

**Long-legged myotis, *Myotis volans***  
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**Description:** *Myotis volans* is a large *Myotis*, with a forearm of 37-41 mm. It can be distinguished from other large *Myotis* species by the presence of a well-developed keel on the calcar and fur on the underside of the wing membrane, extending from the body to a line between the elbow and the knee. It also has notably short, rounded, thick-rimmed ears that barely reach the nostrils when laid forward, and a short rostrum with a high forehead (Warner and Czaplewski 1984, Hoffmeister 1986). The only other California *Myotis* species with a keeled calcar (*M. californicus* and *M. ciliolabrum*) are much smaller. Other species may have some fur on the underside of the wing, but it is not as extensive as in *M. volans*. *Myotis thysanodes*, which is comparable in size, has longer ears and a fringe of hair (usually well developed) on the edge of the interfemoral membrane that is lacking in *M. volans*. *Myotis velifer*, which is also comparable in size, has a distinguishing bare spot on its back between the scapulae.

**Taxonomic Remarks:** *M. volans* is in the Family Vespertilionidae, and was first described as *Vespertilio volans* in 1866 from a type locality in Baja California (Allen 1866). Four subspecies are currently recognized (Hall 1981, Warner and Czaplewski 1984), *M. v. volans*, *M. v. amotus*, *M. v. interior*, and *M. v. longicrus*. *M. v. interior* and *M. v. longicrus* both occur in California. The type locality for *M. v. longicrus* (originally *Vespertilio longicrus* True 1886) was Puget Sound, Washington, and for *M. v. interior*, was Taos County, New Mexico. The earliest California records for *M. v. longicrus* are from Fort Reading, Shasta County (Townsend 1887) and Nicasio, Marin County (Miller 1897), and for *M. v. interior*, San Emigdio, Kern County and Owens Lake, Inyo County (Grinnell 1918).

**Distribution:** *M. volans* is widely distributed across the western third of the United States, reaching the northern limits of its range in northern British Columbia and the southern limits in central Mexico (Hall 1981, Warner and Czaplewski 1984). *M. v. amotus* is confined to central Mexico, and *M. v. volans* to Baja California. *M. v. longicrus* is distributed from northwestern British Columbia across central Alberta, across much of Washington, western Oregon and western California. *M. v. interior* is found throughout much of the western United States from north central North Dakota south to central Texas and west to California, eastern Oregon and eastern Washington. The boundary between the two subspecies in California runs from Mount Shasta to the coast just east of Santa Barbara, with *M. v. longicrus* occurring along the coast and in the coast ranges, and *M. v. interior* east of the Central Valley and to the coast from Ventura County south. Since there are no known ecological differences between the two subspecies, they are treated as a single unit in this document.

In California, *M. volans* occurs in a variety of habitats throughout most of the state, and has been found from the coast, to high elevation in the Sierra Nevada and White Mountains. Records are absent for the low desert areas of southeastern California, but occur in the mountains of the Mojave Desert, central San Diego County, the Coast Range, and the transverse ranges between the Los Angeles basin and the Central Valley. A notable percentage of the records (from California and elsewhere in the range) are from relatively high elevations.

**Life History:** Like all North American vespertilionids, *M. volans* mate in the fall and/or winter. The females store sperm over winter, and ovulate in the spring. They generally give birth to a single young in the late spring or early summer, although considerable variation has been noted in time of birth across the species' range, with pregnant females being found from mid-April until mid-August (Warner and Czaplewski 1984). In California, Dalquest and Ramage (1946) noted that all females

collected from a maternity colony in Kern County on June 4 had near term fetuses. In northern California, lactating females have been captured in Monterey County in early July (unpubl. data), in Sonoma County in mid-July (D. Constantine pers. comm.), and along the upper Sacramento River from mid-July through mid-August. Post-lactating females have been captured at the Sacramento River localities as early as mid-July (Rainey and Pierson 1996). This species is described by Barbour and Davis (1969) as forming large maternity colonies of several hundred females.

*M. volans* feeds primarily on moths (Lepidoptera), although it has also been documented eating a variety of soft-bodied invertebrates and small beetles (Warner and Czaplewski 1984). It is known to feed on spruce budworm moths in southern Oregon (M. Perkins pers. comm.).

**Habitat:** This species is found primarily in coniferous montane forests, and is likely the most forest-dependent of any of the California *Myotis* species. Although it occurs from sea level to 3,200 m, it is usually found between 2,000 and 3,000 m. In southern Oregon it is found primarily in the Ponderosa pine habitat (Cross et al. 1976), and in Colorado is the most common species in high elevation spruce-fir forests (K. Navo pers. comm.). It was the second most common bat found in high elevation evergreen forests in the Mogollon Mountains of New Mexico and Arizona (Jones 1965), and at 2,600 m in western New Mexico (Jones and Suttkus 1972). In California, we (E. Pierson and W. Rainey) have found it in the high desert (e.g., Providence Mountains), in redwood forest along the central coast, in giant sequoia forest in the Sierra Nevada, in mixed conifer forest in the upper Sacramento River drainage, and at lower elevations in the Sierra Nevada (the higher elevations have not been surveyed). In recent surveys in the White Mountains *M. volans* was captured at Owens Lake, and was the most abundant species in summer net captures at 2,700 m (Szewczak et al. In Press, Szewczak unpubl. data). P. Brown (pers. comm.) reported netting pregnant females around Owens Lake in April and May, but captured none during the summer months. Since there are museum records for the summer months from elevations higher than Lone Pine, this species probably migrates altitudinally.

Although this species has been found roosting in abandoned buildings, mines, and rock crevices (Barbour and Davis 1969, Warner and Czaplewski 1984), recent research suggests it roosts primarily in trees, particularly large diameter conifer snags, or live trees with lightning scars. Colonies of up to 200 have been found in live and dead ponderosa pine in New Mexico (Chung-MacCoubrey 1996). Radio-tagged females have also been found in ponderosa pine snags in South Dakota (Cryan 1996), and in large snags and hollow incense cedar trees in the Central Oregon Cascades (Ormsbee 1996). Ormsbee (1996) found that females used multiple day roosts within a single area. Along the upper Sacramento River in California, a post-lactating female *M. volans* was radiotracked to a large diameter conifer snag (Rainey and Pierson 1996).

Barbour and Davis (1969) described *M. volans* as foraging 10-15 ft (3-5.4 m) over water and in openings in the forest. Fenton and Bell (1979) found that in wooded areas *M. volans* foraged along the forest edge, primarily above the canopy, and was never observed gleaning. In recent light-tagging studies, Saunders and Barclay (1992) observed *M. volans* foraging high above the ground, in open areas and high along cliff walls. A single individual radio-tagged in the Upper Sacramento River drainage appeared to forage above the canopy along the river and tributary stream corridors (Rainey and Pierson 1996).

**Status:** Class II. There are relatively few records for *M. volans* in California. In museum collections, there are series of reproductive females from only five localities, all pre-dating 1955. In June 1945, Old Fort Tejon in Kern County had a maternity colony of approximately 500 females which is now gone (Dalquest and Ramage 1946). In July 1954, D. Constantine (pers. comm.) collected

approximately 40 animals, including 16 mature females from a colony of >100 in Sonoma County. He returned to this site in September 1968 and found approximately 25 *M. volans* in another structure at the site. The original building in which the bats were found has been renovated and whether *M. volans* still occurs in this area is unknown. Seventy two specimens were collected in Nicasio, Marin County in the late 1800s (Miller 1897). The original site and current status of that colony are unknown, although extensive netting at Point Reyes National Seashore in recent years has yielded only a single male *M. volans* (G. Fellers pers. comm.). Individual reproductive females have been identified at a number of localities, including the Laguna Mountains in southern San Diego County (Miner et al. 1996), but no maternity roosts for this species have been located in the past 40 years. P. Brown (pers. comm.) found a group of pregnant females in a building at Coso Hot Springs in Inyo County in April of 1980 and 1984, but the animals departed prior to parturition. This site has not been visited recently.

Although this species is reported to be currently common at high elevations in the Rocky Mountains (K. Navo pers. comm.), was known to be common 25-30 years ago at higher elevations in Arizona and New Mexico (Jones 1965, Jones and Suttkus 1972), and has been found at some of high elevation sites in California (e.g., in the White Mountains and Mount Whitney in the Sierra Nevada), its current status in California is largely unknown. Most of the higher elevation areas of California have never been surveyed for any bat species.

The most serious threat to *M. volans* populations is likely to be timber harvest practices which favor selective removal of large diameter trees and have inadequate snag retention/snag recruitment guidelines. State forestry regulations in particular are inadequate (see California Forest Practice Rules 919.1, 939.1, 959.1) in that they make special allowances for the removal of merchantable snags and snags within 100 ft (30 m) of ridge tops. Recent research on tree roosting habits of many bat species suggests the bats generally select early stage (i.e., merchantable) snags, and often selectively seek roosts near ridge tops that offer maximum solar exposure (e.g., Barclay and Brigham 1996).

Another potentially serious risk to *M. volans* and other forest species is aerial spraying of pesticides. Henny et al. (1982) showed that the carcasses of *M. volans* and four other bat species showed post-spraying residues of DDT metabolites following a single DDT spray application for the Douglas fir tussock moth (*Orgyia pseudotsugata*) in northeastern Oregon, eastern Washington and northern Idaho in 1974. These residues were still detectable in tissue three years post-spray. Although the impact on bat populations (e.g., survivorship or reproductive success) were not assessed in this study, other studies have related bat population declines to application of pesticides (e.g., Geluso et al. 1976, Clark et al. 1978). While pesticides in use today are less persistent, their effects on bats have not been investigated. Short-term neurotoxic insecticides could be lethal or impair maneuverability, leading to reduced foraging efficiency and increased vulnerability to predators. Lepidopteran-specific agents like *Bacillus thuringiensis* result in significant, if short-term, reduction in the prey base for lepidopteran specialists like *M. volans* (Sample et al. 1993).

**Management Recommendations:** What is most urgently needed is research exploring the breeding range of this species, both latitudinally and altitudinally in California, with a focus on the higher elevations of the Sierra Nevada, White Mountains, and northern Coast Range. Additionally, radiotracking studies are needed to identify roost sites and foraging areas. Since limited available data suggest an association with late successional forest, research should focus especially on areas subjected to timber harvest. Ormsbee (1996) recommended management or protection of a 240 m buffer zone around more permanent tree roosts for *M. volans*. Whether this would be appropriate for *M. volans* in California forests needs to be assessed. An additional unresolved issue is the location

of winter range or refugia.

DRAFT

## LONG-LEGGED MYOTIS

*Myotis volans*



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

- Post - 1978
- 1978 and before

No CNDDDB Data