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Peromyscus bullatus.

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Peromyscus bullatus Osgood, 1904

Perote Mouse

Peromyscus bullatus Osgood, 1904:63. Type locality "Perote, Veracruz, México."

CONTEXT AND CONTENT. Order Rodentia, suborder Sciurognathi, family Muridae, subfamily Sigmodontinae, genus *Peromyscus* (Musser and Carleton 1993), subgenus *Peromyscus* (Carleton 1989). *P. bullatus* is a member of the *P. truei* species group, which includes *P. difficilis*, *P. gratus*, *P. nasutus*, *P. sagax*, and *P. truei* (sensu Bradley et al. 1996; Carleton 1989). The Perote mouse is monotypic (Carleton 1989; Hoffmeister 1951).

DIAGNOSIS. *Peromyscus bullatus* (Fig. 1) differs from other *Peromyscus* in having a larger ear than hind foot (almost always >2.0 mm longer) and auditory bullae that are more inflated. *P. bullatus* co-occurs with *P. difficilis* in all of its range, but can be distinguished by its smaller size. Total length of adult *P. bullatus* ranges from 178 to 224 mm and occipitonasal length ranges from 27.4 to 28.6 mm; total length for sympatric *P. difficilis* ranges from 210 to 245 mm and occipitonasal length ranges from 29.6 to 32.2 mm (González-Ruíz et al., in press). Molars of *P. bullatus* are less robust than those of *P. difficilis*; auditory bullae of the 2 species are similar in size (González-Ruíz et al., in press). The Perote mouse is seemingly allopatric with *P. gratus*, but can be distinguished by several morphological features. Length of ear is greater in *P. bullatus* (mean and range, in mm; 25.7, 23–28) than in *P. gratus* (24, 22 dry) and auditory bullae are more inflated and larger in *P. bullatus* (González-Ruíz et al., in press). Color of *P. bullatus* is lighter than that of *P. gratus* (González-Ruíz et al., in press). Baculum closely resembles bacula of other members of *P. truei* species group, but is longer than that of *P. gratus* and *P. nasutus* and smaller than that of *P. difficilis* (Burt 1960; Tamsitt 1958). Morphology of molars is similar to that of *P. gratus* (Hoffmeister 1951; Hooper 1957), except that *P. gratus* has a high proportion of entolophids in m1 and m2 and entolophids are lacking in *P. bullatus*.

GENERAL CHARACTERS. *Peromyscus bullatus* is medium in size for genus; total length is rarely <200 mm. Tail is longer than head and body, strongly bicolored, and moderately well-haired. Upper parts of body are tawny ochraceous with sides slightly lighter; middle of back is dusky, producing a "broccoli brown" effect (Osgood 1904:63). Sides of head between base of ear and eye are distinctly grayish; underparts are pure creamy white.

Skull (Fig. 2) is medium in size for genus; length of auditory bullae is always >6.5 mm and >23% of length of skull (González-Ruíz et al., in press; Hoffmeister 1951; Osgood 1904). Mean and range (in parentheses) of external and cranial measurements (in mm) from 30 *P. bullatus* in the mammal collection of the Escuela Nacional de Ciencias Biológicas and Universidad Autónoma Metropolitana, Iztapalapa are: total length, 197.0 (178–224); length of tail, 103.6 (87–120); length of hind foot, 22.9 (19–25); length of ear, 25.7 (23–28); length of skull, 28.0 (27.4–28.6); width of braincase, 13.3 (12.9–15.0); width of postorbital constriction, 4.4 (3.7–4.8); length of nasal, 10.4 (9.5–11.1); length of maxillary toothrow, 4.1 (3.8–4.4); length of auditory bullae, 6.8 (6.5–7.2). No sexual dimorphism occurs in either external or cranial measurements. Baculum measurements (mean, range in parentheses, in mm) for 6 males are: length, 15.3 (14.3–16.6) and width at base, 1.5 (1.3–1.7—N. González-Ruíz, pers. comm.).

DISTRIBUTION. The Perote mouse is endemic to Mexico (Fig. 3). *P. bullatus* occurs on the eastern edge of the Transverse Volcanic Range (Fa and Morales 1991) and is limited to the Oriental Basin at elevations of 2,250–2,500 m. This distribution encompasses the western edge of the state of Veracruz, the center of the state of Puebla, and possibly the eastern edge of the state of Tlaxcala (González-Ruíz et al., in press). No fossils are known.

FORM AND FUNCTION. Large ears and auditory bullae of *P. bullatus* have been interpreted as evolutionary adaptations associated with detection of predators in open sandy desert (Hall and Dalquest 1963; Hoffmeister 1951; Vial 1962).

ONTOGENY AND REPRODUCTION. Three juveniles were found in the last week of September (Hall and Dalquest 1963). Length of testes (in mm) for males collected in different months are given as mean (*n*), range: March, 10.3 (3), 9.0–13.0; June, 11.3 (9), 10.0–14.0; September, 12.3 (7), 11.0–15.0. Females showed no signs of reproductive activity in March, June, September, or October (González-Ruíz et al., in press).

ECOLOGY. Dominant vegetation associations in the Oriental Basin include grasslands and arid scrub in bottom lands and coniferous forests at higher elevations (Gaona 1997; Valdéz and Ceballos 1997). *P. bullatus* is restricted to flat bottoms with areas of fine sandy soil that support grasses and a few trees (*Juniperus dippeana* and *Yucca*—González-Ruíz et al., in press; Hall and Dalquest 1963). The Perote mouse has not been collected in rocky areas. Small mammals collected in association with *P. bullatus* include *Dipodomys phillipsi perotensis*, *Perognathus flavus mexicanus*, *Peromyscus maniculatus*, and *Reithrodontomys megalotis saturatus* (González-Ruíz et al., in press).

CONSERVATION STATUS. Before 1950, *P. bullatus* was known from 7 specimens. Hall and Dalquest (1963) considered this species to be rare because only 1 *P. bullatus* was collected for every 50 *P. maniculatus* taken in traps. *P. bullatus* exhibits very specific and strong habitat selection, and its preferred habitat is uncommon and restricted to the Oriental Basin. Alteration and fragmentation of habitat and encroachment of agriculture threaten survival of *P. bullatus*. In 2001, only 2 of 10 localities sampled in the 1980s for specimens for museum collections yielded Perote mice

FIG. 1. Photograph of an adult male *Peromyscus bullatus* from 4.5 km S, 9.5 km W of San José Alchichica, Puebla, México. Used with permission of the photographer J. Navarro.

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Peromycus bullatus* (from 4.5 km S, 9.5 km W San José Alchichica, Puebla, México. Escuela Nacional de Ciencias Biológicas, #42328). Greatest length of cranium is 28.2 mm. Photograph by Centro de Microscopía, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional.

(González-Ruíz et al., in press). The Mexican Government has designated *P. bullatus* as needing special protection (Norma Oficial Mexicana 2002).

REMARKS. *Peromyscus bullatus* may be a subspecies of *Peromyscus truei* (Carleton 1989; Hooper 1968; Modi and Lee 1984), but is morphologically distinct from *P. difficilis* and *P. gratus* (Carleton 1989; González-Ruíz et al., in press). *P. bullatus* is morphologically more similar to *P. gratus* than to *P. difficilis* (González-Ruíz et al., in press). The generic name *Peromyscus* is derived from the Greek *pera*, meaning small, *mys* meaning mouse, and *iskos*, a diminutive suffix (Álvarez-Castañeda and Álvarez 1996). The species name *bullatus* is from the Latin *bulla*, in reference to the large auditory bullae.

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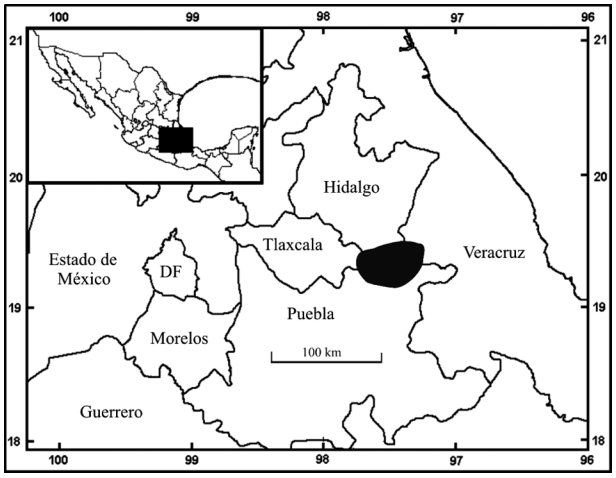

FIG. 3. Geographic distribution of *Peromyscus bullatus* in east central México. Map redrawn from Carleton (1989).

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