

# Bat Echolocation Survey Hassayampa River Preserve Palm Lake 2021

Prepared May 2022 for Hassayampa River Preserve Maricopa County Regional Park Matt Haberkorn

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## Introduction

Previous bat echolocation surveys at the Hassayampa River preserve have found a total of 17 species of bats with the greatest number and diversity of bats present at Palm Lake located on the preserve ([2019-21 survey](#), [2020 survey](#), [2021 habitat analysis](#)). In order to more thoroughly survey bat species and their seasonal use of the preserve, Palm Lake was surveyed with a passive echolocation recorder for 305 days between December 2020 and December 2021. It was the goal of this study to identify additional bat species that previous surveys missed, as well as obtain an abundance of echolocation recordings over the course of the year to identify seasonal use of Palm Lake by bats.

## Habitat

The preserve is located near Wickenburg, AZ in a perennial riparian habitat in the Upper Sonoran Desert. This habitat is one of the larger intact riparian areas in the Sonoran Desert with major plant communities being composed of *Populus fremontii*, *Salix gooddingii*, and *Prosopis velutina*. The surrounding Sonoran Desert Uplands are rocky and semi-mountainous with *Carnegie gigantea*, *Ambrosia deltoidea*, *Encelia farinosa*, and *Parkinsonia microphylla* plant associations. Development in the area has to this point been minimal. Palm Lake, the site of the passive echolocation survey, is a small groundwater fed lake containing open water and area covered by Southern cattail (*Typha domingensis*). The lake is surrounded by a dense forest of *Populus fremontii*, *Salix gooddingii*, and *Prosopis velutina*.

## Data collection

The ultrasonic recorder was placed in the southeastern side of the lake attached to a cottonwood tree four meters above the ground and approximately 5 meters away from open water (GPS coordinates 33.9319292,-112.6921727). The Wildlife Acoustics Songmeter Mini Bat Ultrasonic Recorder used was set to record nightly from sunset to sunrise. All recordings were analyzed with Wildlife Acoustics Kaleidoscope Pro software to identify each call to the species level. All species were then verified manually but not all individual calls were verified to species manually. For this reason, numbers in this survey should be viewed as an estimate. Three species, *Myotis evotis*, *Myotis occultus*, and *Myotis thysanodes* were identified by Kaleidoscope Pro but could not be verified manually.

## **Bats at Palm Lake**

A total of 18 species of bats were detected in 2021 (refer to table 1 below). Mexican free-tailed (TADBRA) and canyon bats (PARHES) were the most common species composing between 12 and 13 percent of all detections each. Western small-footed myotis (MYOCIL), big brown bat (EPTFUS), and Yuma myotis (MYOYUM) were the next most abundant species composing approximately 9, 8, and 5 percent of total detections respectively. All other species detected were below 4 percent of total detections.

Species richness peaked between April and mid-September, with the months of April and September being slightly higher than the months in between (refer to figure 1 below). The slightly higher species richness peak in spring and fall possibly was a result of spring and fall migrations. Species richness then decreased from the peak in September until December, then stabilized somewhat until February. From the low in February, species richness increased until April. Total detections peaked in June through July, likely when bats born in the previous months or so, fledged from the maternity roost. Another smaller peak occurred in September, possibly a result of fall migration. Total bat detections then decreased until December when it stabilized at the lowest levels of the year. Total detections began to increase in February and March until the sharp increase seen in June mentioned above. Of the 305 days monitored in 2021, bats were detected in all but one of the days, which occurred in December.

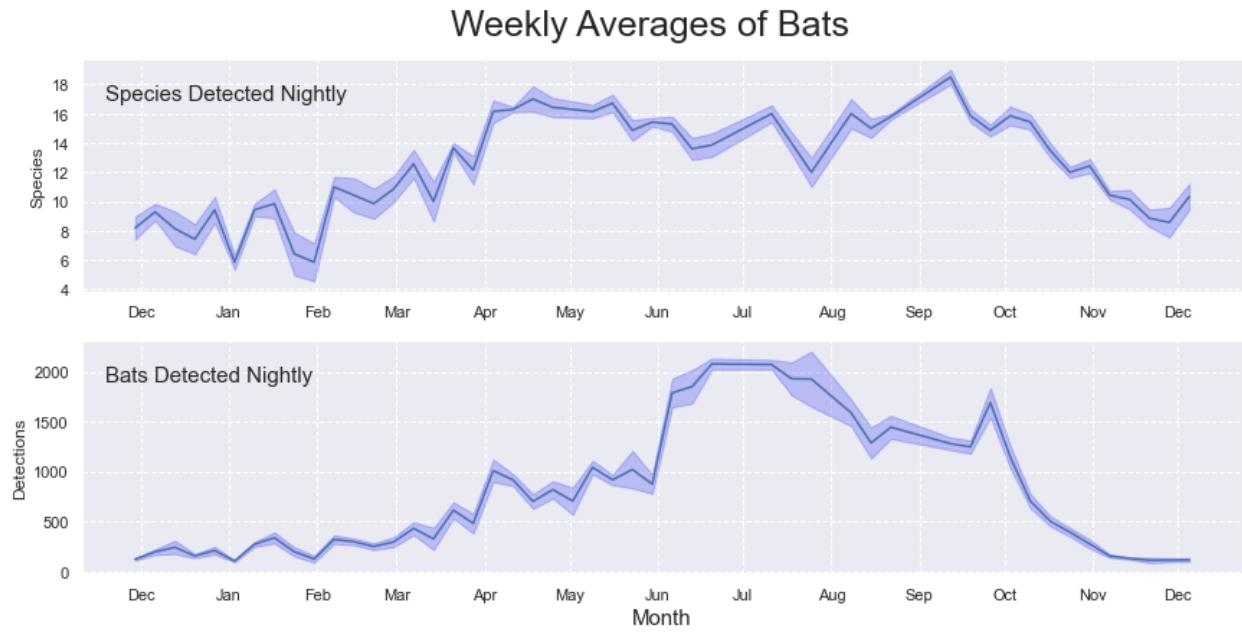
Different bat species had different patterns of seasonal use of Palm Lake. The majority of species had the highest levels of detections during the summer (ANTPAL, EPTFUS, MYOVOL, TADBRA, PARHES, EUMUND, MYOCAL, MYOYUM). Only one species (LASCIN) had a peak only in spring. Three had bimodal peaks during the year, often one in spring and one in fall (MYOCIL, LASBLO, NYCFEM). Two species had peaks only in the fall (LASXAN, MYCMAC). Other species did not necessarily have a discernible peak period of detection. While these peaks appear significant, it is not known if they simply happen by chance. See figures 2, 3, and 4 below for individual species detections over the course of 2021.

## **Conclusion**

Palm Lake was found to be an extremely important habitat year round for bats in the region of the Hassayampa River preserve. A total of 18 species utilized it during the course of 2021. One species detected in this study, the California leaf-nosed bat (MACCAL), had not been detected in previous echolocation surveys on the preserve. Previous echolocation surveys several hundred meters away from the lake have detected similar patterns of bat activity. However, these studies had very little to no bat activity during the winter months, while the lake was determined to have some level of bat activity in all but one night during the winter. The lake also was found to have an important role in both spring and fall migration as well as with the fledging of bats born during the spring and summer. Additional bat survey work may focus on specific roosting habitat present on the preserve as well as in the surrounding desert habitat, such as abandoned mines.

**To view GitHub repository for raw data, presentation, and Python code:**

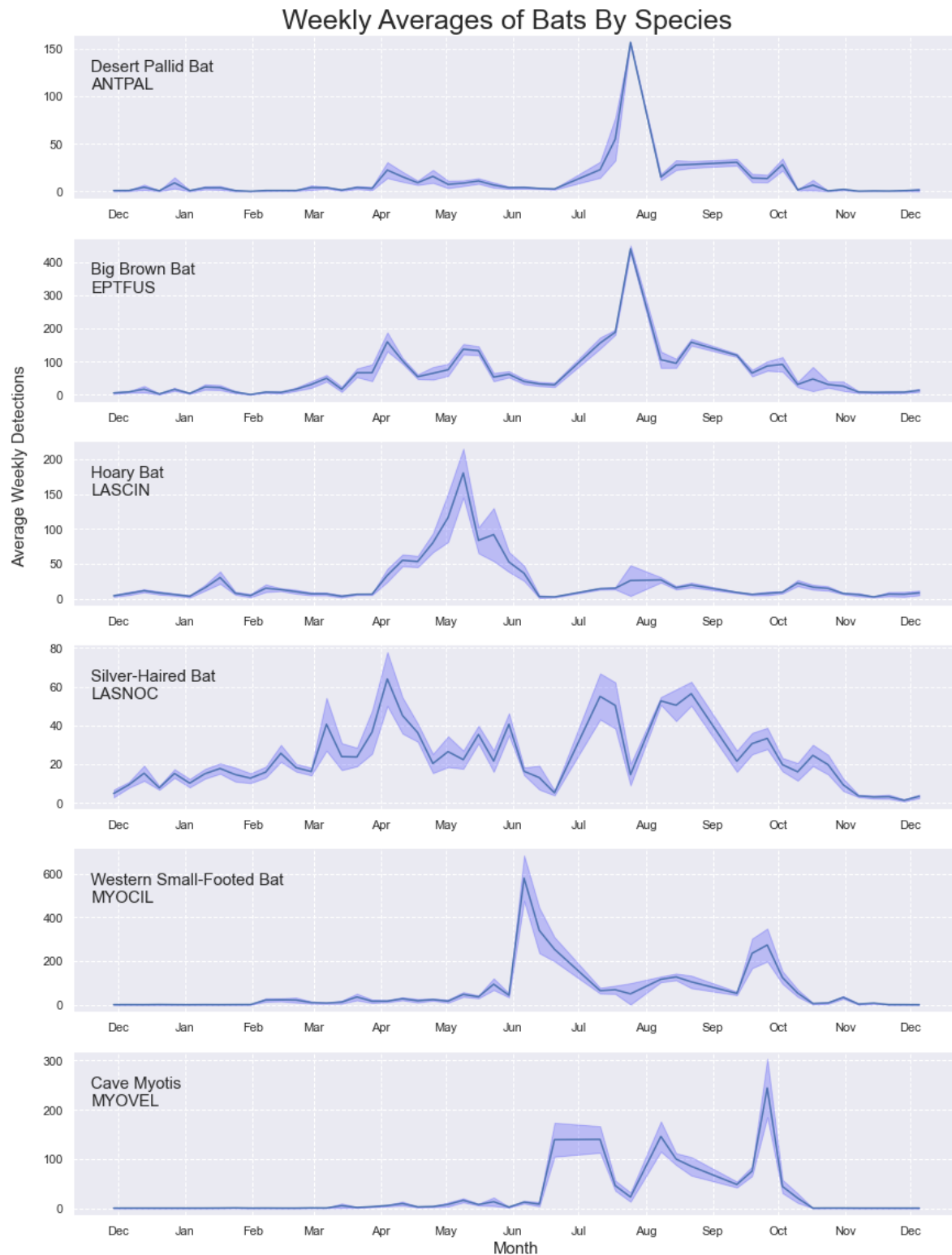
<https://github.com/haberkornm/Hassayampa-Palm-Lake-Bats>



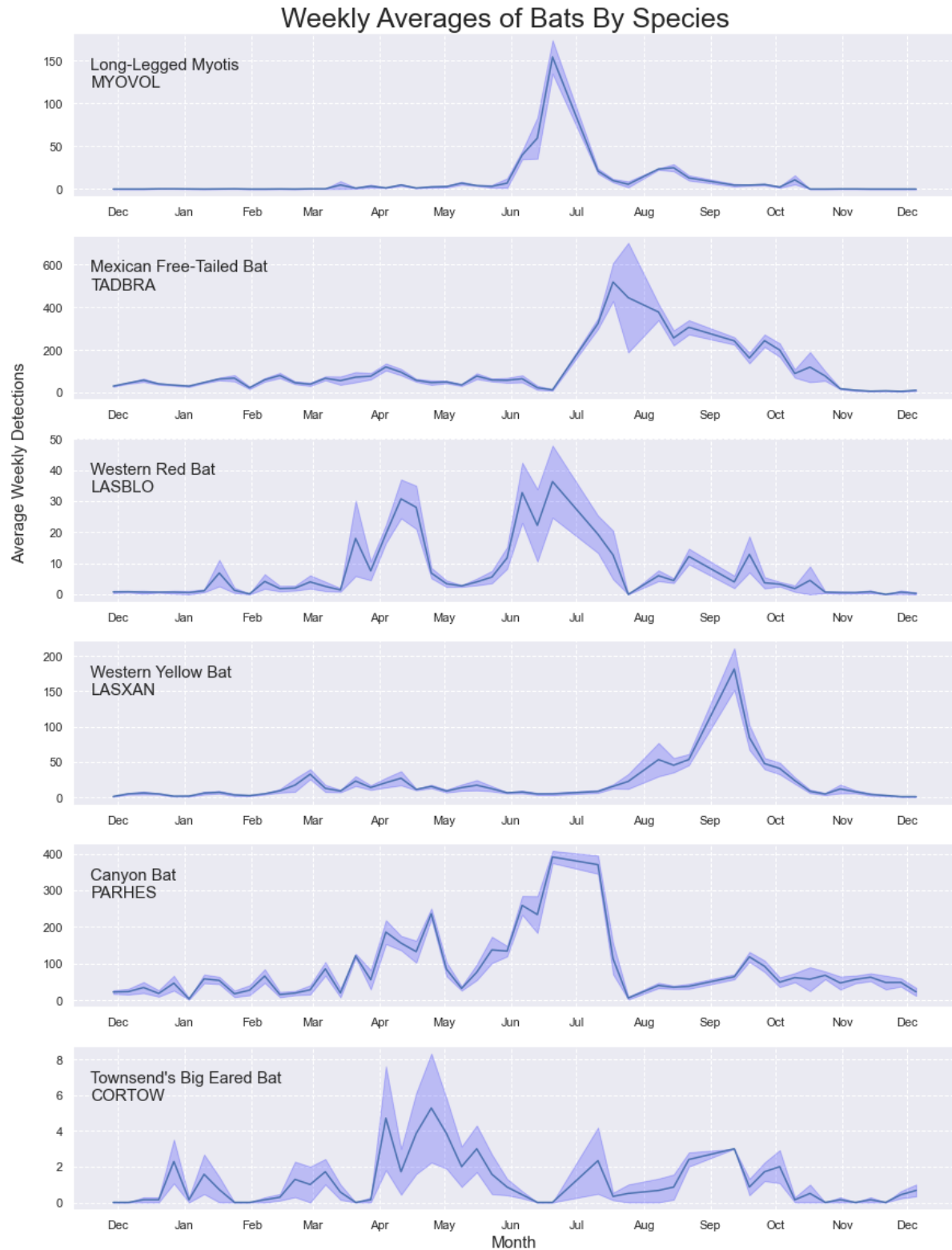
**Figure 1.** Weekly averages of species detected nightly and total bat detectioned nightly. Light blue bands are standard error bands.

**Table 1.** Number of detections by species, percent of total detections, and percentage of nights detected.

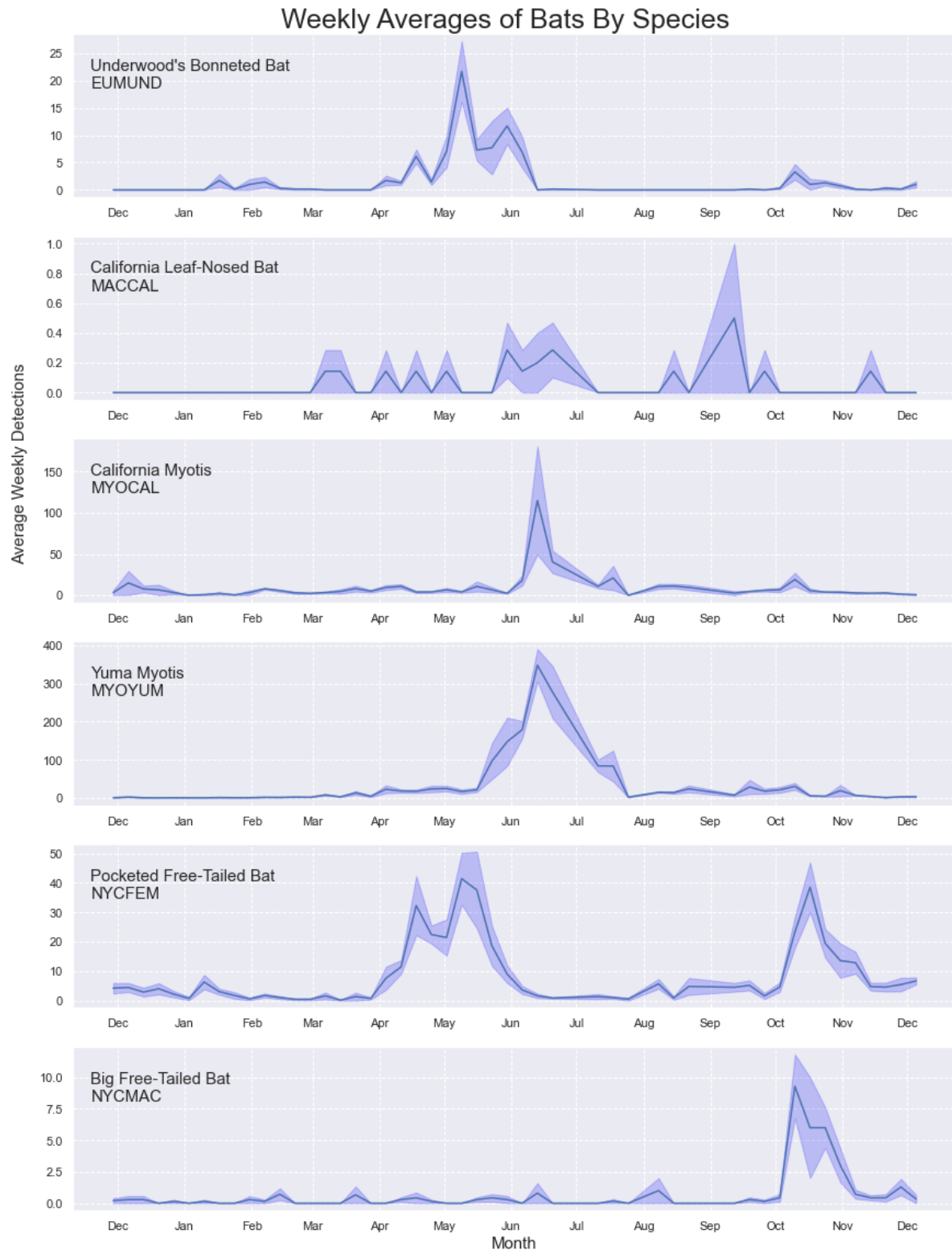
<b>Species</b>	<b>Total detections</b>	<b>% of total detections</b>	<b>% of nights detected</b>
<b>Total bats detected</b>	212455.0	100.00	99.67
<b>No ID</b>	74991.0	35.30	99.67
<b>Mexican free-tailed (TADBRA)</b>	27023.0	12.72	99.34
<b>Canyon (PARHES)</b>	25704.0	12.10	93.44
<b>Western small-footed myotis (MYOCIL)</b>	18510.0	8.71	73.11
<b>Big brown (EPTFUS)</b>	16026.0	7.54	91.15
<b>Yuma myotis (MYOYUM)</b>	9866.0	4.64	75.41
<b>Hoary (LASCIN)</b>	7821.0	3.68	97.38
<b>Silver-haired (LASNOC)</b>	6921.0	3.26	97.05
<b>Cave myotis (MYOVEL)</b>	6707.0	3.16	49.18
<b>Western yellow (LASXAN)</b>	4973.0	2.34	93.44
<b>Desert pallid (ANTPAL)</b>	2633.0	1.24	66.89
<b>California myotis (MYOCAL)</b>	2618.0	1.23	76.07
<b>Long-legged myotis (MYOVOL)</b>	2572.0	1.21	48.85
<b>Pocketed free-tailed (NYCFEM)</b>	2528.0	1.19	70.82
<b>Western red (LASBLO)</b>	2133.0	1.00	70.16
<b>Underwood's mastiff (EUMUND)</b>	594.0	0.28	27.87
<b>Townsend's big-eared (CORTOW)</b>	339.0	0.16	32.46
<b>Big free-tailed (NYCMAC)</b>	205.0	0.10	19.02
<b>California leaf-nosed (MACCAL)</b>	15.0	0.01	4.92



**Figure 2.** Weekly averages of individual species detected nightly. Light blue bands are standard error bands.



**Figure 3.** Weekly averages of individual species detected nightly. Light blue bands are standard error bands.



**Figure 4.** Weekly averages of individual species detected nightly. Light blue bands are standard error bands.