ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMACB01010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Macrotus californicus* Baird
COMMON NAME: California Leaf-nosed Bat

SYNONYMS: *M. waterhousii californicus*
OTHER COMMON NAMES: Leaf-nosed Bat
FAMILY: Phyllostomidae

AUTHOR, PLACE OF PUBLICATION: Baird, 1858. Proc. Acad. Nat. Sci. Phila., 10:116.

TYPE LOCALITY: USA, California, Imperial Co., Old Fort Yuma.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Species *californicus* is one of two in the genus *Macrotus*, and the only species of the genus to occur in Arizona.

This species was formerly considered a subspecies of *M. waterhousii* (Anderson and Nelson 1965, Anderson 1969, Hall 1981). Chromosomal studies and multivariate analysis of cranial characters demonstrated the existence of two different groups with a narrow zone of overlap in southern Sonora, but no evidence of hybridization (Davis and Baker 1974). Based on this morphometric and karyotypic evidence, Davis and Baker (1974) recognized two species: the northern population as *M. califonicus* and the southern population as *M. waterhousii*. Greenbaum and Baker's (1976) analysis of electrophoretic and chromosomal data supports the recognition of two distinct species. Jones et al. (1975, 1997), Jones and Carter (1976), Hoffmeister (1986), Banks et al. (1987) Baker et al (2003), Simmons (in Wilson and Reeder 2005), Bradley et al. (2014), ASM (2023), and Simmons and Cirranello (2023) follow Davis and Baker (1974) in recognizing *M. californicus* as a distinct species.

The chromosomal variation is of the Robertsonian type in which the fundamental number (FN) is constant but the diploid number (2N) varies. In this case, both groups had an FN of 60 but the northern population, now *M. californicus*, was found to have a 2N of 40 and the southern population, *M. waterhousii*, had a 2N of 46. No variation was found within either group. The primary cranial character that separates the two species, as identified by multivariate analysis, is interorbital breadth measured across the narrowest part. If breadth is 3.8 mm (1.52 in.) and is a male or it measures less than 3.8 mm (1.52 in.) it is *M. californicus*. If it measures 3.8 mm (1.52 in.) and is a female or it measures more than 3.8 mm (1.52 in.) it is a *M. waterhousii*.

Genic heterozygosity (=$\bar{H}$ which is the mean number of heterozygous loci per individual) for *M. californicus* has been estimated at 0.030. This estimate, based on electrophoretic analysis

of allozymic variation at 17 loci, is low for mammals which average 0.056 (Straney et al. 1976). Estimates for mammals are mostly within the range of 0.008 to 0.110. Heterozygosity for this bat is also near the low end (0.026 -0.144) for the few bats analyzed.

DESCRIPTION: A medium sized gray bat with a total length of 8.5-9.9 cm (3.35-3.90 in). The forearm is 4.6-5.2 cm (1.81-2.05 in), tail 28-41 mm, and weight is 12-22 g (0.42-0.78 oz). They have long ears (longer than 25 mm) that joins together at the base. At the tip of the nose is a distinct erect leaf-like projection, hence were their name comes from. Their tail extends slightly beyond the tip of the interfemoral membrane, approximately 5-10 mm. Dentition: 2/2, 1/1, 2/3, 3/3.

AIDS TO IDENTIFICATION: *M. californicus* is identified by the combination of large ears and nose-leaf. No other large-eared bat has a nose-leaf and no other bat with a nose-leaf has such large ears. It is easily distinguished from *Choeronycteris mexicana* and *Leptonycteris curasoae* by its much larger ears (>29.0 mm [>1.16 in.)] in *M. californicus*, < 19.0 mm (0.76 in.) in *C. mexicana* and *L. curasoae*) which are joined together near their base. *M. californicus* also has a shorter rostrum, shorter tongue, no bristle-like papillae on the tongue and its first upper premolars contact its canines and usually also its second premolar. Guano of this bat is reported to have a distinctive odor that maybe used to help identify a roost.

Roosting *Macrotus* give clues to their identity by where they hang and how they cluster. They generally prefer to hang from the ceiling of caves and mines in groups of up to several hundred. Although they roost close to each other they are not usually touching or tightly packed as are the individuals of many other colonial bat species. If they do come into contact they become restless and move.

ILLUSTRATIONS:

Color photo (Barbour and Davis 1969: plate I)
Black and white photo (Hoffmeister 1986:59)
Color photo (Whitaker 1980: plate 147)

TOTAL RANGE: They range from N Sinaloa and SW Chihuahua (Mexico) north to S Nevada and S California (USA); also range into Baja California and Tamaulipas (Mexico). (Wilson and Reeder, 2005).

RANGE WITHIN ARIZONA: Primarily south of Mogollon Plateau; additional reports in extreme southeastern and in summer extreme northwestern Mohave County. Year-round occupant of some roosts. Winter range essentially the same as summer range. Not known from northwestern Mohave County in winter.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This bat is not known to hibernate, and although it may not occupy the same roost year-round it is not known to migrate. Remains active year-round. When temperatures drop to between 9º and 12º C, they do not become torpid, but regulate their body temperature to between 18º and 20º C. They can only survive these temperatures for a few hours. Sustained exposure to ambient temperatures less than 26º C results in death. These bats rarely encounter such low temperatures for long periods within the underground caverns and desert conditions in which they live.

Most individuals leave day roosts within 1 to 3 hours after sunset although some may leave immediately after sunset. Their vision is better than other insectivorous bats that have been tested and is at least as good as that of frugivorous and nectarivorous bats that have been tested. *M. californicus* in the lab can locate motionless (dead) mealworms which suggests it may be able to exploit prey items unavailable to other bat species.

Kidney anatomy indicates that *M. californicus* is better able to concentrate urine and thus conserve water than its closest relative *M. waterhousii*, which occupies a wetter habitat. Some individuals in captivity have been reported to go for at least 6 weeks without drinking water (Lu and Bleier 1981). However, Bell et al. (1986) suggest that these bats are able to exist in temperate desert areas because they minimize energy expenditure by using geothermally-heated winter roost sites with stable year-round temperature of about 29º C and an "energetically frugal pattern of foraging that relies on visual prey location" and detection of prey-produced sounds.

REPRODUCTION: One young per year. Females can breed during their first autumn. Males, however, do not breed until their second year. Females congregate in maternity colonies to give birth during May and June. The young are nursed during the following month after which they are able to fly and begin foraging for themselves. Nursery colonies are in roost sites with temperatures of about 90º-95º C and located near the entrance to the roost.

During spring and summer males roost separately. They may be in small groups in roosts at different localities from maternity roosts or in a different place but at the same site as a maternity roost. Males join females in late summer and early fall and they are found together during winter. Fertilization takes place in early fall with embryological development greatly slowed through the winter until March when it proceeds normally. Some nursery colony sites are occupied year round. Maximum life expectancy is greater than 15 years.

FOOD HABITS: Primarily takes prey while hovering close to the ground or by gleaning from vegetation often within 3 feet of the ground. It does not crawl well, so it does not forage on the ground as does *Antrozous pallidus* but rather lands on its prey from above and then takes it to a night roost to feed. Feeds on large, flying insects such as grasshoppers, moths and flying beetles. Also capable of taking prey in flight. Insect larvae, especially lepidopterans, and other flightless, or daytime active prey are taken from bushes and off the ground. Daytime insects are especially important during winter months.

Hoffmeister (1986) reports that *M. californicus* may also feed on fruits, including those of cacti. Commonly uses night roosts, where it may take large insects (sphinx moths, butterflies, dragonflies) to eat and where insect wings and other discarded body parts may be found below the roost site. Foraging typically occurs during two periods: 1 to 3 hours after sunset and a 2 hour period ending about half an hour before sunrise. Total time spent foraging by a single bat has been estimated at about 1 3/4 hours including time spent at a night roost eating larger prey items. These bats do not hibernate and therefore must feed year-round.

HABITAT: Mostly found in the Sonoran desertscrub; primary summer and winter range essentially the same; primarily roost in mines, caves, and rock shelters. Day roosts in mines are usually within about 80 feet of the entrance. Prefer roost sites with large areas of ceiling and flying space. In colder parts of their range, during winter, they are found in mines where temperatures are well above external ambient temperatures. During this time they are found in roosts with temperatures 80°F and are usually found 100 ft or more back from the entrance.

Nocturnal roosts are found in places that provide overhead protection and an adequate flight approach. Such places including a variety of manmade structures, rock shelters and mines.

ELEVATION: All Arizona records below 4,000 feet (1,220 m) with most below about 2,500 feet (7,625 m). Based on records in the Heritage Data Management System, elevation ranges from 160 - 3,980 ft. (49 - 1,214 m) (AGFD unpublished data, accessed 2001).

PLANT COMMUNITY: Predominantly Sonoran and Mohavean, but also occasionally in Chihuahuan and Great Basin desertscrub.

POPULATION TRENDS: Concerns expressed by biologists regarding roost abandonment and reduced numbers. Mainly as a result of disturbance by both recreationists and scientists at a number of well known and accessible roost sites. In addition, a number of old mines in southwestern Arizona have begun to be closed or are slated for closure in the future , which could affect roosting sites, if not monitored for presence at proper time of year.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	SC (USDI, FWS 1996) [C2 (USDI, FWS 1989, 1991, 1994)]
STATE STATUS:	2 (AZGFD, AWCS 2022) [1B (AGFD SWAP 2012)] [WSC (AGFD, WSCA 1996 in prep)] [Candidate (AGFD, TNW 1988)]
OTHER STATUS:	Not Forest Service Sensitive (USDA, FS Region 3, 2013)

Bureau of Land Management Sensitive (USDI, BLM AZ 2008, 2010, 2017)
[Not Bureau of Land Management Sensitive (USDI, BLM AZ 2005)]
[Bureau of Land Management Sensitive USDI, BLM AZ 2000]
[Forest Service Sensitive (USDA, FS Region 3, 2007)]
[Not Forest Service Sensitive USDA, FS Region 3, 1999]
[Forest Service Sensitive USDA, FS Region 3, 1988]
LC (IUCN, Solari 2018)

MANAGEMENT FACTORS: Susceptible to human disturbance which may cause abandonment of roosts. Loud noises in roosts may disorient the bats and also negatively affect reproductive success. Habitat destruction (closure by dynamiting, bulldozing, or otherwise blocking of caves and mines) or modification (altering air movement, humidity, temperature, or interfering with bat access) by partial blocking or improper gating are all potentially serious concerns. Mine closure for hazard abatement and renewal of mining activity at previously abandoned mines both present threats to existing colonies.

PROTECTIVE MEASURES TAKEN: Some abandoned mines used as roosts, instead of being sealed, have been gated to allow access by bats.

SUGGESTED PROJECTS: Studies to determine home range, foraging areas and distances, and local, seasonal movements. Also, historical studies of roost site use and disturbance are needed.

LAND MANAGEMENT/OWNERSHIP: BLM - Havasu, Kingman, Phoenix, Safford, Tucson and Yuma Field Offices; FWS - Cabeza Prieta and Imperial National Wildlife Refuges; USFS - Coronado National Forest; NPS - Organ Pipe Cactus National Monument; DOD - Barry M. Goldwater Air Force Range and Yuma Proving Ground; BIA - Tohono O'odham Nation; State Land Department; Picacho Peak State Park; La Paz County Park; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION: These bats are seldom netted over water or even in flyways; thus surveying for *M. californicus* seems to be most efficiently done at roosts using exit counts or other estimation methods.

Revised: 1991-08-08 (RBS)
1992-05-03 (BKP)
1992-09-29 (RBS)
1994-04-07 (DCN)
1997-12-31 (SMS)
2001-10-03 (GLR)
2014-01-29 (BDT)
2023-03-06 (MBL)
2023-08-04 (MSB)

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