

TRADITIONAL ECOLOGICAL KNOWLEDGE AND CITIZEN SCIENCE YIELD NEW INSIGHTS ON THE LITTLE BROWN BAT (MYOTIS LUCIFUGUS) IN ALASKA

Introduction

The current lack of information of the little brown bat (*M. lucifugus*) in Alaska represents a serious impediment to its conservation with respect to understanding and managing the consequences of White Nose Syndrome (WNS), wind energy development, and other potential threats.

Six species of bat are known to occur in Alaska. Five species are restricted to Southeast Alaska (Figure 1). The little brown bat is the most common and widely distributed bat species in Alaska (Figure 2) Although the range of the little brown bat has been broadly described, the locations of roosts, maternity colonies, and hibernacula remain almost entirely unknown.

In 2004 we developed the ABMP, a Citizen Science and Traditional Ecological Knowledge (TEK) approach for collecting baseline information on the little brown bat that would be prohibitively expensive to acquire using more customary methods. The goals of the ABMP are to fill in the gaps on the distribution, habitat associations, life history, and ecology of this species in Alaska to be used as the basis for more intensive, directed research efforts.



Keens Bat



Yuma Bat



California Bat

Figure 1. Five species of bats are restricted to Southeast Alaska: Keens Bat (Myotis keenii);

California Bat (Myotis californicus); Yuma Bat (Myotis yumanensis); Long-legged Bat (Myotis

volans); and the Silver-haired Bat (Lasionycteris noctivagans).







FIGURE 3. Photograph of dead little brown bat that is included in the Mammal Collection at UAM.

Methods

- Through extensive public outreach efforts, volunteers were enlisted to report their bat observations.
- A website was designed to provide an alternative for those who could not be reached in person.
- Photographs were collected to validate observations and were deposited as "observations" to the Mammal Collection at the University of Alaska Museum (UAM; Figure 3).
- Each observation was given a subjective qualitative "confidence score".
- Data are transferred on an annual basis to the Alaska Natural Heritage Program (AKNHP) and are accessible by request.

Results

Spatial Distribution

- We received reports of bats from 252 distinct locations (Figure 4).
- 191 locations were from Southcentral, 34 were from Central, and 27 were from Western Alaska.
- Locations ranged from sea level to 1280 m.
- . Some locations were far beyond the range extensions for the species;
- in the northernmost location in Kotzebue.
- in the westernmost locations in White Mountain and St. Michael, and
- in the southernmost observation from the Semidi Islands group.



FIGURE 4. Locations of bat observations in Southcentral, Central, and Western Alaska submitted to the ABMP, 2004 to 2012.

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FIGURE 2. Little brown bat (Myotis lucifugus) is most common and widely distributed bat species in Alaska.



Observation Types

- 58% of reports indicated bats flying outdoors.
- 42% of reports indicated bats were using a variety of substrates.
 - o 97% of the roosting reports indicated bats using human structures, including bat houses.
- 3% of the roosting reports indicated bats using natural substrates.
- 67% of reports indicated individual up to groups of three bats.
- Observations were verified with photos at 28 locations; these have been deposited to the University of Alaska Museum and have been assigned catalog numbers UAMObs:Mamm:150 to UAMObs:Mamm:180.

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TABLE 1. Roosting Substrates used by bats in Southcentral, Central, and Western Alaska



FIGURE 5. Locations of bat maternity colonies in Southcentral, Central, and Western Alaska identified by the ABMP, 2004 to 2012.

Seasonality

- Bats were observed in every month of the year, with 76% of observations occurring July through September (Figure 6).
- Winter bats were found both indoors and outdoors.
- Winter bats were observed in the following locations: White Mountain, St. Michael, McKinley Park, Petersville, Wasilla, Palmer, Chugiak, Anchorage, Girdwood, Sterling, Anchor Point, Homer, Chenega Bay, King Salmon, and Kodiak Island. (Figure 7).



FIGURE 6. Seasonal distribution of bat observations for Southcentral, Central, and Western Alaska submitted to the ABMP, 2004 to 2012 (n=281).

Substrates used by sting bats (all roosts)		Substrates used in maternity colonies only	
	# of observations		# of observations
eral Substrates		Natural Substrates	
ock crevice"	1	none observed	0
ee"	2		
an Structures		Human Structures	
ouse"	52	"house"	25
uilding"	18	"building"	5
abin"	16	"cabin"	9
at house"	4	"bat house"	3
arn"	3	"lodge"	2
mbrella"	3	"barn"	2
odge"	2	"plywood"	1
hed"	2	"school"	1
ner	9		
Roosts	112	Maternity Roosts	48

Maternity Colonies

Roosts were classified as maternity colonies if pups were confirmed roosting with adults or if 20 or more bats were observed roosting together. Maternity colonies were indicated in 48 reports, all were associated with human structures (Table 1). They were found in the following locations:

- Central Alaska; Fairbanks, Tok, Northway, Copper Center, and Talkeetna,
- Southcentral Alaska; Big Lake, Wasilla, Palmer, Sutton, Girdwood, Hope, Summit Lake, Cooper Landing, Moose Pass, Nikiski, Soldotna, Kenai, Kasilof, Ninilchik, Clam Gulch, Anchor River, Homer, Bear Cove, Seldovia, and Cordova,
- Southwest Alaska; Nondalton, Koliganek, Nunavaugaluk, Aleknagik, Naknek, King Salmon, in Katmai National Park, and on Kodiak Island (Figure 5).



FIGURE 7. Locations of winter (October through April) bat observations in Southcentral, Central, and Western Alaska submitted to the ABMP, 2004 to 2012.

Discussion

Spatial Distribution

We have documented reports of bats from Kotzebue, White Mountain, St. Michael and the Semidi Islands group, all of which represent extensions of their previously known limits.

- unambiguously as bats.



Figure 8. Maternity roost in a bat house in Katmai National Park.

Seasonality

- Seasonal peak in TEK and Citizen Science observations from mid-July to September occur after maternity colonies, adults and juveniles, begin to disperse. Additionally in Alaska there is a gradual overlapping of human and bat activity patterns as daylight hours shorten.
- Hibernating bats are unobtrusive and may be partially responsible for the limited number of winter observations we received.
- Late season and winter bats in the northern most of their range may rely on human structures for hibernacula.
- Winter bats were observed outdoors south of the 0°C isotherm at six sites, leaving open the possibility that bats may have been using some unknown natural hibernacula in addition buildings.
- Reports of bats in Southcentral leave open the possibility of migration.
- Bats near or south of the 0°C isotherm may migrate elsewhere, possibly to concentrate in undiscovered hibernacula in caves or mines.

Next Steps

Conserving Alaska's bats and managing for the consequences of WNS and expanded wind energy development will require a concerted effort to fill the large gaps remaining in our understanding of their ecology, habitat use, migration, and overwintering behavior. Through TEK and Citizen Science we have paved the way for more directed research. Our next steps include the following: Conduct systematic and/or randomized acoustic surveys to determine unbiased habitat

- associations.
- far north and west are utilized by bats.
- Collect tissue samples for molecular analyses.

- posed by WNS in the region.

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• These observations were either validated with photos and/or occurred in a setting that allowed the subjects to be identified

• Taken together, the western most observations suggest that far Western Alaska is indeed within the current range of the little brown bat.

Maternity Colonies

- Prior to this study there were only two maternity colonies known throughout Central, Southcentral, and Southwestern Alaska.
- The maternity colonies that were reported represent an improvement in our understanding of the Alaska breeding distribution of the little brown bat.



Figure 9. Two reports included photo-documentation of "winter bats". Picture A was taken from Trapper Creek on October 21, 2008, and picture B was taken from a library in Anchorage on April 20, 2011.

• Target acoustic monitoring and trapping surveys to determine the extent to which areas in the

Record voucher calls to aid in acoustic species identification.

• Conduct disease surveillance for organisms that cause WNS and rabies.

• Determine if bats migrate and concentrate in caves or mines to evaluate the potential danger