Pallid bat, *Antrozous pallidus*

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**Description:** *Antrozous pallidus* is a large (forearm = 45-60 mm), long-eared vespertilionid bat. It can be readily distinguished from all other California bat species by a combination of large size, large eyes, large ears, light tan coloration, a pig-like snout, and a distinctive skunk-like odor. Although color varies from very light, almost blonde, in desert populations, to tan along the coast and farther north, the overall impression is of a light colored bat. No other species has fur this light. It lacks the nose-leaf found in *Macrotus californicus* and the bilateral nose lumps found in *Corynorhinus townsendii*. *Myotis evotis* is much smaller and has dark, rather than pale colored, ears. *Euderma maculatum*, which also has light ears, can be distinguished by its unique pelage coloration -- black with three large, white dorsal spots.

Pallid bats sometimes leave characteristic sign. Remains of scorpions, Jerusalem crickets, sphinx moth wings, and/or long-horned beetles in association with bat guano, indicate the presence of pallid bats. It is possible, however, to find pallid bat guano deposits that do not have culled insect parts.

**Taxonomic Remarks:** *A. pallidus*, a member of the Family Vespertilionidae, was first described in 1856 from a specimen collected in El Paso, Texas (LeConte 1856). The first record of *A. pallidus* for California was from Old Fort Tejon, Kern County (Merriam 1897). Based on morphometric analyses, there are six currently recognized subspecies of *A. pallidus*, with three (*A. p. pacificus*, *A. p. pallidus*, and *A. p. minor*) occurring in California (Martin and Schmidly 1982). The primary characteristic used to separate subspecies is size. Since genetic analyses have not been conducted on California populations, geographic boundaries between the subspecies have not been clearly delineated, and specimens for most localities have not been examined, we treat all California *Antrozous* as *A. pallidus*. Koopman (1993) recognizes two species of *Antrozous*, *A. pallidus* and *A. dubiaquercus*, whereas others (Engstrom and Wilson 1981, Engstrom et al. 1987) place the latter species in a separate genus, *Bauerus*.

**Distribution:** Pallid bats are known from Cuba, Mexico and Baja California, through the southwestern and western United States, into southern British Columbia. They occur as far east as Kansas, Oklahoma, and Texas, and throughout much of the United States west of the Rocky Mountains (Hall 1981, Martin and Schmidly 1982). In California, the species occurs throughout the state in a variety of habitats including low desert, oak woodland and coastal redwood forests, extending up to 3,000 m elevation in the Sierra Nevada.

According to Martin and Schmidly (1982), *A. p. pacificus*, the largest subspecies, occurs along the coast and in the coast ranges west of the Central Valley. *A. p. minor*, the smallest subspecies, occurs in the Colorado River basin and adjacent mountain ranges. *A. p. pallidus* occurs throughout the rest of the state (including western San Diego County, the Central Valley, all of the Sierra Nevada and areas east of the crest, and, farther north, all areas east of the coast ranges). Martin and Schmidly (1982) describe an area of intergradation in the Klamath Mountains between *A. p. pacificus* and *A. p. pallidus*. According to Hall (1981), *A. p. pallidus* is confined to the area east of the Sierra Nevada crest, south of Lake Tahoe. The subspecific status of *A. pallidus* populations in California warrants further investigation.

**Life History:** Pallid bats are colonial, with a typical colony containing 30-70 animals, although colonies of several hundred have been found. Colonies form in the spring (March-May), and stay together until October (Barbour and Davis 1969). These colonies can be bachelor groups, but usually consist of adult females and their young. Pallid bats mate in the fall or winter, but, as is
Pallid bats forage primarily on large (20-70 mm) arthropods, caught on the ground or gleaned off vegetation. Prey items include flightless arthropods, such as scorpions (Vejoridae), ground crickets (Gryllacrididae), solpugids (Solpugidae), and darkling ground beetles (Tenebrionidae); largely ground-roving forms, including scarab beetles (Scarabaeidae), predacious ground beetles (Carabidae), carrion beetles (Silphidae), and short-horned grasshoppers (Acrididae); and vegetation-dwelling insects, including cicadas (Cicadidae), katydids (Tettigoniidae), praying mantids (Mantidae), long-horned beetles (Cerambycidae) and sphingid moths (Sphingidae) (Hatt 1923, Borell 1942, Barbour and Davis 1969, Hermanson and O'Shea 1983).

Radiotelemetry (P. Brown pers. comm.) and the known behavior of favored prey items suggest pallid bats fly close to the ground, and land on the ground to capture prey. Light-tagging studies have also documented animals feeding on the wing, 10-20 ft (3-6 m) off the ground (pers. obs.). Discarded large arthropod remains most commonly found in pallid bat roosts in California are Jerusalem crickets, cicadas, long-horned beetles, and scorpions (D. Pierson and W. Rainey pers. obs.). Although pallid bats use echolocation to assess habitat, they apparently locate prey primarily by listening (Bell 1982). Pallid bats have also been reported as visitors to fruits and flowers (Barbour and Davis 1969, Howell 1980). Although they are presumably feeding on insects associated with these plants, they also appear to serve as pollinators of some desert plants (Herrera et al. 1993).

Habitat: Although pallid bats are frequently associated with desert areas and the Sonoran Life Zone (Barbour and Davis 1969, Hermanson and O’Shea 1983), Orr (1954), who studied this species extensively in California, described the species as occurring in a number of habitats, including coniferous forests, nonconiferous woodlands, brushey terrain, rocky canyons, open farm land, and desert. In our observations (D. Pierson and W. Rainey) in northern California, this species is associated with oak habitat, particularly lower elevation oak savannah. It is also found in association with coast redwoods, and mid- to higher elevation coniferous forest (Orr 1954, Rainey et al. 1992). It is, for example, one of the species most frequently observed in Giant Sequoia groves at ca. 2,000 m (Pierson and Heady 1996).

Pallid bats are primarily a crevice roosting species, and select daytime roosting sites where they can retreat from view. Common roost sites are rock crevices, old buildings, bridges, caves, mines, and hollow trees (Barbour and Davis 1969, Hermanson and O’Shea 1983). Recent radiotracking efforts in the west, including California, suggest that pallid bats are far more dependent on tree roosts than was previously realized. They have been located in tree cavities in oak, Ponderosa pine, coast redwood and giant Sequoia (Rainey et al. 1992, Cross and Clayton 1995, Pierson and Heady 1996).
On Santa Cruz Island, however, radio-tagged animals selected rock crevices and buildings, despite abundant oak woodland (Brown et al. 1984). Pallid bats are also one of the species most predictably associated with bridges. They sometimes roost in expansion joints by day, but more commonly are found night roosting, particularly under concrete girder structures (Lewis 1994, Pierson et al. 1996). They are also often associated with buildings, ranging from collapsing barns and historically significant sites (e.g., some of the missions) to some relatively recent structures.

Roost temperature may be a limiting factor in roost selection. Cliff-roosting pallid bats in Arizona selected crevices that remained warm and stable (ca. 30°C) in the summer, and tracked ambient temperature fluctuations in spring and fall (Vaughan and O’Shea 1976). Pallid bats are intolerant of roost temperatures above 40°C (Licht and Leitner 1967), and often occupy roosts that offer a varied temperature regime. In attic settings, the animals emerge from crevices to roost on open rafters when roof temperatures become excessive. Pallid bats are very sensitive to disturbance at the roost. When disturbed, they generally retreat into crevices, and with repeated disturbance, may abandon the roost. Their response time is slow, however, making them vulnerable to shooting and other forms of vandalism, and their loyalty to a chosen roost (particularly buildings, mines, bridges) is generally high.

In central coastal California, pallid bats are most frequently found foraging in open oak woodland, but also feed in forested canyons (E. Pierson and W. Rainey pers. obs.). Radiotracking studies have shown that animals generally feed within 6-8 km of their roost, and have regularly occupied feeding areas (E. Pierson and B. Rainey unpubl. data; P. Brown pers. comm.).

Status: Class II. Although the status of *A. pallidus* has not been investigated, bat biologists have noted a definite decline in populations in recent years in California (P. Brown pers. comm.; E. Pierson and W. Rainey pers. obs.). For example, in 1980, four substantial pallid bat roosts were known in Napa County, and two in southern Sonoma County. Only one of these is still occupied, and when last checked, had many fewer animals than in 1980. This decline may be due to the conversion of oak woodlands to vineyards in the Napa Valley. This species, although it will coexist with humans in rural settings, appears to be intolerant of suburban and urban development. In the San Francisco Bay area, there are museum records for pallid bats from the Stanford University campus for 1895-1951, for San Francisco in 1948-1950, and for Berkeley from 1883-1945. Available data suggest this species is extirpated from all these localities. Recent surveys of the Presidio in San Francisco found no pallid bats despite the persistence of small remnant patches of suitable oak habitat (Pierson and Rainey 1995). Although there have been numerous records of bats on the UC Berkeley campus in the past 20 years, none have been pallid bats. The species does persist in the more rural eastern portions of Alameda and Contra Costa counties, and in parts of Marin County, particularly in the vicinity of Point Reyes National Seashore and in proximity to oak woodland.

P. Brown (pers. comm.) has noted precipitous declines in populations in coastal southern California since the 1970s. Yet, at that time, only one of 12 roost sites documented by Krutzsch (1948) in the 1940s was still occupied (P. Brown pers. comm.). Destruction of buildings and urban expansion likely account for observed declines in Los Angeles, Orange, and San Diego counties.

Current timber harvest practices, particularly the selective removal of hardwoods and large Ponderosa pine snags, likely pose a serious threat to pallid bat populations in forested areas. Additionally, at lower elevations, oak habitat is being lost to suburban expansion and agricultural conversion. The rapidly growing human population of the Sierra foothills is a case in point. Because pallid bats frequently roost in buildings, they often are excluded by renovations or by the
desire of property owners to be rid of them. Because their roosting sites are often highly visible (e.g., open rafters) and the animals display considerable roost loyalty, they are often targeted by pest control operators and vandals. This species is often associated with historic buildings in which their presence is typically viewed as a hazard by property managers. Pallid bats colonies could also be impacted by bridge modifications and/or replacements, inappropriate mine/cave closures, and human induced alterations of rock features (e.g., blasting of cliffs for road construction or inundation for water impoundment).

Management Recommendations: Status surveys are necessary, particularly in areas where apparent declines have occurred or where habitat conversion is most intense. More information is needed on the habitat requirements of pallid bats, particularly in forested settings. Genetic studies, using non-lethal sampling techniques, should be conducted to resolve subspecies issues.
PALLID BAT

*Antrozous pallidus*

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

- Post - 1978
- 1978 and before
- CNDDB post-1978
- CNDDB 1978 and before