

Cave and mine use by tree-roosting bats

Caitlin J. Campbell and Hannah B. Vander Zanden
Department of Biology, University of Florida, Gainesville FL USA

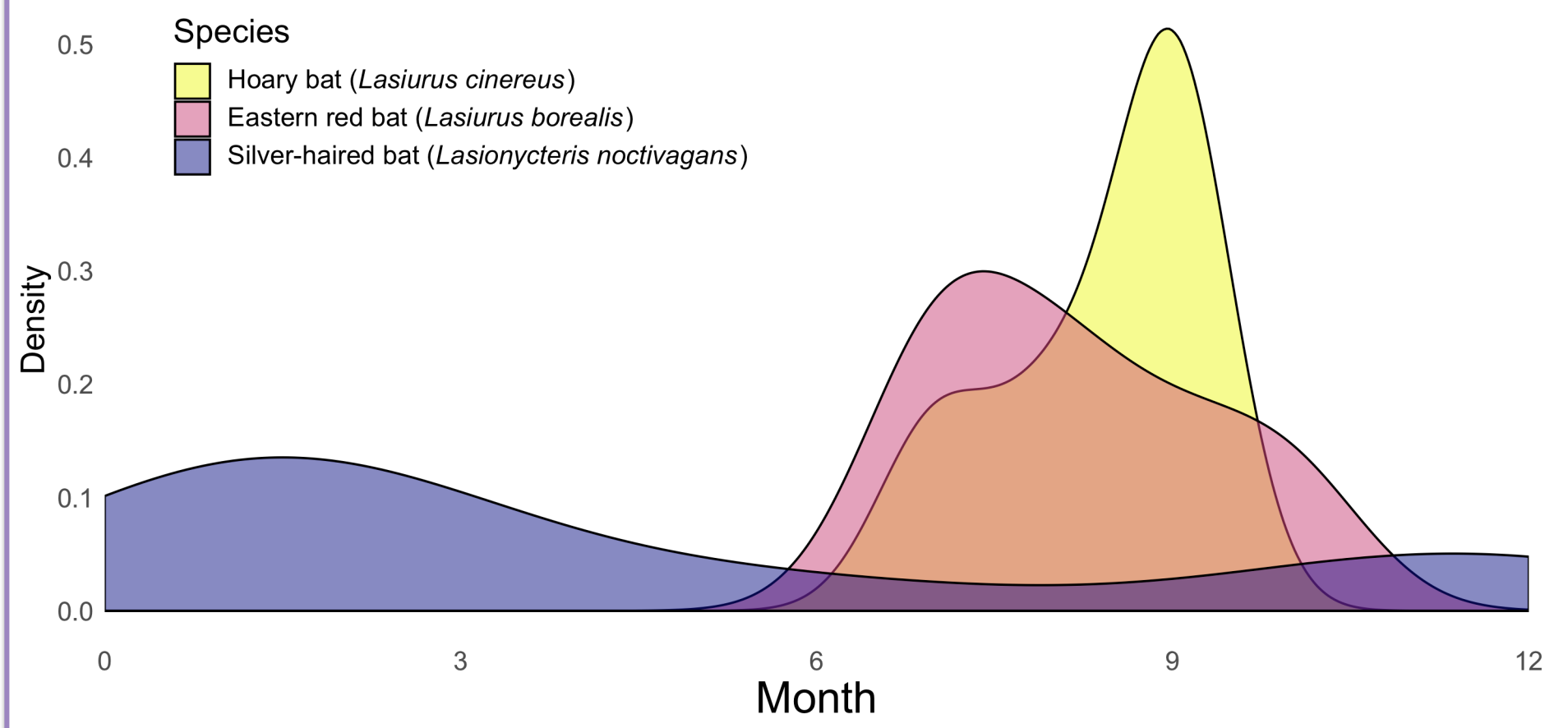
Tree bats aren't always in trees

- The roosting and general habitat preferences of migratory North American "tree-roosting" bats are poorly-understood.
- We conducted a review of records of these bats found within caves and mines, habitats they aren't commonly thought to use.
- Tree-roosting bats are infrequently but regularly observed using cave and mine habitats:
 - Lasiurus* primarily in the fall (during mating and migration season)
 - Lasionycteris* primarily while overwintering.

What does it mean?

- Lasiurus* may enter caves and mines during fall swarm / migration
 - Accidental entry or deliberate (though rare) habitat use?
- Lasionycteris* uses caves and mines to overwinter
 - Important, understudied habitat use
- Implications for these species as potential vectors of White-nose syndrome (WNS)

Densities of observations of living individuals found in caves or mines over the course of a year



Where did we find records?

- Google Scholar** In the literature
 - By search term and citation. All records cite primary sources.
- George A. Smathers Libraries**
- GBIF** Museum databases
 - Parsed matches with "cave", "mine", "grotto", "quarry", or "grotte" (French)
- iNaturalist** Community-science platform
 - We parsed through all photos of each species on iNaturalist.org

Send us your records!

caitlincampbell@ufl.edu
@BatsOnTheMove
cjcampbell

Records of cave and mine use

Species

- Hoary bat (*Lasiurus cinereus*)
- Eastern red bat (*Lasiurus borealis*)
- Silver-haired bat (*Lasionycteris noctivagans*)

Observation type

- Alive (diamond symbol)
- Dead (circle symbol)

USGS Karst areas

These species are of growing conservation concern, as they comprise ≥75% of bats killed at wind-energy facilities. Thus, understanding habitat use and preferences is a research priority. Arnett and Baerwald, 2013; Frick et al., 2017; Kunz et al., 2007



"An active individual found in a mine adit in the southern Okanogan Valley on 26 January"
Nagorsen, David W., et al. 1999

"During the winter of 1950 a mummy of a hoary bat (*Lasiurus cinereus*) was found on the floor of a man-made cave at St. Paul, Minnesota... It is probable that the bat had died during the latter part of the preceding summer. The location of the bat suggested that it had died hanging to the ceiling of the cave..."
Beer 1954

"In the large room of the Shawnee Cave more than two hundred skulls of *L. borealis* [eastern red bat] and two of *L. cinereus* [hoary bat] were found scattered among the rocks on the floor... The skulls, accompanied by other bones, were scattered among the rocks in a manner indicating that the animals had probably died where they hung suspended from the roof of the cave and that they had not reached the place by accident nor been killed all at one time by a single catastrophe."
Hahn 1908

An iNaturalist observation of an eastern red bat in a cave used for commercial tours prompted interest in this project. The bat was observed seemingly alive in August 2019.
<https://www.inaturalist.org/observations/30965198>



The earliest records in this dataset is a reference to specimens taken prior to the 1900's: "[Eastern red bat] specimens have been obtained from a cave near Albany, N.Y., by G. J. Green, and the collection of the Museum of Comparative Zoology contains a specimen... which was secured in Short Cave, Kentucky."
Allen 1893

"On 5 occasions from 2004 to 2008, during fieldwork by biologists with the Colorado Bats/Inactive Mines Project, silver-haired bats were found that were associated with abandoned mines in southwestern Colorado."
Bonewell et al. 2017

Prior to reclassification, two early records of "*Lasiurus borealis*" (eastern red bat) fell well outside their current geographic range. This suggests that the western red bat (*Lasiurus blossevillei*) may also incidentally enter caves and mines.
Hardy 1941; Bailey 1928

We found a diversity of records of torpid silver-haired bats overwintering in the Appalachians and mid-Atlantic regions, e.g.: A West Virginia Cave Record for the Silver-Haired Bat
On April 12, 1952, a Silver-haired bat, *Lasionycteris noctivagans*, was found in Greenville Sulfur Cave, Greenville, Monroe County, West Virginia, by Christy A. Weiland, Jr., while he was collecting bats for banding. The animal was an adult male and was hanging by itself approximately 1000 feet from the cave entrance and was brought to me by Weiland. The specimen was sent alive to W. Gene Frum and is now No. 1848 in his collection. Nearby were found *Pipistrellus s. subflavus* and the only colonies of *Myotis l. lucifugus* and *Myotis sodalis* which were seen in the cave. The Silver-haired bat is one of the so-called tree bats and it is unusual to find it in a cave.
WAYNE H. DAVIS, 307 Duquesne Ave., Morgantown, W. Va.
Davis 1952

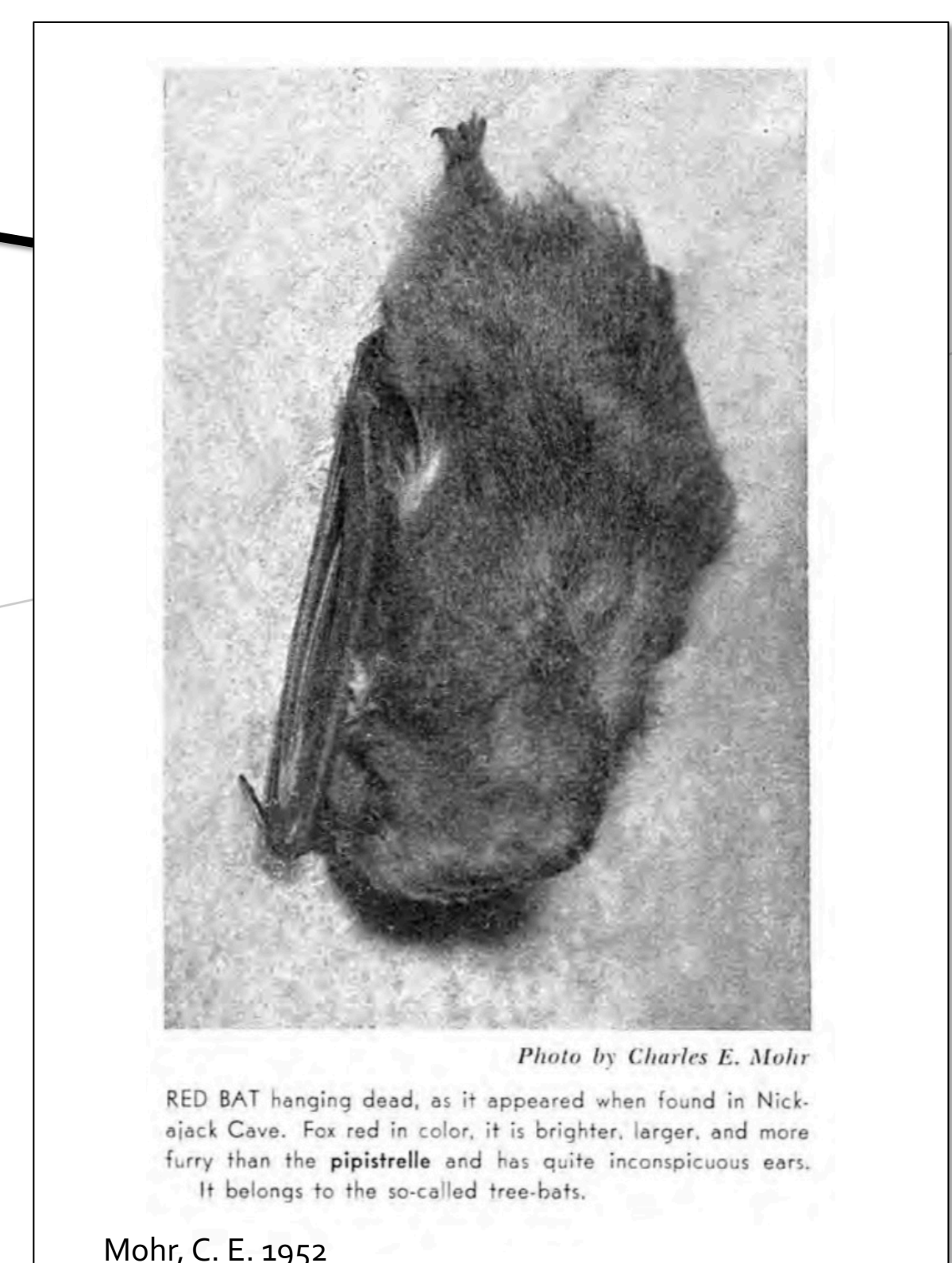


Photo by Charles E. Mohr
RED BAT hanging dead, as it appeared when found in Nickel Cave. Fox red in color, it is brighter, larger, and more furry than the pipistrelle and has quite inconspicuous ears. It belongs to the so-called tree bats.
Mohr, C. E. 1952

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All records of living hoary bats in caves and mines came from one source, a survey of lasiurines in Missouri caves:

TABLE 1.—Total number of lasiurine bats from Missouri caves, 1954-1958

DATE	CAVE	COUNTY	NUMBER OF BATS COLLECTED		ZONE IN CAVE
			<i>L. borealis</i>	<i>L. cinereus</i>	
July 1954	Tunnel	Pulaski	3 ♂, 8 alive		by entrance
July 1954	Bat	Pulaski	40 alive/fresh dead	2 ♂, 8 alive	far inside
Sept. 1954	Spring	Pulaski	60 skulls/sknl.	5 skulls/sknl.	far inside
Oct. 1954	Bruce	Pulaski	3 skulls		far inside
Oct. 1954	Piquet	Pulaski	77 alive/fresh dead	1 ♂, dead	far inside
to present			190 skulls/sknl.	8 skulls/sknl.	
Feb. 1955	Freeman	Pulaski	1 mummified		by entrance
Aug. 1955	Inca	Pulaski	142 alive/fresh dead	3 ♂, 1 ♀	far inside
to present			1,100 skulls/sknl.	alive, 2 skulls	
April 1957	Joel	Camden	1 skull		far inside
Oct. 1957	Carroll	Camden	1 skull		far inside
Oct. 1957	Hunter's	Boone	1 mummified		by entrance
Nov. 1957	Unnamed	Boone	1 skull		far inside
April 1958	Powder Mill	Shannon	5 skulls	1 skull	far inside
Aug. 1958	Bat	Laclede	1 skeleton		far inside

Myers, R. F. 1960.

We found several records from northern Arkansas: Two living eastern reds in Stone and Independence Co.'s, and the remains of all three species found in caves including Blanchard Springs Cavern and Rowland Cave.
Grove 1974; Saughey et al. 1978, 1998; Lanier et al. 2019 (museum record)