

California leaf-nosed bat, *Macrotus californicus**Elizabeth D. Pierson & William E. Rainey*

Description: *Macrotus californicus* is one of two phyllostomid species that occur in California. It is a medium sized bat (forearm = 46-52 mm, weight = 12-22 g), with grey pelage and long (>25 mm) ears. It can be distinguished from all other long-eared bats by the presence of a distinct nose leaf, which is erect and lanceolate (Hoffmeister 1986). The only other California species with a leaf-shaped nose projection, *Choeronycteris mexicana*, has very short ears. *Corynorhinus townsendii*, the other long-eared species with which *M. californicus* could most readily be confused, can be distinguished by the presence of bilateral nose lumps as opposed to a single nose leaf. *Antrozous pallidus* has long ears and a scroll pattern around the nostrils instead of a nose leaf. *M. californicus* has a tail which extends beyond the edge of the tail membrane by 5-10 mm.

Taxonomic Remarks: *M. californicus*, a member of the Family Phyllostomidae, has sometimes been considered a subspecies of *Macrotus waterhousii* (Anderson and Nelson 1965), but more recently, based primarily on chromosomal characters, has been treated as a separate species (Davis and Baker 1974, Greenbaum and Baker 1976, Baker 1979, Straney et al. 1979). The form now recognized as *M. californicus* was first described from a specimen collected at Old Fort Yuma, Imperial County (Baird 1859). There are currently two species recognized in the genus *Macrotus* (Koopman 1993). Only *M. californicus* occurs in the United States.

Distribution: *M. californicus* has a limited distribution which extends from northwestern Mexico (Sonora and Sinaloa) and Baja California into Arizona, southern Nevada, and southern California (Greenbaum and Baker 1976, Hall 1981).

Museum records document that earlier in the 20th century, *M. californicus* was distributed across most of southern California (specifically Imperial, Los Angeles, Riverside, and San Diego counties). It was observed in southcentral San Diego County (west of the Laguna Mountains) as recently as 20 years ago (P. Brown pers. comm.). Extensive surveys conducted over the past 30 years indicate that the species also occurs in San Bernardino County. It currently appears to be limited to the eastern portion of its former range. It is found primarily in the mountain ranges bordering the Colorado River basin, with records occurring as far west as the Eagle Mountains, Riverside County (P. Brown pers. comm.). A few individuals (males) were recently found in the Avawatz Mountains, just south of Death Valley, approximately 160 km north of the next known roost containing more than a few animals (P. Brown pers. comm.).

Life History: *M. californicus* is colonial, forming large seasonal aggregations. Females congregate in the spring and summer in maternity colonies of typically 100 to 200 bats (Barbour and Davis 1969, Vaughan 1959), although colonies of only 6-20 bats are also found. Within the larger colonies, clusters of five to 25 females will be associated with a single "harem" male that defends the cluster against intruding males (Brown and Berry 1991). Large male roosts may also form. Each female bears a single young between mid-May and early July. Maternity colonies disband once the young are independent in late summer. In September and October, males aggregate in "display" roosts, which may be separate from the maternity sites, where they are visited by females for mating (Berry and Brown 1995). Although pregnancy is initiated immediately, embryos undergo several months of "delayed development," remaining at a very early embryonic stage until development resumes in March (Bradshaw 1962). The total gestation period is almost nine months. This species also forms larger, mixed sex aggregations of up to 2,000 bats in winter. Unlike vespertilionids, phyllostomids do not hibernate. *M. californicus* has a narrow thermal-neutral zone, and appears incapable of entering torpor (Bell et al. 1986).

M. californicus is purely insectivorous, and forages low over desert wash vegetation, often within one meter of the ground (Vaughan 1959). Although the species can use echolocation, it relies preferentially on vision to localize its prey (Bell 1985, Bell and Fenton 1986), and probably uses prey-produced sounds as well. The diet is composed primarily of large moths (sphingid, noctuid, and cossid), butterflies, grasshoppers, and katydids (Anderson 1969, Huey 1925, Vaughan 1959). Since many of these taxa are either flightless or diurnal, it is presumed that *M. californicus* frequently gleans prey off surfaces (Stager 1943b, Vaughan 1959). Wings and other culled prey parts are found under night roosts.

Habitat: *M. californicus* appears to be confined to lowland Sonoran Desert habitat below 900 m (Brown et al. 1995, Brown 1996). This species also appears to be totally dependent on either caves or mines for roosting. Although it has occasionally been found night roosting in buildings or bridges (e.g., P. Brown pers. comm., Constantine 1961, Hatfield 1937), its maternity, mating, and overwintering sites are all in mines or caves (Brown et al. 1995). All except two currently known day-roost sites are in abandoned mines. Several caves used earlier in the century, some of which contained hundreds of individuals (e.g. Grinnell 1918, Howell 1920b), have either been abandoned due to human disturbance/suburban encroachment, or now contain only a few bats.

M. californicus has quite restrictive roosting requirements. Individuals remain active year round and need to find both summer and winter roosts that have temperatures of approximately 29°C. Summer roosts are generally relatively close to the roost entrance, often within the twilight zone, where temperatures in the summer in the desert exceed 30°C. In the Colorado River basin, all known winter roosts are in geothermally-heated mine workings, and may be as much as a kilometer from the entrance (P. Brown pers. comm.). Banding studies conducted over the past 30 years suggest that distances traveled between summer and winter roosts are generally no more than a few kilometers (Brown et al. 1995), and different areas of the same mine complex can be used at different seasons. While abandoned mines have long been recognized as an extremely important resource for summer and winter colonies of *M. californicus* in California, recent research has revealed that this species also uses particular sites in the fall for courtship and mating, that may be different from summer or winter sites (Berry and Brown 1995).

M. californicus also appears to require desert wash vegetation for foraging. In several radiotracking studies, Brown et al. (1993b) showed that the bats fed primarily in this habitat, generally within one to three miles (1.6-4.8 km) of the roost. Having foraging areas adjacent to the roost was more important in winter, when the bats tended to forage closer to the roost and for shorter periods than in the summer.

Status: Class I. The range of *M. californicus* has contracted during this century, and the species no longer occurs outside of desert habitats in California. The primary factors responsible for the declines are roost disturbance, renewed mining in historic districts, closure of mines for hazard abatement, and destruction of foraging habitat. The combination of limited distribution, restrictive roosting requirements, and the tendency to form large but relatively few roosting aggregations make this species especially vulnerable.

Museum records establish that this species occurred in western San Diego, northwest Los Angeles, and western Riverside counties at the turn of the century (Grinnell 1918, Howell 1920c, Kruttsch 1948). Despite extensive surveys over the past 30 years (Brown 1996), virtually no animals have been found at any of these historic localities, except for a few individuals near Lake Barrett (in 1978), and three individuals at a natural cave in the Coachella Valley, near the current city of La

Quinta (early 1990s) (P. Brown pers. comm.). The La Quinta roost, reported by Grinnell (1918) to contain at least 300 individuals in 1908, is now surrounded by golf courses and luxury estates, with only remnants of desert wash vegetation in the vicinity. The remaining known cave roosts are now subject to heavy recreational use. The complex of caves near the Salton Sea (Bat Cave Buttes) reported to have multiple colonies of up to 200 each early in the century (Howell 1920b) has been heavily vandalized and no longer contain *M. californicus*. The historic roost at Owensmouth on the Los Angeles/Ventura County line is surrounded by housing developments, and is a local party spot. The Santa Susanna roost is in the middle of a large housing tract. The Santa Margarita Ranch location is now Camp Pendleton, and the historic roosting site has not been located.

Currently, only about 20 maternity colonies, and about the same number of winter roosts are known (P. Brown pers. comm., Brown et al. 1995), although in some cases, the winter and summer roosts are in different mines within a mountain range. The largest colonies are confined to the mountain ranges along the Colorado River. The two largest roosts, with over 1,500 bats each, are in mines in extreme southeastern California. One of these mines is currently under claim to a mining company that has destroyed adjacent *M. californicus* roosts in renewed mining efforts. Bat populations in the mined areas declined by over 60% in one drainage. Another colony of 150 was totally eliminated when the mine roost was closed. The largest winter roost in California is in an area of heavy winter recreational use, and two of the three entrances were closed in 1985 for hazard abatement. This made the mine unsuitable as a maternity colony, and it is now occupied by almost 2,000 *M. californicus* only in the winter. Except for roosts in the Cargo Muchacho Mountains, none of the current roosts is threatened by renewed mining. This situation could change if mining becomes more profitable in historic districts (i.e., the price of gold increases or the cost of extraction decreases).

This species faces a number of threats in California:

Renewed mining. The primary threat to *M. californicus* populations in California is renewed mining in historic districts. Since 1977, *M. californicus* populations have been monitored in the Cargo Muchacho Mountains. In 1989, mining commenced in one drainage, and then spread out into another. In some cases bats were killed or displaced as historic mines became part of open pits. Even where mines were not directly impacted, bat populations dropped to 10% of pre-mining levels due to the removal of foraging habitat (desert wash vegetation) adjacent to the roost. The second largest winter roost in California, which is also a maternity roost, is in a drainage adjacent to the active mine (and under claim). *M. californicus* roosts at the Picacho Mine were eliminated without surveys or exclusion of roosting bats to prevent their death.

Abandoned mine closures. The largest *M. californicus* winter roost in California was almost closed for hazard abatement. Two of three entrances were closed before the Bureau of Land Management was alerted to the threat. The main shaft of the Senator Mine was covered with chain-link fence material after two Marines ignored warning signs and perished inside. Although bats continue to gain access to the mine through an alternate opening, they cannot get through the chain-link material, and the numbers in this colony have declined. With appropriate gate design, it is possible to close mines to human access and still allow use by bats and other wildlife.

Disturbance from the public. Human visitation is likely responsible for the disappearance of the colonies in Chatsworth, Owensmouth, Toro, and Salton Sea caves. There is no recent bat sign at the Owensmouth and Chatsworth roosts, which are currently surrounded by housing tracts and/or used as party sites. A combination of human disturbance and removal of foraging habitat is likely responsible for declines (from >300 to 2-3) at the La Quinta and Toro roosts. Bat Cave Buttes along the east side of the Salton Sea occasionally house a few *Tadarida brasiliensis* or *Antrozous pallidus*,

but have no evidence of *M. californicus*. These are heavily visited by OHV riders. A mine near Dulzura, which had *M. californicus* in the 1940s (Krutzsch 1948) currently receives heavy recreational use and has no bats. Recreational mine exploration and artifact collection (now a lucrative business) pose an increasing threat. P. Brown (per. comm.) reports signs of human entry (e.g., missing ore carts and an accumulation of beer cans) in deep, relatively inaccessible portions of formerly undisturbed mines.

Suburban/urban expansion. Suburban/urban expansion leads to increased recreational activity at roost sites and eliminates foraging habitat. This has been most evident in western San Diego and Los Angeles counties, as well as in the Coachella Valley near Palm Springs.

Loss of foraging habitat. The removal of desert wash vegetation, as evidenced at the American Girl mine site, has had negative impacts on *M. californicus* populations, and is particularly critical for wintering populations (Brown 1996). The largest disturbances are from active mines in the Cargo Muchachos, i.e., the Mesquite Mine at Glamis and the Picacho Mine. A new mine (Imperial) is being permitted north of the Cargos. While this will not affect any known roosts, it may remove foraging habitat. Desert wash vegetation has also been removed from large areas of the Coachella Valley, primarily due to expansion of urban areas and construction of golf courses.

Landfills. The roost in the Kaiser adit at Eagle Mountain (Riverside County) may eventually be covered by landfill. The landfill at Mesquite mine (Imperial County) will probably remove foraging habitat, although at present, the landfill site is not near an active roost.

Military activities. The Chocolate Mountain Gunnery Range has two mines with *M. californicus*. The main disturbance is troops (Navy SEALs) entering the mines. These mine entrances should be gated as soon as possible. The Twenty-nine Palms Marine Corps Training Center may have had a *M. californicus* roost (as judged by guano), but troops regularly enter the mine. A gate is planned (P. Brown pers. comm.).

Management Recommendations: Surveys of mines within range of *M. californicus* should be required before any closures occur for renewed mining or hazard abatement. Survey protocol should be standardized (Altenbach 1995, Dalton and Dalton 1995, Navo 1995, Rainey 1995).

Mines that are vulnerable to human disturbance (have evidence of recent human entry) should be gated with bat-friendly gates.

Key roosts (both gated and ungated) should be monitored annually to document population fluctuations in both winter and maternity colonies. Mines with declining populations should be most closely monitored.

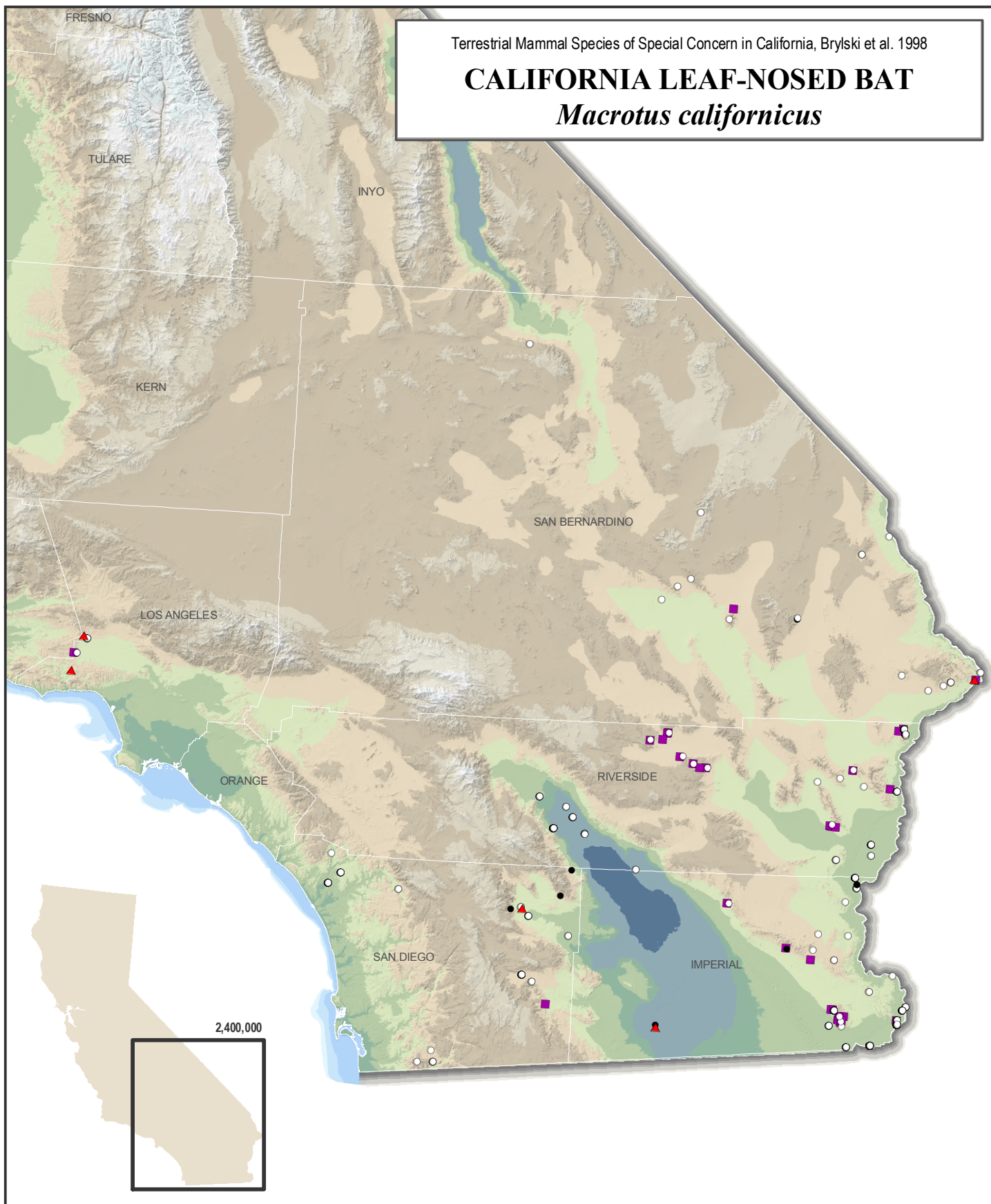
Additional surveys are needed to identify the limits of current distribution of *M. californicus* in California. Surveys conducted in 1989-1994 expanded the known range to the northwest, yet many mining areas have not been surveyed. Key populations may yet be discovered and require protection.

Preservation of desert wash vegetation within the range of *M. californicus*, especially within 5 mi (8 km) of known roosts, may be critical to survival.

Terrestrial Mammal Species of Special Concern in California, Brylski et al. 1998

CALIFORNIA LEAF-NOSED BAT

Macrotus californicus



Locations verified by authors
(captures, observations, museum records)

- Post - 1978
- 1978 and before

- ▲ Constantine 1998
- CNDDDB 1979 -1998