

*Peromyscus madrensis*. By Sergio Ticul Álvarez-Castañeda and Lia Méndez

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***Peromyscus madrensis* Merriam, 1898**

Tres Marias Island Mouse

*Peromyscus madrensis* Merriam, 1898:16. Type locality “María Madre Island, Tres Marias Islands, Nayarit, México.”

**CONTEXT AND CONTENT.** Order Rodentia, suborder Sciurogathi, family Muridae, subfamily Sigmodontinae, genus *Peromyscus* (Musser and Carleton 1993), subgenus *Peromyscus*. *Peromyscus madrensis* is monotypic (Hall 1981).

**DIAGNOSIS.** Compared to other *Peromyscus* species, *Peromyscus madrensis* (Fig. 1) is large with a long, scantily haired tail, large hind feet, and relatively small pinnae. Phallus is small compared to species of the *boylei* group (Carleton et al. 1982). Interorbital area has an hourglass shape, similar to that of *P. boylei*, but posteromedial borders of orbits in *P. madrensis* are more square (Carleton et al. 1982; Merriam 1898).

*Peromyscus madrensis* is larger and has a longer tail and shorter ears than *Peromyscus spicilegus*, the nearest species on the Mexican mainland. *P. madrensis* has a larger braincase than *P. spicilegus*, and the skull of *P. madrensis* is decidedly broader and flatter. Length of molar series is the same in the 2 species, but the series appears shorter and somewhat broader in *P. madrensis* (Merriam 1898). Individual variation in *P. madrensis* and *P. spicilegus* bridges average differences between them, and skulls of María Madre specimens are identical to those of *P. spicilegus* from the mainland (Osgood 1909). *P. spicilegus* and *P. boylei* are distinguished from *P. madrensis* by presence and size of 2nd primary fold on lower 3rd molar (Carleton et al. 1982).

*Peromyscus simulus* may be a close kin to *P. madrensis* (Carleton et al. 1982). Shape and proportions of skull, bacular length, and morphology of glans penis are similar in *P. madrensis* and *P. simulus*, but the difference in mesoloph is conspicuous. Karyotype of *P. madrensis* has 1 more pair of biarmed chromosomes than that of *P. simulus*.

**GENERAL CHARACTERS.** Dorsum is light tan, almost ochre, with an indistinct darker band on posterior one-half of back. Ears are same color as body, and upper part of ankle has a dark spot. Eyelids are darker than rostrum. Ventrums, lips, and feet have white hair. A salmon spot or streak on pectoral area is usual. Tail is indistinctly bicolored, darker on top except for last one-third which is dark all around (Carleton et al. 1982; Merriam 1898). Two specimens from María Magdalena Island had a pale yellow wash on belly, probably due to staining (Merriam 1898).

Skull is large, flat, and smoothly rounded, with elongated rostrum and no supraorbital or superciliary ridges (Fig. 2). *P. madrensis* from María Cleofás Island is larger and has a larger and heavier skull than animals from María Madre Island (Merriam 1898). Tooth row and auditory bullae are relatively small. Dentition is relatively simple. In molars, mesolophid is absent, and ectolophid is often absent or underdeveloped; mesoloph is typically incomplete (Carleton et al. 1982; Merriam 1898).

External and cranial measurements (mean and parenthetical range, in mm) of specimens from María Cleofás and San Juanito islands ( $n = 30-36$  and  $n = 15-17$ , respectively—Carleton et al. 1982) are: length of head and body, 225.8 (210–250), 221.9 (203–246); length of tail, 114.5 (103–130), 110.7 (99–126); length of hind foot, 25.6 (23–28), 25.5 (25–26); length of ear, 18.2 (17–20), 18.6 (18–20); length of skull, 29.8 (28.3–31.5), 29.7 (28.4–31.3); length of auditory bullae, 3.8 (3.5–4.3), 3.8 (3.6–4.1); length of palate, 4.0 (3.8–4.4), 4.3 (4.5–5.2); length of maxillary tooth row, 4.4 (4.1–4.7), 4.4 (4.3–4.6); zygomatic breadth, 15.0 (14.4–15.6), 14.7 (14.1–15.6); mastoid breadth, 12.2 (11.6–12.6), 12.3 (11.9–12.6); depth of braincase, 9.9 (9.4–10.3), 10.1 (9.8–10.4); breadth

of braincase, 12.6 (12.1–13.0), 12.4 (12.0–13.0); least interorbital width, 4.6 (4.4–4.9), 4.7 (4.5–4.9).

**DISTRIBUTION.** *Peromyscus madrensis* has been recorded from all islands in the Islas Marias group: San Juanito, María Madre, María Magdalena, and María Cleofás, from north to south (Fig. 3; Carleton 1977; Carleton et al. 1982; Merriam 1898). Distances between islands are 10–13.6 km. No fossils are known.

**FORM.** Phallic morphology of *P. madrensis* is similar to that of *P. levipes*, *P. pectoralis*, *P. boylei rowleyi*, and *P. simulus* (Carleton 1977). Dorsal lappets are present, but are not as distinct as in *P. boylei*. Ventral lappets are absent. Body of glans is moderately long ( $n = 2$ , 7.69 mm) and wide (1.46 mm), and has a protractile tip (2.37 mm). Spines do not cover body of glans. Baculum (10.37 mm) lacks a minute cone of cartilage at tip (Carleton 1977; Carleton et al. 1982). No preputial glands were visible macroscopically. *P. madrensis* has 6 mammary glands, 2 inguinal pairs and 1 axillary pair (Carleton 1977).

**ONTOGENY AND REPRODUCTION.** Pregnant and lactating females, scrotal males, and juveniles of both sexes were found in March on the island chain (Carleton et al. 1982; Wilson 1991).

**ECOLOGY.** *Peromyscus madrensis* is present on María Madre Island in several habitats, but mainly in tropical deciduous forest. The island is 144 km<sup>2</sup> with a peak elevation of 616 m. María Madre Island is a prison island housing more than 5,000 people, and cattle, horses, goats, sheep, donkeys, rabbits, poultry, and cats (Lopez-Forment et al. 1996). *Rattus rattus* is common on this island, and *P. madrensis* was found in the interior highlands, near dry riverbeds, and on the surrounding hillsides (Carleton et al. 1982). In the past, the area was covered by cedar (*Cedrela mexicana*—Carleton et al. 1982).

The Tres Marias mouse is abundant on María Cleofás Island in all habitats, living under logs, projecting roots, rocks, and small ledges (Wilson 1991). María Cleofás Island is 25 km<sup>2</sup> in area, with somewhat rocky soil and a peak elevation of 402 m. Marias Cleofás Island is considered the least disturbed island in the chain (Carleton et al. 1982). *P. madrensis* has been captured in forest, under shrubby vegetation, near the shoreline, and on a stream bank (Carleton et al. 1982).

María Magdalena Island is 84 km<sup>2</sup> in area with a peak elevation of 457 m; soils are mainly sandy, and vegetation is tropical deciduous forest. Many specimens of *P. madrensis* were collected on María Magdalena Island in 1897 by Nelson and Goldman (Nelson 1899). None were collected in 1991, after the introduction of



FIG. 1. *Peromyscus madrensis* drawn from specimen 512568 in the Smithsonian National Museum of Natural History. Used with permission of the artist Oscar Armendariz.

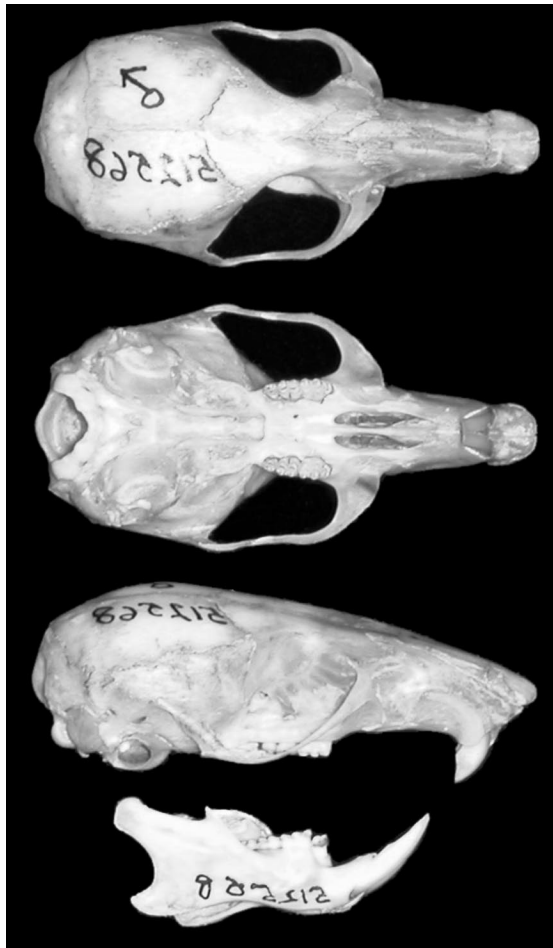


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Peromyscus madrensis* (from María Madre, Tres Marias Islands, Mexico, Smithsonian National Museum of Natural History, specimen 512568). Greatest length of cranium is 29.08 mm. Photograph by Sergio Ticul Álvarez-Castañeda.

3 nonnative species (*Capra hircus*, *Odocoileus virginianus*, and *R. rattus*—Wilson 1991).

On San Juanito Island, the smallest of the islands, no specimens of *P. madrensis* were collected (Nelson 1899). More recently, *P. madrensis* was considered very common on the elevated plateau that covers most of the island (Carleton et al. 1982).

Two hypotheses explain the presence of *P. madrensis* on the Islas Marias group. The 1st posits a bridge to the mainland in the Pleistocene, subsequently submerged by rising sea levels during the Holocene (Carleton et al. 1982; following Hanna 1926). The sea floor between the islands and mainland is <150 m. The 2nd suggests that the 1st individuals arrived during the Pleistocene by rafting (Carleton et al. 1982). Other native mammals found on the island chain are *Oryzomys nelsoni* and *Procyon insularis* (Álvarez-Castañeda and Mendez 2003; Wilson 1991).

**GENETICS.** Karyotype of *P. madrensis* is  $2n = 48$ , FN = 54. *P. madrensis* has 4 pairs of biarmed autosomes (with 1 pair of large and 1 pair of medium-sized subtelocentrics and 2 pairs of small submetacentrics), and 19 pairs of acrocentrics. A male and female from María Cleofás Island possessed heteromorphic pairs among the acrocentric chromosomal complement, and 1 chromosome had distinct short arms, so FN was 55. X chromosome is a large subtelocentric, and Y chromosome is a small subtelocentric (Carleton et al. 1982).

**REMARKS.** *Peromyscus madrensis* evolved from either *P. simulus* or ancestral stock that gave rise to *P. simulus* and *P. boylii* (Carleton et al. 1982). *P. madrensis* was considered a subspecies of *P. boylii* (Osgood 1909), and then raised to species status (Carle-

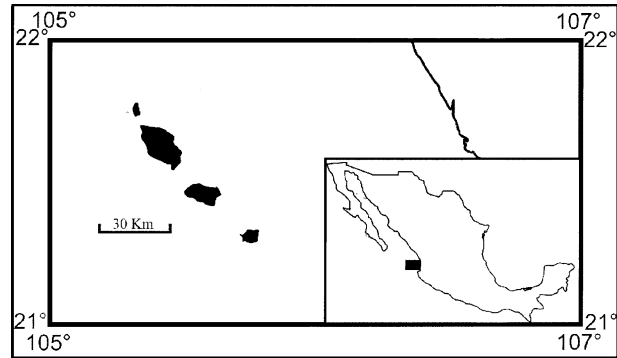


FIG. 3. Geographic distribution of *Peromyscus madrensis* on the Tres Marias chain, Nayarit, México. Names of islands from north to south are: San Juanito, María Madre, María Magdalena, and María Cleofás. Map redrawn from Álvarez-Castañeda and Cortés-Calva (1999).

ton 1977). Morphological analyses of the *boylii* species group did not resolve the position of *P. madrensis* (Carleton 1977; Carleton et al. 1982). Analysis of mitochondrial cytochrome-*b* data supports *P. madrensis* as distinct species in the *boylii* group (Tiemann-Boege et al. 2000).

*Peromyscus madrensis* was once the most common rodent on María Magdalena, María Cleofás, and María Madre islands. The field notes of Nelson state: "Specimens were taken on all the three islands. They were generally distributed in the forest above the shore belt which is infested by land crabs, and were found more commonly about the fig trees on the high interior ridge of María Madre than elsewhere" (Merriam 1898:16). *Mus musculus* has been recorded on the island group since the travels of Forrer in 1881, and Nelson found *Rattus* in 1897 (Merriam 1898). Deer and goats have drastically altered undergrowth of all islands since the travels of Forrer (Merriam 1898). The Mexican federal government considers *P. madrensis* as threatened (Norma Oficial Mexicana 2002). Specific name *madrensis* is derived from name of archipelago in which it is found.

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