2022 Tennessee Bat Working Group

18th Annual Meeting

UT Extension Office

1801 Downtown West Blvd, Knoxville, TN 37919

Agenda (Times are eastern standard):

8:30 Registration

9:30 Welcome/Opening Remarks, Sara Samoray

9:40 Business Meeting

9:50 Joe Hoyt (Virtual)- **Persistence in the tricolored bat**

10:10 Dustin Thames- **Annual update on white-nose syndrome in Tennessee**

10:30 Break

11:00 Kitty McCracken- **2022 Tennessee Bat Working Group Bat Blitz Results**

11:20 Ben Neece- **Southeast Bat Hub: Assisting and Sustaining NABat Efforts for Enhanced Regional and Continental Bat Conservation**

11:40 Ashleigh Cable (Virtual)- **An Investigation of Microplastic Exposure in North American Insectivorous Bats**

12:00 Lunch

1:20 Karah Jaffe- **Evaluating Bat Roost Abundance: a comparison of drone-acquired thermal imagery and acoustic recordings with human observers**

1:40 Aaron Corcoran (Virtual)- **Software for Automated Video Tracking and Counting of Bats**

2:00 Sebastian Stockmaier (Virtual)- **Understanding the behavioral ecology of pathogen transmission: insights from neotropical bats**

2:20 Break

2:40 Cory Holliday- **A Brief Update on Bat Telemetry in Tennessee Using Motus Transmitters and Receivers**

3:00 Dave Pelren- **An update to the status of the tri-colored bat**

3:20 Tri-colored Bat Panel- **A discussion with the TNBWG tri-colored bat experts**

4:00 Closing remarks

Abstracts (in order of presentations)

*Student presenter

Persistence in the tricolored bat

Joseph Hoyt
Biological Sciences, Virginia Tech, Blacksburg, VA, USA.

White-nose syndrome (WNS) has caused severe mortality in populations of multiple bat species across the eastern United States. *P. subflavus* have suffered >95% declines across much of its range. However, initial declines in the southern part of the range have been much more variable and mechanisms that are allowing more northern populations to stabilize and even increase in some instances remain largely unexplored. Preliminary data suggests that the fraction of *P. subflavus* that become infected may be decreasing over time and that pathogen avoidance could be contributing to the survival of this species.

Annual update on white-nose syndrome in Tennessee

Dustin Thames
Tennessee Wildlife Resources Agency, Nashville, TN, USA.

White-nose syndrome (WNS) was first discovered in Tennessee during the winter of 2009/10. Following the discovery, biologists from a variety of state and federal agencies, non-profit organizations, and universities joined forces to create and implement a response plan. A major element of the response is annual monitoring of bat hibernacula to determine the scope of the disease across the state and the severity of the disease on bat populations in Tennessee. Since the 2010, members of the Tennessee's WNS Response Team have conducted approximately 1,140 surveys at approximately 500 sites across Tennessee. White-nose syndrome has either been confirmed or is considered suspect (i.e., field signs observed) in 61 of the 77 (79%) counties in Tennessee with caves. The disease is now endemic in the state and population declines have been documented in several species of cave hibernating bats including northern long-eared bats, Indiana bats, little brown bats, and tri-colored bats. During the winter of 2021/22, 101 surveys were conducted in bat hibernacula across the state at 88 sites. Priority Indiana bat and gray bat hibernacula were surveyed. Results of these surveys and bat population trends in winter hibernacula will be presented.

2022 Tennessee Bat Working Group Bat Blitz Results

Kitty McCracken
Natural Resources Management Team, Oak Ridge National Laboratory, Oak Ridge, TN, USA.

A Bat Blitz was held by the Tennessee Bat Working Group on August 22 and 23, 2022 on the U.S. Department of Energy's Oak Ridge Reservation in East Tennessee. Ten teams comprised of 46 bat experts and volunteers were involved in mist netting both nights. Seventeen mist net sites were selected on two portions of the Oak Ridge Reservation. A total of 64 bats from 6 species were captured and released during the Blitz. These data and data from acoustic monitoring will be used in population diversity estimates across the entire Reservation. The Bat Blitz was sponsored by Oak Ridge National Laboratory Natural Resources Management Program and the Tennessee Wildlife Resources Agency.

Southeast Bat Hub: Assisting and Sustaining NABat Efforts for Enhanced Regional and Continental Bat Conservation

Ben Neece[1], Susan C. Loeb[2], and Pete Pattavina[3]
[1]Southeast Bat Hub, Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC; [2]Southern Research Station, Upland Hardwood Ecology and Management Research Unit, U.S. Forest Service, Clemson, SC; [3]U.S. Fish and Wildlife Service, Athens, GA.

North American Bat Monitoring Program (NABat) surveys are conducted by a variety of individuals and groups at diverse scales, which can lead to unique challenges to conducting the surveys, managing and analyzing data, and submitting records to the national database. After seven years since the introduction of NABat and widespread implementation of surveys based on its guidelines, regional bat hubs have emerged as a new resource to ensure the long-term sustainability of this large-scale standardized bat population monitoring effort. Bat hubs provide support and guidance to address these challenges by regionally coordinating individual efforts, sharing solutions to commonly experienced issues, and directly addressing unique obstacles. The Southeast (SE) Bat Hub was started in June 2022 to offer services for both ongoing and new NABat projects in the southeastern United States. The SE Bat Hub is working to increase efficiencies and strengthen the NABat effort across the region by providing training sessions, fostering collaboration among practitioners, producing and recommending tools and techniques to streamline tasks, and assisting with the development of additional monitoring projects to fill data gaps. By combining all the data collected by individual NABat survey efforts thus far, it became possible for analysts to model bat distributions for several North American species across their continental ranges. With assistance from bat hubs, individuals collecting NABat data can more easily and quickly contribute consistently higher quality data to long-term, range-wide population studies, improving our knowledge of bat ecology and informing better conservation decision making.

An Investigation of Microplastic Exposure in North American Insectivorous Bats

*Ashleigh B. Cable[1], Leah N. Crowley[2], and Emma V. Willcox[1]
[1] Department of Forestry, Wildlife, and Fisheries, University of Tennessee Knoxville, USA
[2]Department of Biology, Austin Peay State University

Microplastics are contaminants of emerging concern to aquatic and terrestrial wildlife globally. There are no investigations into the exposure risk to bats in North America. We have been investigating exposure in bat stomach contents collected from early WNS research in the Northeast, guano from live-captured bats in Tennessee, and organs extracted from bats from Tennessee public health monitoring programs. We are finding that bat samples of all sample types analyzed contain microplastics, with the majority being fibers. Blue and clear are the most abundant color of particles in samples. In *Myotis lucifugus* stomach content samples, there is no significant difference in microplastic concentrations for males vs. females or adults vs. juveniles. In *Eptesicus Fuscus* organ samples, there are more samples in the GI tract than in lung, liver, and kidney samples. Our data suggest bats are ingesting plastics either from drinking water or contaminated prey items. The presence in other organ samples that contain lung tissue suggest bats may also be inhaling particles if they are suspended in the air column. This warrants additional research into the toxicity of microplastics to bats, exposure pathways, and potential food web impacts.

Evaluating Bat Roost Abundance: a comparison of drone-acquired thermal imagery and acoustic recordings with human observers

Karah Jaffe[1], Richard Carter[2], Aaron Corcoran[3]
[1]Department of Biological Sciences, East Tennessee State University, Johnson City, TN; [2]Department of Biology, University of Colorado Colorado Springs, Colorado Springs, CO.

Roost colonies provide an opportunity to census philopatric populations of bats. Comparing the efficacy of traditionally accepted methods with novel methods can provide guidance on the use of new technologies in the field. This project aims to compare the precision of survey methodologies, i.e., drone-acquired thermal imagery, acoustic estimates, and visual counts, for counting bats during emergence events. The survey methods were conducted for ten nights at two emergence sites and temporally synchronized to compare counts. Acoustic estimates could not be established as there was a weak prediction of the linear relationship between root-mean-square pressure and emergence count; therefore, this method was removed from the comparative analysis. A linear mixed-effects model and Bonferroni correction found a significant difference in visual and thermal methods at the eastern Tennessee site. Additionally, there was an overall median similarity of 92% from visual and thermal methods counts. This study supports the validity of drone-acquired thermal imagery for external emergence counts which could be used in tandem with current emergence count survey methods.

Software for Automated Video Tracking and Counting of Bats

Aaron Corcoran
Department of Biology, University of Colorado, Colorado Springs, CO.

Here I present ThruTracker, an open-source and free program for automated tracking and counting of bats. ThruTracker is a robust program that detects moving objects, links detections into tracks and provides a variety of tools to convert these detections into bat counts and filter noise. It can be used with thermal or near-infrared videos as long as they can be saved in a standard video format such as AVI or MP4. In this presentation I will give an overview of how the software works and present applications for counting bats including thermal imaging a large emergence (~350,000 individuals) of Mexican free-tailed bats (*Tadarida brasiliensis*) in New Mexico, and using drone surveillance to count big brown bats (*Eptesicus fuscus*) leaving a bridge in North Carolina. A free version of the software and tutorials are available at www.sonarjamming.com/thruTracker.

Understanding the behavioral ecology of pathogen transmission: insights from neotropical bats

Sebastian Stockmaier[1,2]
[1]Ohio State University, Department of Ecology, Evolution and Organismal Biology, Columbus, USA
[2]University of Tennessee (starting in 2023), Department of Ecology and Evolutionary Biology, Knoxville, USA

Pathogen transmission is strongly tied to how animals behave. My research program investigates the causes and evolutionary consequences of pathogen transmission in bats, adopting theory from diverse fields such as animal behavior, evolutionary biology, social network theory, and epidemiology. I will briefly summarize three ongoing research programs. First, I will talk about our work on social distancing in vampire bats. We show that social distancing depends on who is observed and what behavior is quantified. Second, I will explore how pathogens manipulate host behaviors using rabies virus in vampire bats as an example. Generally, rabies is thought to increase aggression as the virus mainly spreads through bites. In vampire bats, however, we found that aggression might be absent in strains that are not

currently circulating suggesting co-evolution of behavioral manipulation and host response. Finally, I will show preliminary data demonstrating the use of next-generation animal tracking to map out high resolution contact networks that could underly cross-species transmission between neotropical bat species and livestock. By summarizing our research groups' questions, methods, and ongoing projects, I hope to spark interest in collaborations involving local bat species in Tennessee.

A Brief Update on Bat Telemetry in Tennessee Using Motus Transmitters and Receivers

Cory Holliday
The Nature Conservancy

Understanding bat habitat and landscape use is critical to informing strategic conservation efforts in Tennessee. Due to the size and habits of bats, this type of life history information can be very challenging to collect. Methods of mark and recapture, passive telemetry, and active tracking all provide different levels of information resulting from differing levels of effort.

Motus is a network of shared frequency transmitters and receivers across the western hemisphere designed to connect data and projects through centralized management of data. Motus is designed primarily as a passive telemetry network with stationary receivers operating at 166mhz and 434mhz. Transmitter detections on all Motus receivers are scrutinized and filtered through the Motus cooperative then shared. The cooperative nature of Motus provides great benefits for researching aerial wildlife that may migrate beyond the scope of a site-based project, or political boundaries which can be barriers to research.

The Nature Conservancy initiated a Motus project in 2019, and with assistance from TWRA, has now grown that project to 13 active Motus receiver stations, and growing. To date, 137 Motus transmitters have been placed on bats in Tennessee by cooperating partners. This research is ongoing, but Cory Holliday from The Nature Conservancy will provide an update on results and share a handful of interesting detections to date.

An update to the status of the tri-colored bat

David Pelren, Nicole Sikula
US Fish and Wildlife Service

Abstract not available.

Seasonal Incidence of Bats and Their Prey on the Eastern Highland Rim

*Carmen Black[1], Jerome Grant, Rebecca Trout-Fryxell, Ernest Bernard, Elizabeth Beilke, and Joy O'Keeffe
[1] *Department of Entomology and Plant Pathology, University of Tennessee Knoxville, USA*

As white nose syndrome (WNS) causes devastating impacts to many populations of bat species, it becomes integral to understand the seasonal availability of prey for bats. Recent studies on bat diets included PCR testing on guano samples, providing identification of the organisms comprising diets of bat species. Data collected from PCR studies were unable to provide relative frequency of these organisms or nutritional value. Relative abundance of arthropods and bats were determined at six sites with light traps, carbon dioxide traps, and mist-nets. Acoustic data can be supplemented for mist-net data in off season. Samples were collected from May 2022 to the present and will continue for one year. Insect samples have

been sorted to order and assigned dry weight classes. Trends suggest availability of insects peaks in mid-summer and declines steadily into the fall season. Weight classes for most insects tend to decrease as temperatures cool. In relation to mist-netting, gray bats and evening bats were the most prevalent species in July and eastern red bats in August. There were no significant relationships between the overall number of insects and bats sampled at each site. The frequency of prey available for bats can allude to relative nutritional availability for bats known to forage at Arnold Air Force Base before and in traditional hibernation periods that are disturbed by WNS. This research may allow for management decisions about how to increase high nutritional diets for bats on the highland rim and in return mitigate mortality rates associated with WNS.