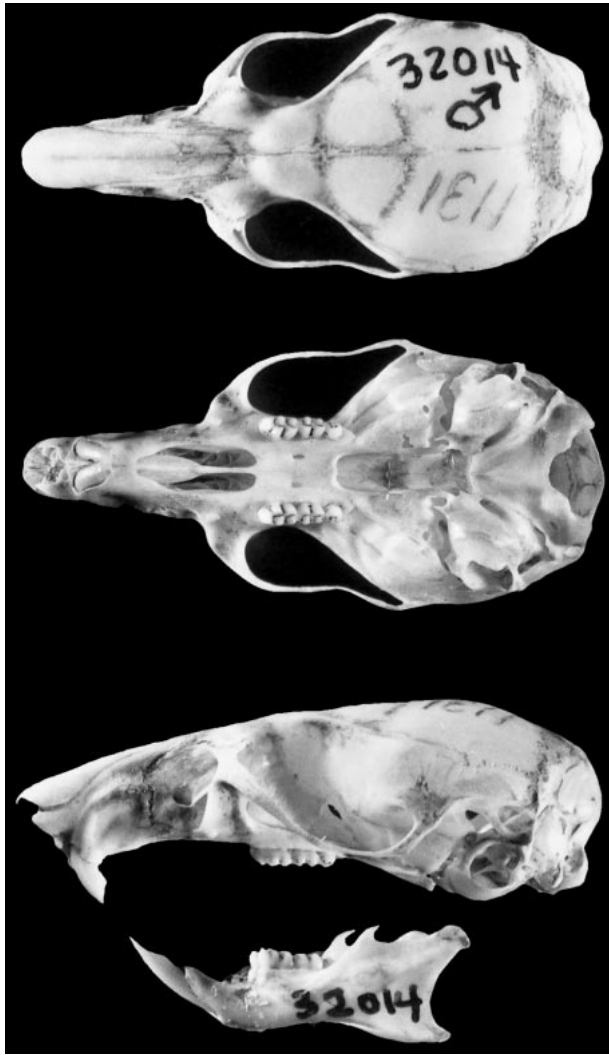


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Peromyscus aztecus* from 8 km S Ocozocoautla, Chiapas, México (male, Institute of Biology, National University Autonomous of Mexico, 32014 IBUNAM). Greatest length of cranium is 33.7 mm.

curved, and longer than they are wide. The penis lacks dorsal and ventral lappets. The baculum is straight, relatively slender, and tipped with a minute cap of cartilage (Carleton 1977; Hooper and Musser 1964).

Glans and bacular measurements are smaller for *P. a. aztecus* than for other subspecies; the baculum length and width at base are large relative to the glans length, and spines occur on the dorsal and ventral surfaces of the glans. *P. a. evides* has the largest glans of all the subspecies of *P. aztecus*, a baculum short relative to the glans length, short and blunt spines on the surface of the glans, and fluting of the glans. The glans and baculum of *P. a. hylocetes* are relatively small but wide, spines on the surface of the glans are round or conical with blunt tips, and fluting is well developed. *P. a. oaxacensis* has glans and bacular measurements that are relatively large (one-third length of hind foot), triangular spines with pointed tips that are sparsely but uniformly distributed on the dorsal and ventral surfaces, and pronounced fluting (Bradley and Schmidly 1987).

ONTOGENY AND REPRODUCTION. Pregnant *P. aztecus* females have been found in Jalisco from July through November, and lactating females have been found from August to December. In July, 1 female had 5 embryos ca. 16 mm in length (Vázquez et al. 2000), and in September 1 female had 5 embryos that were ca. 18 mm in length. In May, 1 female had 2 embryos that were ca. 20 mm in length (Alvarez et al. 1984). In Guerrero, females

were lactating in February, April, and November (Jiménez-Almaraz 1993).

Sexual activity for adult males in Jalisco occurs in all months except October, November, and December (Vázquez et al. 2000). In Guerrero, reproductive activity for adult males was recorded from February to May (Jiménez-Almaraz 1993). Average testicle length for 4 adults was 14.3 mm (range, 8–20 mm—Alvarez et al. 1984). Subadult males occur in all months except in December (Vázquez et al. 2000).

ECOLOGY. The aztec mouse has a tropical distribution and occurs at elevations from 1,000 to 2,700 m. *P. a. aztecus* and *P. a. evides* were collected at lower elevations (Carleton 1979; Osgood 1909) than were *P. a. oaxacensis* (1,500–2,700 m—Carleton 1979) or *P. a. hylocetes* (generally >2,300 m—Carleton 1979; Glendinning 1989; Vázquez et al. 2000).

Habitat of *P. a. hylocetes* is variable. In Michoacan, the vegetation is montane, boreal, coniferous forest dominated by the oyamel fir (*Abies regliosa*—Glendinning 1989), and in Jalisco, the pine/oak habitat is dominated by *Pinus douglasiana*, *P. herrerae*, *P. oocarpa*, *Quercus eliptica*, and *Q. glaucescens* and the cloud forest is dominated by *Carpinus tropicali*, *Conostegia volcanalis*, *Cornus disciflora*, *Dendropanax arboreus*, *Parathesis villosa*, *Quercus salicifolia*, and *Solanum nigricans* (Vázquez et al. 2000). In Guerrero, *P. a. evides* inhabits cloud forest (*Quercus castanea*, *Q. laurina*, and *Q. seyatoftla*), oak forest (*Juniperus flaccida*, *Quercus magnoliifolia*, and *Q. obtusata*), and pine/oak associations (*Pinus michoacana*, *P. pringlei*, *Quercus magnoliifolia*, and *Q. obtusata*—Jiménez-Almaraz 1993; León-Paniagua and Romo-Vázquez 1993). In volcanic areas, this species lives in forests dominated by juniper (*Juniperus*) and in tropical zones dominated by pine (*Pinus ayacahuite*, *P. patula*, *P. pseudostrobus*, and *P. teocote*) and oak (*Quercus salicifolia*—Baker 1968; Ceballos and Galindo 1984; León-Paniagua and Romo-Vázquez 1991, 1993). These rodents occasionally occur in fields with poor cover (Ceballos and Galindo 1984) and in abandoned agricultural fields (Vázquez et al. 2000). Densities in mountains of western Mexico are highest in the wet (July–October; 12 mice/ha) and cold (November–February; 15 mice/ha) seasons and lowest in the hot dry (March–June; ca. 3 mice/ha) season (Vázquez et al. 2000).

Diet of *P. aztecus* in Guerrero consists primarily of grasses and seeds (Jiménez-Almaraz 1993). In Jalisco, the diet of animals from abandoned agricultural fields had great seasonal variation, with monocot seeds dominating the diet in dry hot (March–June; 45.9%) and dry cold (November–February; 44.1%) seasons and dicot leaves dominating in the wet season (July–October; 82.5%—L. B. Vázquez, in litt.). Highest consumption of insects was in the dry hot season (35.5%). In cloud forests, dicot fruit dominated the diet in all seasons (51.4% with seasons pooled—L. B. Vázquez, in litt.). Seasonal variation in the diet for cloud forest mice was much less than for mice from abandoned agricultural fields. Dicot leaves, dicot seeds, and invertebrates also were eaten. In coniferous forests of western Mexico that were dominated by the oyamel fir, the aztec mouse ate monarch butterflies (Glendinning 1989). Potential predators include barn owls (*Tyto alba*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), and weasels (*Mustela frenata*—Ceballos and Galindo 1984).

The aztec mouse has been collected in association with *Liomys irroratus*, *Megadontomys thomasi*, *Neotoma mexicana*, *Peromyscus megalops*, *P. spicilegus*, and *Reithrodontomys sumichrasti* in Guerrero, Mexico (Jiménez-Almaraz 1993); with *Hodomys alleni*, *P. melanotis*, *P. spicilegus*, *Reithrodontomys fulvescens*, *R. sumichrasti*, and *Oryzomys couesi* in Jalisco (Baker and Phillips 1965; Hooper 1955, 1968; Vázquez et al. 2000); with *P. melanotis*, *R. sumichrasti*, and *Microtus mexicanus* in Michoacan (Glendinning 1989); with *P. levipes* in Veracruz and Hidalgo (Alvarez 1961; Musser 1964); and with *Habromys leprurus* and *Megadontomys cryophilus* in Oaxaca (Musser 1964). Ectoparasites include the mite *Eubrachylaelaps circularis* and fleas (*Jellisonia hayesi*, *Peochaetis mathesoni*, *P. mundus*, *P. parus*, and *Strep-sylla fautini*—Traub 1950).

GENETICS. *Peromyscus aztecus* has a diploid number of 48 and a variable fundamental number (FN = 68–74—Smith 1990; Smith et al. 1989). Karyotypes of *P. aztecus*, including topotypes from Huatusco, Veracruz, exhibit a graded series of 11 or 12 small to large submetacentric pairs and 11 or 12 acrocentric autosomal

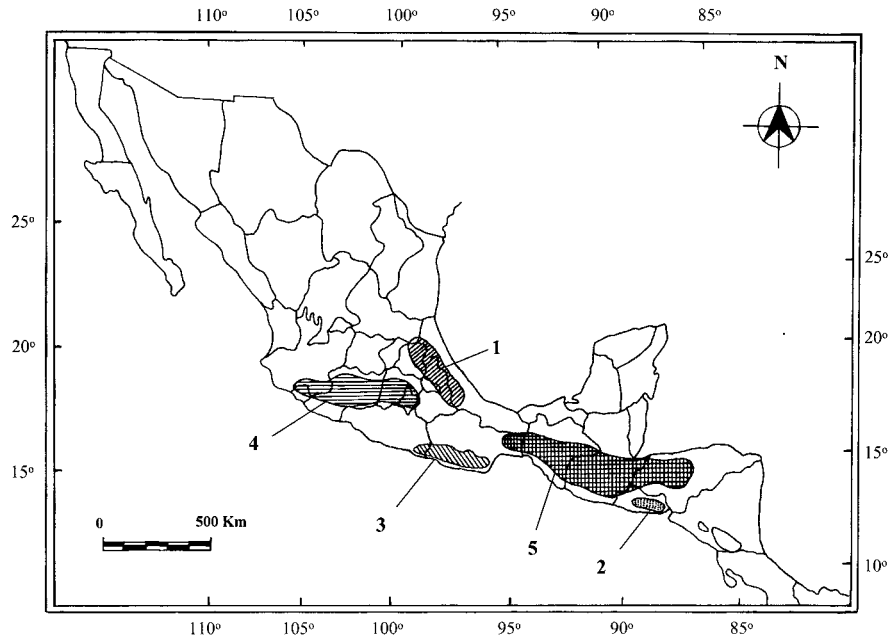


FIG. 3. Distribution of *Peromyscus aztecus* in Mexico and Central America: 1, *P. a. aztecus*; 2, *P. a. cordillerae*; 3, *P. a. evides*; 4, *P. a. hylocetes*; 5, *P. a. oaxacensis* (Carleton 1979).

pairs (Schmidly and Schroeter 1974; Smith 1986, 1990; Smith et al. 1989). Pair 15 is acrocentric in all subspecies of *P. aztecus* except *P. a. hylocetes*, where it is biarmed (Smith 1990). *P. a. hylocetes* has less genetic similarity to other forms of *P. aztecus* than is typically observed for subspecies of *Peromyscus*. Sequence analysis of the mitochondrial cytochrome *b* gene produced estimated genetic distances of 0.044–0.069 between *P. a. hylocetes* and other subspecies of *P. aztecus* (Sullivan et al. 1997). Other allozyme, chromosomal, and morphological differences led Sullivan and Kilpatrick (1991) to argue that the subspecies should be recognized as a distinct species, *P. hylocetes*.

REMARKS. Sausurre (1860) did not designate a type or type locality for *P. aztecus*. Osgood (1909) considered the aztec mouse a subspecies of *P. boylii* but accorded specific status to *P. a. hylocetes* and *P. a. oaxacensis*. Recent sequencing data also suggest that southern populations of *P. a. oaxacensis* represent a distinct species (possibly *P. hondurensis*). Although Musser and Carleton (1993) still recognized 5 subspecies of *P. aztecus*, they acknowledged that inclusion of some of these taxa under *P. aztecus* deserves further scrutiny.

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LUIS BERNARDO VÁZQUEZ, DEPARTAMENTO DE ECOLOGÍA DE LOS RECURSOS NATURALES, INSTITUTO DE ECOLOGÍA, UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO, APARTADO POSTAL 27-3 (XANGARI), MORELIA, MICHOACÁN, MÉXICO 58089. GUY N. CAMERON, DEPARTMENT OF BIOLOGICAL SCIENCE, UNIVERSITY OF CINCINNATI, CINCINNATI, OHIO 45221. RODRIGO A. MEDELLÍN, INSTITUTO DE ECOLOGÍA, UNAM, AP. POSTAL 70-275, MÉXICO, DISTRITO FEDERAL 04510, MÉXICO.