

Myotis milleri. By Sergio Ticul Alvarez-Castañeda and Michael A. Bogan

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Myotis milleri Elliot 1903

Miller's Myotis

Myotis milleri Elliot, 1903a:172. Type locality "La Grulla, Sierra San Pedro Martir, Baja California, Mexico."

CONTEXT AND CONTENT. Order Chiroptera, Family Vespertilionidae, Subfamily Vespertilioninae, Genus *Myotis*, Subgenus *Myotis*. *M. milleri* is monotypic (Hall, 1981). The genus *Myotis* is cosmopolitan in distribution and includes about 84 species. Findley (1972) placed *M. evotis*, *M. auriculus*, and *M. keenii* in the *evotis* group of the subgenus *Myotis*. *M. milleri* likewise should be placed in the *evotis* group of subgenus *Myotis*.

DIAGNOSIS. *Myotis milleri* (Fig. 1) is a pale, medium-sized bat, with black ears extending more than 2.0 mm beyond the nose when laid forward. *M. milleri* externally resembles *M. evotis* but can be distinguished by shorter forearm (34-37 mm vs. 36-41), shorter length of maxillary tooththrow (5.4-6.0 mm vs. 6.0-6.8), noticeably flatter and less elevated braincase, and absence of a sagittal crest (Hall, 1981; Manning, 1993; Miller and Allen, 1928). *M. milleri* differs from the single specimen of *M. evotis micronyx* from Comondú, Baja California Sur, in the same ways that it differs from *M. evotis* in general. *M. milleri* can be distinguished from *M. thysanodes* by its small size and absence of hair on the trailing edge of the uropatagium, and from *M. yumanensis* by longer tibia, longer ear length, and greater skull length. From *M. ciliolabrum* and *M. californicus*, *M. milleri* can be distinguished by overall greater size, longer hind foot, and breadth across the canines greater than across the interorbital (Alvarez et al., 1994), and from *M. volans* by its larger size and longer ears. *M. milleri* lacks a keeled calcar which *M. californicus*, *M. ciliolabrum*, and *M. volans* all possess.

GENERAL CHARACTERS. The upper parts are greenish brown with a tinge of russet, underparts whitish or creamy white. The base of all hairs on the body are blackish. The ears are black with an indication of purple shade and the sides of the face pale brown. Wing and interfemoral membranes are purplish brown and the feet black (Elliot, 1903a). The dental formula is $i\ 2/3, c\ 1/1, p\ 3/3, m\ 3/3$, total 38. The calcar is well developed, terminating in a minute lobule, but not keeled. Mean and range of measurements (in mm) of five skins and six skulls are: length of body, 42.8 (40.0-46.6); length of tail vertebrae, 38.3 (36.2-41.0); length of tibia, 16.7 (16.0-17.0); length of foot, 8.1 (7.6-9.0); length of ear from meatus, 19.4 (19.0-20.0); length of forearm, 35.1 (34.0-37.0); length of thumb, 6.1 (5.8-6.4); length of third metacarpal, 31.8 (30.6-33.4); length of fifth metacarpal, 30.8 (30.0-32.4); greatest length of skull, 15.0 (14.8-15.2); condylobasal length, 14.1 (13.8-14.6); zygomatic breadth, 8.9 (8.8-9.0); length of interorbital constriction, 3.5 (3.4-3.6); breadth of brain case, 7.1 (7.0-7.2); breadth of maxillary at M3, 5.7 (5.6-5.8); length of maxillary tooththrow, 5.7 (5.4-6.0); length of mandibular tooththrow, 6.1 (5.8-6.4—Miller and Allen, 1928). Average body mass of five males was 4.8 g (4.0-5.4) whereas one female had a body mass of 5.0 g (Manning, 1993).

DISTRIBUTION. Most specimens are from the Sierra San Pedro Martir of northern Baja California, specifically from La Grulla, La Encantada, Picacho Diablo, 15 km S Vallecitos, 1 mi W Vallecitos, and Vallecitos (Huey, 1964; Ramirez-Pulido et al., 1983; Ramirez-Pulido et al., 1986; Reduker et al., 1983; Villa-R., 1967). Huey (1964:94) gives the range as "higher mountains in northern Baja California" and also reports specimens from El Valle de la Trinidad, which lies between the Sierra Juarez and Sierra San Pedro Martir. Specimens from El Valle de la Trinidad have not been reported elsewhere. This species is found in the Transition Zone of the San Pedro Martir District (Fig. 2; Nelson, 1922). No fossils of *M. milleri* are known.

FORM AND FUNCTION. In a recently-taken sample of *M. milleri*, females averaged larger than males in length of forearm, condylobasal length, postorbital constriction, mastoid breadth, depth of braincase, width across upper canines, and width across upper molars, whereas males averaged larger in greatest length of skull, breadth of braincase, length of rostrum, length of maxillary tooththrow, and length of mandibular tooththrow (Manning, 1993). Mean differences were small for this sample of six males and two females, although upper 95% confidence limits for all variables were larger for females. Testes of three males measured 1 and 2 mm in May and 6 mm in early July.

In *M. milleri* (and in *M. auriculus* and *M. evotis*), the crown of M3 has been shortened antero-posteriorly compared to *M. keenii*,

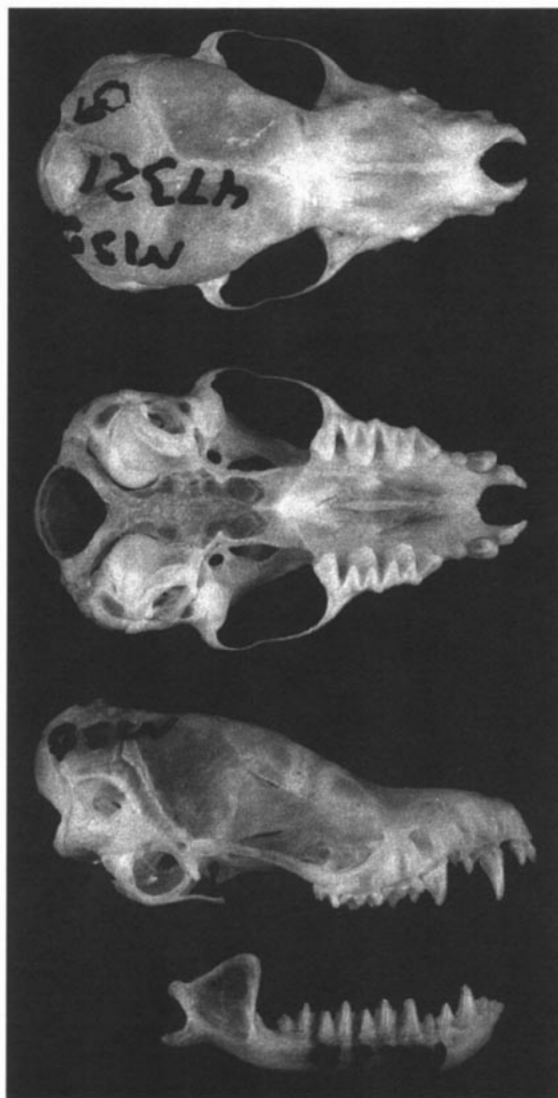


FIG. 1. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of a male *Myotis milleri* (MSB 47321) from La Encantada, Sierra San Pedro Martir, Baja California, México (Photographs by J. D. Armstrong and P. Cryan).

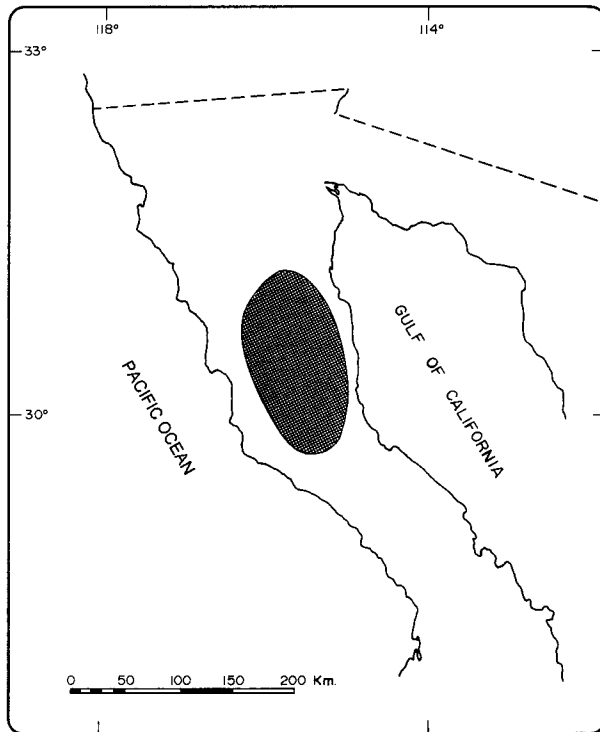


FIG. 2. Distribution of *Myotis milleri* in Baja California (modified from Hall, 1981).

and concurrent with this shortening there has been a loss of the metaconule and its loph. In addition, the re-entrant angle between the parastyle and the mesostyle of M3 is more trenchant than in *M. keenii* (Genoways and Jones, 1969).

ECOLOGY. This species appears to be restricted to mixed coniferous forest habitat in the mountains of northern Baja California, primarily (or exclusively) the Sierra San Pedro Martir. Most records are from 7,000 to 8,000 ft (ca. 2100–2400 m) in elevation; recent captures were netted over pools or streams in grassy valleys surrounded by coniferous forest. The forest is composed almost entirely of Jeffrey pine, *Pinus jeffreyi*. Other tree species present, mostly at higher elevations, include sugar pine, *P. lambertiana*, lodgepole pine, *P. murrayana*, incense cedar, *Libocedrus decurrens*, and white fir, *Abies concolor* (Elliot, 1903b). *M. milleri* has been netted with *M. yumanensis*, *Eptesicus fuscus*, *Pipistrellus hesperus*, *Lasiurus cinereus*, *Antrozous pallidus*, and *Nyctinomops femorosaccus*.

GENETICS. The standard karyotype of five specimens of *M. milleri* consists of a diploid number of 44 and a fundamental number of 52 (Reduker et al., 1983). The autosomal complement consists of five pairs of banded chromosomes and a graded series of acrocentric chromosomes. The X chromosome is recognizable as the only medium-sized banded chromosome in the complement. The Y chromosome is a small acrocentric (Fig. 3). This species has a small pair of banded autosomes (pair 25 of Bickham, 1979). Examination of the karyotype of *M. milleri* confirms its close relationship to other long-eared congeners (*M. auriculatus*, *M. thysanodes*, and *M. evotis*).

Reduker et al. (1983) examined 20 loci electrophoretically in five species of long-eared *Myotis* and found 12 loci were monomorphic for the same allele in all species. Of the eight polymorphic loci, *M. milleri* was fixed for one allele at six loci (SDH, ADH, LDH-2, ES-1, Hb, and 6 PGD) and was heterozygous for two loci (LAP and PGM). *M. evotis* and *M. milleri* possess a high value for Roger's genetic similarity (0.898) and clustered separately from *M. auriculatus* and *M. thysanodes*. However, a fixed allelic difference between *M. milleri* and *M. evotis* at the ES-1 locus suggests that no introgression occurs between the two forms.

REMARKS. The specific epithet *milleri* honors G. S. Miller, Jr. The specific status of *M. milleri* has been a subject of debate.

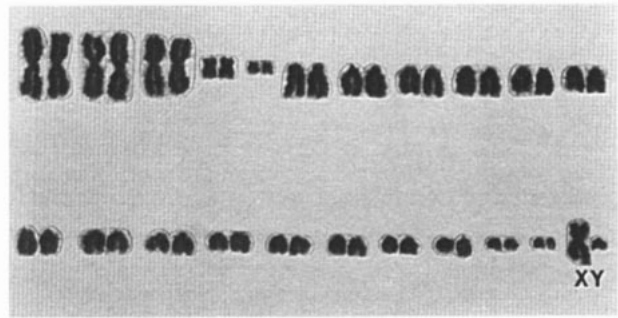


FIG. 3. Karyotype of *Myotis milleri* from 15 km S Vallejos, Sierra San Pedro Martir, Baja California (Karyotype and photograph by I. F. Greenbaum).

After a careful study, using morphological, karyotypic, and starch-gel electrophoretic evidence, Reduker et al. (1983) recommended that *M. milleri* should retain its specific status rather than be reduced to subspecies of *M. evotis*, as there is no distinct cohesion between the species. More recently, Manning (1993), on the basis of morphological evidence and a review of existing information, suggested that *M. milleri* would best be considered a subspecies of *M. evotis*. Manning (1993) noted an apparent cline of decreasing size of *M. evotis* in southern California and postulated that *M. milleri*, in the Sierra San Pedro Martir, represents the small end of the cline. However, the single specimen of *M. evotis micronyx* from Comondú does not fit this cline. Given the thorough review of several lines of evidence by Reduker et al. (1983) and continuing uncertainty about the status of *M. evotis* elsewhere in Baja California, including Comondú, we choose to retain full specific status for *Myotis milleri*. We thank John D. Armstrong, Ira F. Greenbaum, and Paul Cryan for providing photographs.

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SERGIO TICUL ALVAREZ-CASTAÑEDA. CENTRO DE INVESTIGACIONES BIOLÓGICAS DEL NOROESTE, S. C., APARTADO POSTAL 128, LA PAZ, BAJA CALIFORNIA SUR 23000, MEXICO; MICHAEL A. BOGAN. BIOLOGICAL RESOURCES DIVISION, U. S. GEOLOGICAL SURVEY, MUSEUM OF SOUTHWESTERN BIOLOGY, UNIVERSITY OF NEW MEXICO, ALBUQUERQUE, NM 87131.