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Microtus oaxacensis.

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Microtus oaxacensis Goodwin, 1966

Oaxacan Vole

Microtus oaxacensis Goodwin, 1966:1–2. Type locality "an evergreen rain forest at Tarahundi [*sic*], a ranch near the village of Vista Hermosa, about halfway between Comaltepec and Valle National, 135 kilometers north of Oaxaca city, district of Ixtlan, Oaxaca, Mexico, altitude, about 5000 feet."

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciurognathi, Family Muridae, Subfamily Arvicolinae, Genus *Microtus* (Musser and Carleton, 1993), Subgenus *Pitymys* (Martin, 1987). *M. oaxacensis* is monotypic (Hall, 1981).

DIAGNOSIS. The presence of one inguinal pair and two pectoral pairs of mammary glands separates *M. oaxacensis* from all microtines except *M. guatemalensis*. The presence of two rather than three transverse loops and at least one closed median triangle rather than none on the last lower molar separates *M. oaxacensis* from all *Microtus* except *M.* (= *Orthriomys*) *umbrosus* and *M.* (= *Herpetomys*) *guatemalensis* (Hall, 1981). *M. oaxacensis* can be distinguished from these species by five triangles on the last upper molar rather than two in *M. umbrosus* or three in *M. guatemalensis*.

GENERAL CHARACTERS. *Microtus oaxacensis* is a medium-large blackish brown vole (Goodwin, 1966, 1969; Hall, 1981; Jones and Genoways, 1967). The pelage is long, soft, and somewhat wooly. Dorsal hairs are black, finely tipped with orangish brown, and mixed with blackish hairs; underparts are slightly paler. The tail is thick at the base and of medium length, ca. 20% of total length (length of head and body 3.3–4.1 times as long as length of tail; length of tail 1.5–1.7 times as long as length of hindfoot). The feet are black, contrasting with yellowish white claws. There are one inguinal and two pectoral pairs of mammary glands. Means and ranges (in mm) for external measurements of nine adult males (Sánchez, et al., 1996) and measurements of another male specimen (Jones and Genoways, 1967), and the adult male holotype (those available provided in brackets; Goodwin, 1966), respectively, are: total length, 155.0 (143–167), 163; length of head and body, (mean and range of nine not provided), 125, [140]; length of tail, 37.4 (31–40), 38; length of hindfoot, 21.8 (20–23), 22, [22.5]; length of ear, 13.5 (12–16), 14.5; mass (in g), 38.4 (31–46), 43.2. Means and ranges (in mm) for external measurements of five adult females (Sánchez, et al., 1996), and measurements of another female specimen (Jones and Genoways, 1967), respectively, are: total length, 162.0 (155–170), 159; length of head and body, (mean and range of five not provided), 128; length of tail, 37.0 (34–39), 31; length of hind foot, 22.3 (21–24), 21; length of ear, 14.2 (13–15), 12; mass (in g), 32.8 (27–38), 37.6.

The skull is elongate, flat, and less angular than most *Microtus* (Fig. 1). The braincase is long and relatively narrow, and tapered forward anteriorly rather than squared; interorbital area is broad and flat; zygomatic arches are relatively narrow; incisive foramina are short and narrow; bullae are small and rounded; mesopterygoid fossa is broad and rounded anteriorly rather than V-shaped; supraorbital ridges are weakly developed and bow outwards as they extend posteriorly across the parietals; rostrum is slender and not constricted posteriorly; anterior palatine foramina are short and narrow; and anterior border of the zygomatic plate is concave, bowing slightly outward causing the infraorbital foramina to appear large when viewed from the front and side (Goodwin, 1966, 1969; Hall, 1981). Means and ranges (in mm) of cranial measurements for nine adult males and five adult females (Sánchez et al., 1996), respectively, are: greatest length of skull, 27.7 (27.5–28.6), 27.9 (27.0–28.0); nasal length, 7.7 (7.4–8.0), 7.5 (7.0–8.0); zygomatic breadth, 16.1 (15.1–16.7), 16.4 (15.8–16.8); braincase breadth, 10.6 (10.1–10.8), 10.9 (10.2–12.0); interorbital breadth, 4.0 (3.8–4.3), 4.0 (3.7–4.5); maxillary toothrow length, 7.0 (6.7–7.1), 7.2 (7.1–7.4); mandibular toothrow length, 6.8 (6.5–7.0), 6.9 (6.8–7.0). Cranial characters (in mm) for an adult male and an adult female specimen, respectively (Jones and Genoways, 1967), and the adult male ho-

FIG. 1. Dorsal, ventral, and lateral view of the skull, and lateral view of the mandible of *Microtus oaxacensis* (adult male, Instituto de Biologia, Universidad Nacional Autónoma de Mexico, 27429) from 11 km SW La Esperanza, Municipio Santiago Comaltepec, Oaxaca, Mexico, 2,000 m. Greatest length of skull is 28.8 mm.

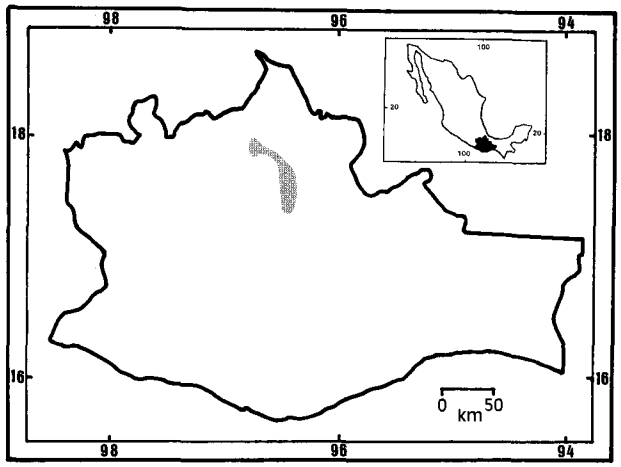

FIG. 2. Distribution of *Microtus oaxacensis* (modified from Goodwin, 1969).

lotype (in parentheses; Goodwin, 1966) where available are: greatest length of skull, (28.1); condylobasal length, 28.6, 28.2 (27.8); zygomatic breadth, 16.2, 15.8 (15.8); interorbital constriction, 4.0, 3.6; interorbital breadth, (4.4); lambdoidal breadth, 12.2, 12.0; breadth of braincase above mastoid processes, (11.0); length of nasals, 8.1, 7.9 (7.8); breadth of rostrum across nasolacrimal capsules, 6.1, 5.8; breadth of rostrum at root of zygoma, (4.1); length of maxillary toothrow, 7.8, 7.7 (7.5); width of palate across molars, (5.7); length of bullae, (6.5).

DISTRIBUTION. Published localities of record for *M. oaxacensis* include the type locality; 6.5 and 10 miles SSW of Vista Hermosa at elevations of 2,164 m and 2,499 m, respectively (Jones and Genoways, 1967); 16.8 km S Vista Hermosa, 2,030 m (Martin, 1987); 11 Km SW La Esperanza, Municipio Santiago Comaltepec, 2,000 m (Cervantes et al., in press); 80.0–102.0 km from Tuxtepec along the Tuxtepec-Oaxaca highway at elevations ranging from 1,600 to 2,280 m (Sánchez et al., 1996). The localities of record are on a relatively small, semi-isolated mountain range in Ixtlan District, Oaxaca, north of Ixtlan de Juarez, bounded by the Rio Santo Domingo on the north, the Rio Grande on the south and west, and the coastal plain of the Gulf of Mexico on the east (Fig. 2). There are no fossil data for this species.

FORM AND FUNCTION. Neither Goodwin (1966) or Jones and Genoways (1967) mentioned any evidence of molt in the type which was collected on 5 April. Two specimens collected on 25 June were in the process of molting; in one, the molt had progressed over part of the sides and a large portion of the back, whereas in the other, the molt was nearly complete (Jones and Genoways, 1967).

Reproductive activity in *M. oaxacensis* was observed during a study conducted during February and July (Sánchez et al., 1996). In February, three of six adult males had scrotal testes (7–11 mm in length) and one of two adult females were lactating, while two subadult males had abdominal testes. In July, one of two adult males had scrotal testes (5 mm) and of four adult females, one was lactating and one had an embryo (5 by 4 mm). Litter size may be limited to a single young (Sánchez et al., 1996).

The dental formula of *M. oaxacensis* is i 1/1, c 0/0, p 0/0, m 3/3, total 16. The molars are large and broad and the salient angles tend to be acute (Goodwin, 1966, 1969). Molars are undifferentiated in that the thickness of the enamel on the anterior or posterior edge of the molar triangles is about equal (Martin, 1987). Dentition is diagramed in Goodwin (1966) and dental terminology follows that of van der Meulen (1973) and Martin (1987): M1 has an anterior lobe and four closed triangles (five closed sections total), two buccal and two lingual reentrant angles; M2 has an anterior lobe and three closed triangles, two buccal and one lingual reentrant angles (four closed sections total); M3 has an anterior lobe, at least three anterior closed triangles, two median triangles which may be closed or open and confluent with a posterior cap, and an open sixth triangle that is confluent with the posterior cap, the sixth triangle and posterior cap may form an additional lingual reentrant angle, four buccal and four lingual reentrant angles (five to seven closed sections total); m1 has an anterior cap confluent with two open triangles, the next two triangles are open and confluent, three closed posterior triangles, and a posterior lobe, four buccal and five lingual reentrant angles (six closed sections total); m2 has one anterior closed triangle, two open and confluent median triangles, a closed posterior triangle, and a posterior lobe, two buccal and two lingual reentrant angles (four closed sections total); m3 has two anterior confluent open triangles of which the buccal triangle may be reduced, two posterior open and confluent triangles, and a posterior lobe, two buccal and two lingual reentrant angles (three closed sections total).

ECOLOGY. The habitat in which the holotype was collected was described as evergreen rain forest (Goodwin, 1966) and that of the two specimens from southwest of Vista Hermosa as dense cloud forest (Jones and Genoways, 1967). The two specimens from southwest of Vista Hermosa "were captured in wet broadleaf evergreen forest admixed with a few pines and were taken in trap lines set under logs and stumps" (Jones and Genoways, 1967:320). *M. oaxacensis* "inhabited disturbed vegetation consisting of various grasses and wild strawberry (*Fragaria* sp.) in cloud forest, pine (*Pinus* sp.) forest, and an ecotone of cloud and pine forest" along the Tuxtepec-Oaxaca highway (Sánchez et al., 1996:96). Captive specimens offered a variety of wild plants ate grasses but preferred the stems and leaves of wild strawberry (Sánchez et al., 1996).

Mammal species collected with *M. oaxacensis* include: *Cryptotis magna, C. mexicana, Megadontomys cryophilus* (= *Peromyscus thomasi*), *Oligoryzomys fulvescens* (= *Oryzomys fulvescens*), *Oryzomys alfaroi, Peromyscus gratus, P. megalops, P. melanocarpus, P. mexicanus, Reithrodontomys mexicanus, R. microdon,* and *Sorex veraepacis* (Jones and Genoways, 1967; Sánchez et al., 1996).

GENETICS. The diploid chromosome number of *M. oaxacensis* is 30 and its fundamental number is 56 (Cervantes et al., in press). The karyotype includes eleven pairs of small-to-large metacentric chromosomes and three pairs of medium-to-large submetacentric chromosomes. The X chromosome is a medium subtelocentric, whereas the Y chromosome is a small telocentric. Compared with the karyotypical pattern of the hypothesized ancestral condition and that of the Mexican vole (*M. mexicanus*), the karyotype of *M. oaxacensis* represents a derived condition (Cervantes et al., in press).

REMARKS. *Microtus* is derived from the Greek *mikros* meaning small and *otus* meaning ear. The species name is derived from Oaxaca, the state from which it was first described. Another common name for *M. oaxacensis* is the Tarabundi vole. The type specimen, formerly held in the American Museum of Natural History (AMNH No. 208952) is currently housed in the mammalian collection of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (Wilson, 1991). Martin (1974) considers *M. oaxacensis* to be a relict survivor of an early Arvicoline invasion of the subgenus *Pitymys* from Asia ca. 0.6×10^6 years ago. This vole has been grouped with other relictual "pytimine" species found at the southern edge of the Nearctic-*Microtus* distribution (Musser and Carleton, 1993).

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