

Use of an artificial roost site by multiple bat species in Texas

Abi Welch (abi.welch@tcu.edu) & Dr. Victoria J. Bennett (v.bennett@tcu.edu)

Texas Christian University, Fort Worth, TX, USA



Introduction

- ❖ The use of roost sites by multiple bat species is well-documented, especially in large structures where different species are partitioned by distinct microclimates within these structures; however, there is limited research on smaller roost sites including artificial bat houses.
- ❖ With bat houses being recommended as way to improve urban areas for bats or mitigate for roosts that are lost during construction projects, understanding species-specific roost use is imperative to ensure these conservation strategies are effective.
- ❖ To address this need, we compared the temporal and spatial use of an artificial roost site by bats in a residential neighborhood in Fort Worth, Texas from 2017 to 2024.
- ❖ We monitored roost occupancy and species composition both annually and weekly to determine whether use varied depending on the year and season.
- ❖ This study aims to increase our understanding artificial roost use by bats and therefore contributes to their conservation.



Figure 1: A Mexican free-tailed bat in an artificial roost.

Methods

Study Site

- ❖ As part of surveys, undertaken by TCU since 2015, evening bats (*Nycticeius humeralis*) have been caught at an artificial bat roost (Figs. 1 & 2).
- ❖ In 2021, we also caught 3 Mexican free-tailed bat (*Tadarida brasiliensis*). This number increased to 15 in 2023.



Figure 2: Artificial bat roost comprised of two 3-chambered bat wooden bat houses on a pole in a neighborhood in Ridglea Hills, Fort Worth, TX.



Figure 3: View of bat roost in residential backyard.

Roost Occupancy Monitoring

- ❖ To determine when Mexican free-tails started using the roost and if they are displacing the evening bats, we analyzed any available pictures of the bats in the artificial bat roost taken by the owners John and Deborah Zihlman using a JZBrain InfraRed camera from 2017 to 2022.
- ❖ In 2023, we asked the Zihlman if they could take pictures of the bats in their roost every 1-2 weeks for a year to determine how seasonal use in the abundance of these species varied (Fig. 9).
- ❖ More specifically, we addressed whether these species displayed year-around communal roosting or species-specific roost partitioning.

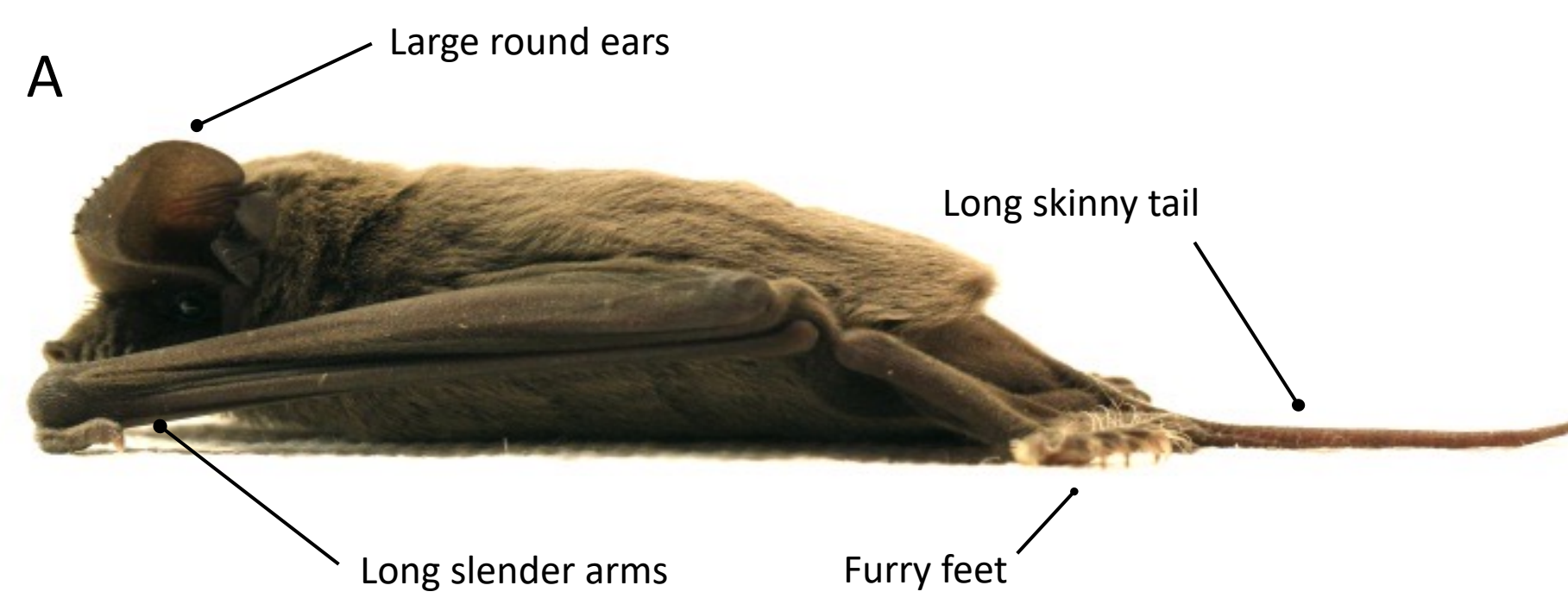
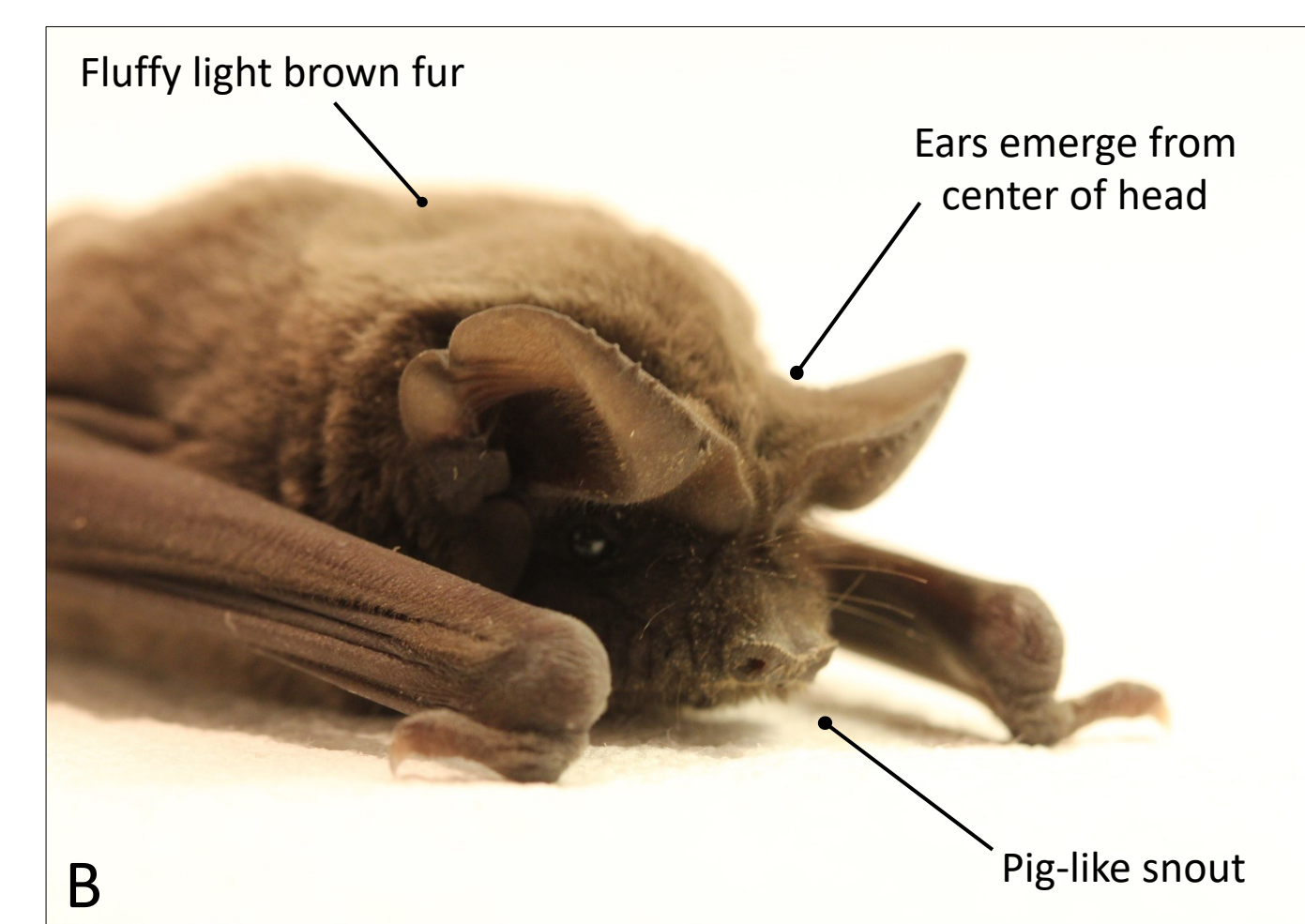
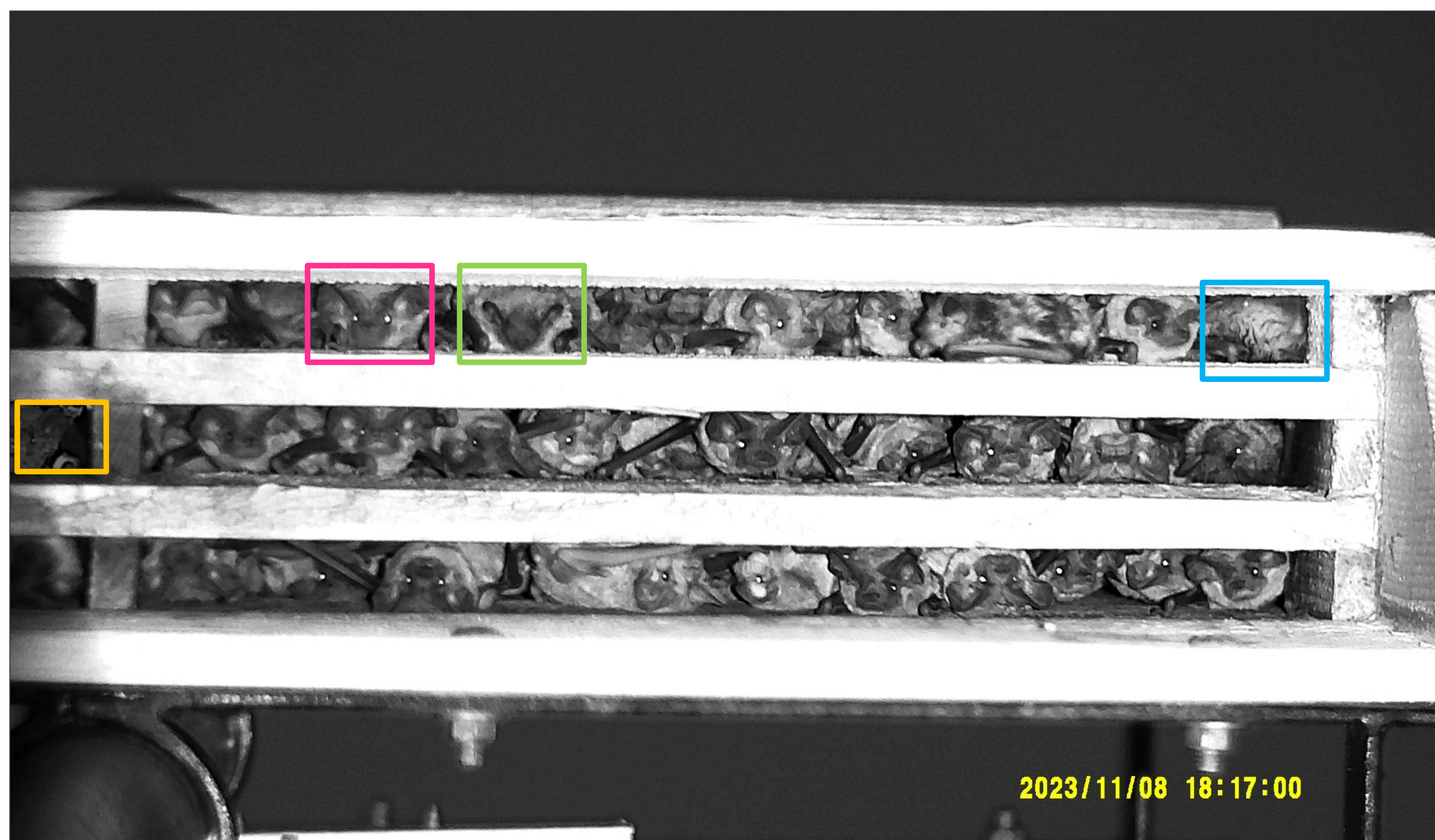


Figure 4: Mexican free-tailed bat – A) Profile showing and B) facial view showing



Data Processing and Analysis

- ❖ For each photo, we counted and identified the bats present to species.
- ❖ To identify the bats, we used distinct morphological features (see Figs 4-6).



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Figure 5: Front angled view of an evening bat

Figure 6: Bat identification key. Pink: Mexican free-tailed bat. Green: Evening bat. Blue: Unidentifiable bat. Orange: Tagged evening bat.

Results

The roost was photographed on **79 nights** from **3 November 2017 to 9 April 2024**.

- ❖ From 2017 to 2024, we found that the average number of bats recorded in the roost **remained constant from year to year** (Fig. 7; $r^2 = 0.02$), suggesting that population size is limited by space.
- ❖ In contrast, we recorded an **increase in Mexican free-tailed bats and a decrease in evening bats** (Fig. 8; $F = 5.81$, $df = 1$, $p < 0.05$)

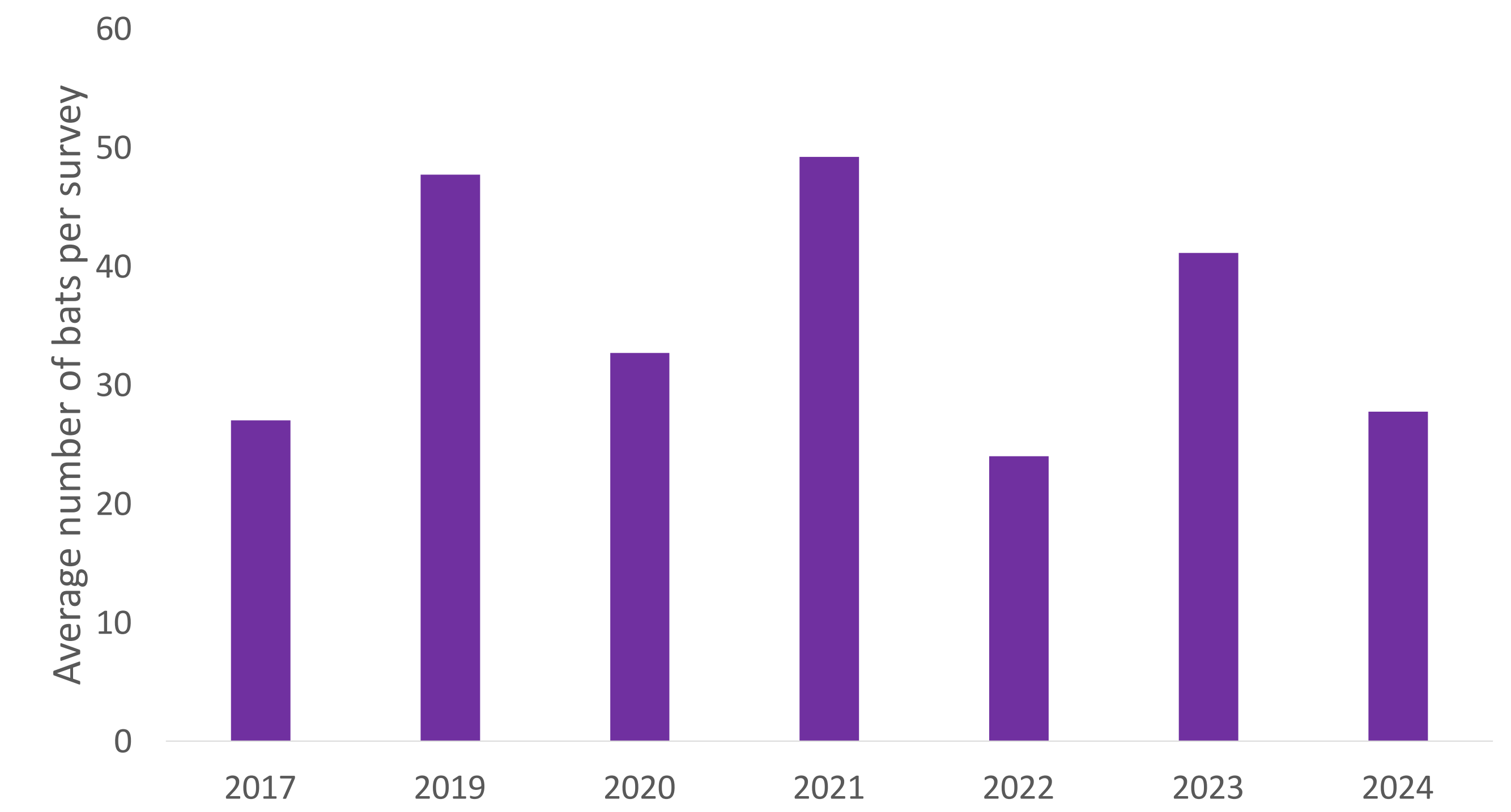


Figure 7: Average number of bats identified per year.

- ❖ We observed **no seasonal differences** in species use over the primary bat activity season (March to September), although evening bats we recorded predominantly during the winter months (Fig. 9; $F = 3.15$, $df = 1$, $p > 0.05$). – confirming Mexican free-tailed bats migrate, while evening bats remain in the area.

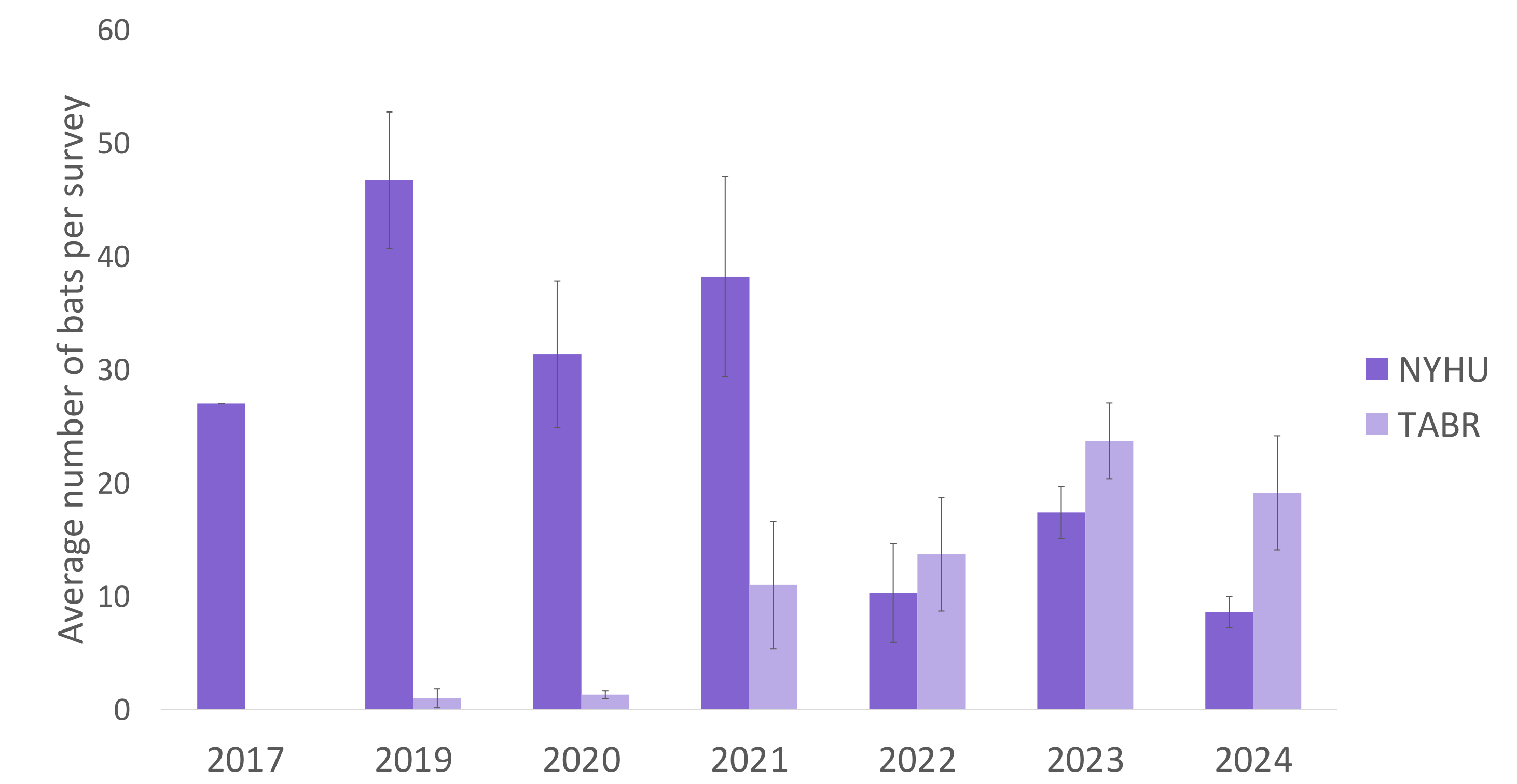


Figure 8: Average number of bats identified per year by species.

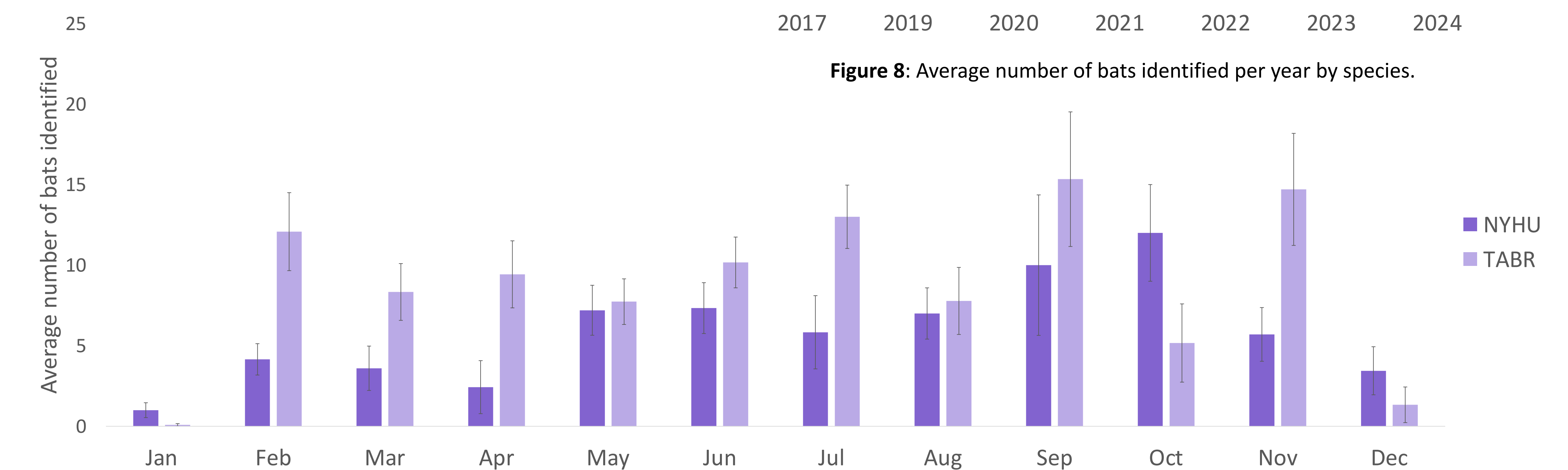


Figure 9: Average number of bats identified per weekly survey from January 2023 to April 2024.

Conclusions

- ❖ This study represents the first to demonstrate **multispecies use of roost site**, natural or artificial, by evening and Mexican free-tailed bats.
- ❖ We can confirm that **Mexican free-tailed bats are displacing evening bats**, although we are yet to see if they displace them completely. The current data suggests that both populations appear stable.
- ❖ In contrast, we confirm that increases in numbers of either species coincides with females returning to the roost to give birth and the first flight of young.
- ❖ The findings have implications for **understanding artificial roost use and interspecies competition** and therefore contributes to bat conservation.

References

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