MEETING PROGRAM

26th Annual Meeting of the Southeastern Bat Diversity Network and the 31st Annual Colloquium on the Conservation of Mammals in the Southeastern U.S.

Thursday, February 25th, 2021

10 am – 6 pm EST

Brief Program Overview: This one-day meeting will consist of a plenary session, SBDN Business Meeting, poster session, and opportunities for working group gatherings as well as informal socializing. The morning plenary session will take place via Zoom and all afternoon events will take place via the Gathertown platform.

Time	Event	Location
10:00-11:30am EST	Plenary session	https://ufl.zoom.us/j/97065335931
11:30am-1:00pm EST	Break – lunch on your own	Gathertown platform
1:00-2:00pm EST	SBDN Business Meeting	Gathertown platform
2:00-3:00pm EST	Poster Session 1	Gathertown platform (Room 1)
3:00-4:00pm EST	Poster Session 2	Gathertown platform (Room 2)
4:00-6:00pm EST	Working Group Meetings, Socializing	Gathertown platform

This virtual meeting will bring together biologists, private and public land managers, private consultation organizations, educational institutions, and citizen scientists from across the Southeast.

10:00 – 11:30 am EST – Plenary Session https://ufl.zoom.us/j/97065335931

Plenary Session – ***Pathogen transmission to and from bats***

I. Experimental infection models with Jamaican fruit bats

Dr. Tony Schountz of the Center for Vector-borne Infectious Diseases at Colorado State University is interested in understanding immune responses of reservoir hosts, particularly rodents and bats, of emerging zoonotic viruses that typically lead to apathogenic infections in the reservoirs, the role of immunopathology during viral infection, and vaccine development and immunomodulatory therapeutics for zoonotic viruses. He will discuss research with coronaviruses (MERS-CoV and SARS-CoV-2) in Jamaican fruit bats and H18N11 bat influenza virus.

II. Virus-host interactions in bats

Dr. Arinjay Banerjee works to understand how emerging zoonotic viruses interact with wildlife reservoirs and spillover species, such as humans. Dr. Banerjee's laboratory at the Vaccine and Infectious Disease Organization at the University of Saskatchewan explores antiviral mechanisms in bats to understand and improve responses in humans. He will discuss the risk of zooanthroponotic transmission of SARS-CoV-2 to animals, and differential antiviral responses in humans and bats in response to surrogate infections and SARS-CoV-2.

III. Update on guidelines intended to prevent spillback + USFWS regulations

Jonathan Cook, Postdoctoral Research Associate at Patuxent Wildlife Research Center, will discuss results of a recent evaluation of measures intended to prevent spillback of virus from humans to bats during winter bat research and monitoring. Following this, Pete Pattavina, SE White-nose Syndrome Coordinator for USFWS, will provide updates on current guidance from USFWS and describe plans the Service anticipates for work on USFWS lands and section 10 permit holders.

IV. Panel Discussion

GATHERTOWN PLATFORM INFORMATION

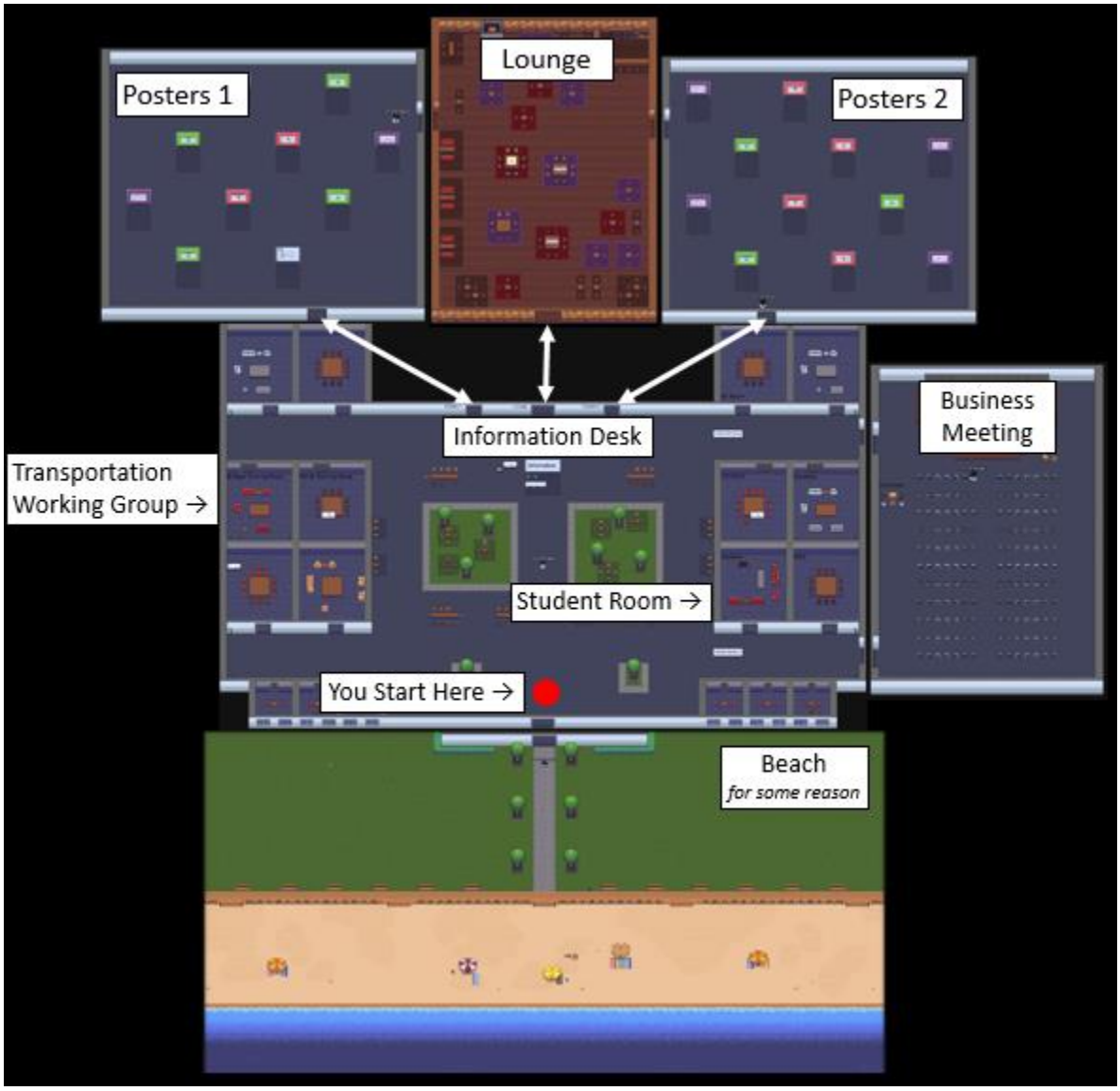
Virtual Meeting Etiquette

1) Please use your full name when naming your avatar. You can also add your affiliation (see video tutorial linked below)
2) Please mute yourself when you are not talking. This will help reduce echo and ensure conversations are understandable
3) Please keep your video on whenever you are active in gather.town. This will help us simulate an actual conference as best possible!

Gather.Town Help

Check out the video tutorial for using gather.town linked below. If you have any problems and need help, please visit the information desk in the main lobby of the conference hall or contact Dr. Scott Bergeson (bergesos@pfw.edu; office phone: 260-481-6317).

VIDEO TUTORIAL



(Screenshot showing meeting spaces within the Gathertown platform.)

Afternoon Sessions on Gathertown

Link: Gathertown

Password: SBDN

1:00 – 2:00 pm EST
SBDN Business Meeting

Call to Order, Introductory Remarks	Steve Samoray, SBDN President
2021 Election Results	Samoray
Treasurer's Report	Luke Dodd, SBDN Treasurer
Committee Reports	
Membership Committee	Scott Bergeson
Website Committee	Jason Robinson
NABCA Update	Trina Morris
Bat Blitz Committee	Pete Pattavina
Awards Committee	Stephen Burnett
Future Meetings	Holly Ober, SBDN President-Elect
Other Business	Membership

2:00 – 4:00 pm EST Poster Sessions

Posters Listed alphabetically by first author
Number beside the title indicates the poster number in the poster session
Underline indicates presenting author
Asterisk (*) indicates student author
Complete abstracts located at the end of the program

2:00 – 3:00 pm EST - Poster Session 1 – Gather.town Room: Poster 1

1. **SORICIDAE RECORDS WITHIN THE MAMMAL COLLECTION OF EASTERN KENTUCKY UNIVERSITY.** S. E. Baker* and L. E. Dodd

2. **IT'S GOING DOWN, I'M YELLING TIMBER… HARVEST SEEMS TO BE BENEFICIAL FOR INDIANA AND NORTHERN LONG-EARED BATS.** S. M. Bergeson, T. C. Carter, and J. M. O'Keefe

3. **CHANGES IN BAT DIVERSITY AND ACTIVITY ALONG AN URBAN-RURAL GRADIENT IN NORTHEASTERN INDIANA.** G. Burrell*, and S. M. Bergeson

4. **EFFECTIVENESS OF SHERMAN TRAPS VERSUS CAMERA TRAPS ON MONITORING SMALL MAMMAL POPULATIONS**. J. L. Clements*, and S. M. Bergeson

5. **ACOUSTIC SURVEYS FOR BATS IN THE LONG CANE RANGER DISTRICT OF THE FRANCIS MARION AND SUMTER NATIONAL FOREST IN SOUTH CAROLINA.** N. S. Gikas, D. J. Judy, P. Moore, and U.S. Forest Service Long Cane Ranger District

6. **SOUTHEASTERN LOUISIANA BAT MONITORING PROGRAM: DOCUMENTING BAT BIODIVERSITY, DISTRIBUTION, POPULATION STATUS AND SEASONAL/NIGHTLY ACTIVITY PATTERNS IN SE LOUISIANA.** C. S. Hood.

7. **INCREASING ROCKET BOX USE BY MATERNAL INDIANA BATS IN NORTHERN KENTUCKY.** S. K. Howe*, R. D. Crawford, J. M. O'Keefe, and L. E. Dodd

8. **BIG BATS BINGE BAD BUGS: VARIATION IN CROP PEST CONSUMPTION.** M. J. Hughes, E. C. Braun de Torrez, and H. K. Ober

9. **POTENTIAL FOR NEONICOTINOID INSECTICIDE EXPOSURE IN BATS OF THE CORN BELT.** D. Z. Jensen*, R. B. Gillespie, J. M. Gonzalez, and S. M. Bergeson

10. **SUMMER ROOST HABITAT AND DISTRIBUTION OF EASTERN SMALL-FOOTED BATS IN THE OUACHITA MOUNTAINS OF ARKANSAS.** V. Kearny*, R. Perry, T. Risch, and V. Rolland

11. **WINTER-ROOSTING TRICOLORED BAT STRUCTURE SURVEYS ON EGLIN AIR FORCE BASE AND HURLBURT FIELD, 2019-2020.** L. Ketzler

3:00 – 4:00 pm EST - Poster Session 2 – Gather.town Room: Poster 2

12. **THE INFLUENCE OF COMMERCIAL FORESTRY PRACTICES ON SEASONAL BAT SPECIES OCCURRENCE AND RELATIVE ACTIVITY IN CENTRAL LOUISIANA.** J. M. Kunberger*, A. M. Long

13. **TRICOLORED BATS MOVE TO COLDER MICROCLIMATES AFTER SEVERE POPULATION DECLINES FROM WHITE-NOSE SYNDROME.** S. C. Loeb and E. A. Winters

14. **INVESTIGATING THE THEORY OF ISLAND BIOGEOGRAPHY IN RELATION TO WOODLAND ISLANDS IN THE INDIANA AGRICULTURAL LANDSCAPE USING CAMERA TRAPPING METHODS.** C. E. May* and T. C. Carter

15. **URBAN ROOST SELECTION OF FLORIDA BONNETED BATS.** H. K. Ober, E. N. Webb, E. C. Braun de Torrez, J. A. Gore, and R. Zambrano

16. **WINTER BAT ACTIVITY IN WORKING FOREST LANDS IN THE SOUTHEASTERN US COASTAL PLAIN: PRELIMINARY RESULTS.** S. Perea*, S. B. Castleberry, A. L. Larsen-Gray, and D.U. Greene

17. **CURRENT DISTRIBUTION AND RELATIVE ABUNDANCE OF EASTERN SPOTTED SKUNKS ACROSS THEIR RANGE.** R. W. Perry, D. B. Sasse, J. C. Perkin, and N. W. Sharp

18. **DO COVID-19 LOCKDOWNS ALTER URBAN BAT TEMPORAL ACTIVITY PATTERNS.** R. Petric, L. Zarecky, H. Li, and M. Schug

19. **ULTRAVIOLET FLUORESCENCE IN POCKET GOPHERS.** J. T. Pynne, S. B. Castleberry, L. M. Conner, and C. W. Piper

20. **DECLINES OF TRI-COLORED BATS WINTERING IN FLORIDA CAVES.** L. M. Smith, T. J. Doonan, and J. A. Gore

21. **MULTI-DIMENSIONAL PREDICTORS OF BRIDGE ROOST USE BY GRAY BATS IN THE SOUTHERN APPALACHIANS.** F. Tousley*, J. M. O'Keefe, W. A. Mitchell

22. **QUANTIFYING RESOURCE PARTITIONING AMONG INSECTIVOROUS BAT SPECIES; A MULTIMETHOD APPROACH.** S. Whitney, L. Moore and T. McElroy

4:00 – 6:00 pm EST- Working Group Meetings

Bats and Transportation Structures Working Group
4:00 – 6:00 pm EST
Discussion room in main lobby – see map for location

4:00 – 6:00 pm EST – Socializing Options

Check out the lounge and private discussion rooms during this time.

Discussion rooms
COVID19: discuss best practices and unique/effective methods
Acoustics: gripe about the difficulty of identifying calls!
WNS: discuss other best practices and recent findings
Students: gripe about advisors! Also, just meet your contemporaries, ya'll are the next generation of SBDN!

Activities in the Lounge:
A bunch of private discussion rooms (tables, benches, chairs)
A bar (drinks not provided)
Battle Tetris
Zdelete (a different type of Tetris)
Colonist.io (Knockoff Settlers of Catan)
One Night Werewolf
Team Piano
Poker (actual gambling is prohibited)
Skribbl.io (essentially Pictionary)
Sudoku
Surviv.io (arcade game)

POSTER ABSTRACTS

Listed alphabetically by first author

Number beside the title indicates the poster number in the poster session

Underline indicates presenting author

Asterisk (*) indicates student author

1. SORICIDAE RECORDS WITHIN THE MAMMAL COLLECTION OF EASTERN KENTUCKY UNIVERSITY

S. E. Baker* and L. E. Dodd
Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475

Natural history collections are valuable for documenting biodiversity and providing global records of species distributions through time. Local diversity is also catalogued within natural history collections and can document presence of cryptic, and endangered species. The goal of this investigation was to assess age of cryptic small mammal specimen acquisitions, and composition of soricid records within the Eastern Kentucky University (EKU) mammal collection. The EKU collection database was used to collect data on collection location and date of soricid specimens, and to assess composition of soricid records. The mammal collection at EKU contains 135 soricid specimens that range in collection date from 1956 to 1999. Although this timeframe covers an impressive four decades, only 84 specimens were collected within Kentucky. Additionally, 65 specimens were collected within Madison County (where EKU is located); all other specimens were collected across 14 other counties in the state. Furthermore, of these records 72 belong to the *Blarina* genus. Comparing these museum records to inventory records for preserves managed by the Office of Kentucky Nature Preserves clearly indicates the mammal collection in EKU is biased towards *Blarina*, and does not document the full diversity of Soricidae present within the state. Renewing efforts to expand the small mammal collection at Eastern Kentucky University will not only increase the diversity of records in EKU's mammal collection, but also assist in updating inventory efforts for preserves that have not been systematically surveyed in past decades.

2. IT'S GOING DOWN, I'M YELLING TIMBER… HARVEST SEEMS TO BE BENEFICIAL FOR INDIANA AND NORTHERN LONG-EARED BATS

S. M. Bergeson, T. C. Carter, and J. M. O'Keefe
Department of Biology, Purdue University Fort Wayne, Fort Wayne, IN 46804 (SMB)
Department of Biology, Ball State University, Muncie, IN 47306 (TCC)
Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL 61801 (JMO)

There is growing interest into the effects of timber harvest on forest-dwelling bats due to the potential for timber harvest to reduce habitat. Additionally, impending changes to the federally threatened status of the northern long-eared bat requires more investigation into its habitat use.

We conducted a 4-year study (2012–2015) to assess summer roosting ecology of endangered Indiana bats (*Myotis sodalis*) and northern long-eared bats (*Myotis septentrionalis*) within a managed Midwestern forest. We tracked 4 male and 11 female Indiana bats to 49 roosts (n_{male} = 24, n_{female} = 25) and 69 female northern long-eared bats to 175 roosts in south-central Indiana, USA. Female Indiana bats selected roosts under exfoliating bark on large (mean tree height: 17 ± 2m, diameter: 35 ± 3cm) standing dead trees and in bat boxes with high solar exposure (28 ± 6% canopy closure above roosts). Male Indiana bats selected for roosts under exfoliating bark on tall trees (23 ± 2m) surrounded by snags (5 ± 1 snags/0.1 ha plot) and live trees (30 ± 3 live trees/0.1 ha plot). Female northern long-eared bats used roosts (mean tree height: 18 ± 11m, diameter: 30 ± 16cm) located under shaded exfoliating bark on mid-story dominant sassafras trees (*Sassafras albidum*) and canopy dominant oak trees (*Quercus* spp.). Female Indiana bats roosted in or ≤ 10 m from harvest openings and first-stage shelterwood cuts more than expected (15 roosts) based on their availability on the landscape. Conversely, male Indiana bats and female northern long-eared bats roosted in harvest openings as expected (3 and 14 roosts, respectively). Our results demonstrate that a managed Midwestern forest provides an array of roosts for bats and that these bat species do not actively avoid roosting near harvest openings in this forest. However, these species may partition roosting resources differently where they co-occur.

3. CHANGES IN BAT DIVERSITY AND ACTIVITY ALONG AN URBAN-RURAL GRADIENT IN NORTHEASTERN INDIANA

G. Burrell*, and S. M. Bergeson
Department of Biology, Purdue University Fort Wayne, Fort Wayne, IN 46805 (GB and SMB)

In the past 20 years, bat species in the Midwestern United States have experienced population declines, partly as a consequence of urbanization and agricultural development reducing the occurrence of uninterrupted natural areas like wetlands and forests. As urban and agricultural areas become more prevalent, it is important to understand what habitat features may support diverse bat communities within these anthropogenic land cover types. In 2020, we began a study that investigates differences in bat activity and community composition along an urban-rural gradient created by Fort Wayne, Indiana and the surrounding agricultural land. We deployed passive acoustic detectors at 20 field sites – 10 in urban areas and 10 in rural. Each site was sampled for 4 to 5 consecutive days twice throughout the summer. In urban areas, we sampled a total of 100 nights and collected 9,973 bat calls throughout the summer (499 ± 128 calls/site). In rural areas, we sampled a total of 104 nights and collected 16,756 bat calls (798 ± 168 calls/site). Based on a preliminary analysis using BCID identification software, both urban and rural sites were dominated by big brown bats (*Eptesicus fuscus*) and silver-haired bats (*Lasionycteris noctivagans*). We also detected red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), evening bats (*Nycticeius humeralis*), tricolored bats (*Perimyotis subflavus*), little brown bats (*Myotis lucifugus*), Indiana bats (*Myotis sodalis*), and northern long-eared bats (*Myotis septentrionalis*) at both types of sites. The proportion of big brown bat calls was similar between urban (59.4% ± 7.7%) and rural areas (57.1% ± 5.7%). However, *Myotis* species calls were slightly more prevalent in rural (3.6% ± 2.8%) than in urban areas (1.6 % ± 1.1%). Further analysis will elucidate relationships between bat activity and environmental variables associated

with individual sites and provide more insight into what habitat types promote large and diverse bat communities.

4. EFFECTIVENESS OF SHERMAN TRAPS VERSUS CAMERA TRAPS ON MONITORING SMALL MAMMAL POPULATIONS

J. L. Clements*, and S. M. Bergeson
Department of Biology, Purdue University Fort Wayne, Fort Wayne, IN 46805 (JLC and SMB)

Small mammal surveys are a valuable technique used for population conservation and assessing environmental conditions. Due to its value, researchers are constantly attempting to generate new and more effective small mammal survey methods. We conducted a study that compared the effectiveness of Sherman traps and the newly developed AHDriFT camera trap system (drift fence with trail cameras inside inverted buckets at each end) when monitoring small mammal populations. We installed AHDriFT systems at 2 forested sites within Eagle Marsh Nature Preserve, Allen County, IN and let these systems continuously (day and night) record photos from March–August 2020. We deployed 10 Sherman traps within 50m transects centered on the AHDriFT systems once a week throughout the same time period; transect length and number of traps were chosen to ensure similar surveying efforts. We coded animals recorded by the AHDriFT systems to species whenever enough of the animal was caught in the photo. Each photo was coded twice by 2 randomly assigned researchers to check for observer bias. Preliminary results show that on average there were more individual small mammals identified by the AHDriFT systems than the Sherman traps, although many of the individuals captured by both techniques were likely recaptures. The AHDriFT systems also identified more species (richness = 9) than Sherman traps (richness = 2). This indicates that AHDriFT systems may be more effective than Sherman traps when investigating both small mammal populations and communities. Sherman traps were useful for identifying specific characteristics from each individual, but it was much more time consuming. The results from this study show that camera trapping can be used more frequently, in a variety of different experiments, that could save time and could potentially capture more species than regular trapping methods

5. ACOUSTIC SURVEYS FOR BATS IN THE LONG CANE RANGER DISTRICT OF THE FRANCIS MARION AND SUMTER NATIONAL FOREST IN SOUTH CAROLINA

N. S. Gikas, D. J. Judy, P. Moore, and U.S. Forest Service Long Cane Ranger District
Environmental Solutions & Innovations, Inc., Maitland, FL 32751; U.S. Forest Service, Sumter National Forest, Long Cane Ranger District, Edgefield, SC 29824.

The Long Cane Ranger District of the Francis Marion and Sumter National Forest is located in the Piedmont ecoregion of South Carolina, and there has only recently been a comprehensive study of the bat communities in this area. Acoustic surveys were completed from 13 July through 30 September in multiple temporal phases on Long Cane in Abbeville, Edgefield, Greenwood, McCormick, and Saluda counties, South Carolina, continuing efforts from mist-netting and acoustic surveys completed in 2019. The 61 mist-netting and acoustic sites from 2019 efforts were each sampled with two detectors for four calendar nights from 13 July through 14 August 2020. Thirty of these sites were sampled from 16 August through 5 September 2020 based on

results from the 2020 summer maternity data to collect information on post summer bat activity. Ten additional sites were sampled from 15 August through 30 September 2020 to collect fall bat migration data. Two established NABat grid cells were sampled with four stationary acoustic detectors per night for at least two nights as well as one mobile transect for two nights within each block. Qualitative vetting of acoustic surveys confirmed the presence of big brown, (*Eptesicus fuscus*), eastern red (*Lasiurus borealis*), Seminole (*L. seminolus*), hoary (*L. cinereus*), silver-haired (*Lasionycteris noctivagans*), southeastern (*Myotis austroriparius*), evening (*Nycticeius humeralis*), tricolored (*Perimyotis subflavus*), and Brazilian free-tailed (*Tadarida brasiliensis*) bats, and the possible presence of Rafinesque's big-eared (*Corynorhinus rafinesquii*), northern yellow (*Lasiurus intermedius*), little brown (*Myotis lucifugus*), northern long-eared (*M. septentrionalis*), and Indiana (*M. sodalis*) bats. One northern long-eared bat call, confirmed through qualitative vetting, was documented from the mobile acoustic route on NABat Grid 130934. Given the difficulty associated with confirming presence of some bat species using acoustic methods alone, the results of the 2020 surveys should be used to guide any future mist netting efforts.

6. SOUTHEASTERN LOUISIANA BAT MONITORING PROGRAM: DOCUMENTING BAT BIODIVERSITY, DISTRIBUTION, POPULATION STATUS AND SEASONAL/NIGHTLY ACTIVITY PATTERNS IN SE LOUISIANA

C. S. Hood. *Department of Biological Sciences & Environment Program, Loyola University, New Orleans, LA 70118*

The SE Louisiana Bat Monitoring Program is a network of long term continuous (nightly, seasonal, and annual) monitoring stations documenting species diversity, activity and relative abundance of bat populations inhabiting SE Louisiana. Initiated in 2018, the network includes passive, electronic bat monitoring stations deployed and maintained in natural and urbanized sites in 8 SE Louisiana Parishes. Sites for the long term monitoring stations include Jean Lafitte National Park, Bayou Sauvage National Wildlife Refuge, and state, parish, and city parks and nature centers, Conservation NGOs, as well as hosted by K-12 schools across the region. Active electronic bat detection (with handheld detectors) and mist-netting supplement the data collected with the passive, monitoring stations. The Program deploys detectors to K-12 partner schools, who host monitoring stations and interact with some of the data generated. Bat echolocation calls recorded nightly (dusk to dawn) are analyzed and identified to species following NaBAT (North American Bat Monitoring Program) protocols using locally developed bat call libraries developed by Hood (2012) and Hood & Nolfo-Clements (2019). Ten species, *Corynorhinus rafinesquii, Eptesicus fuscus, Lasiurus borealis, L. cinereus, L. intermedius, L. seminolus, Myotis austroriparius, Nycticeius humeralis, Perimyotis subflavus,* and *Tadarida brasiliensis* have been recorded throughout our region, throughout seasons, to date. This is the first systematic, large scale monitoring project of bats in SE Louisiana. The Program is also contributing both public outreach, providing bat educational programs and opportunities to participate in citizen science in Coastal Louisiana.

7. INCREASING ROCKET BOX USE BY MATERNAL INDIANA BATS IN NORTHERN KENTUCKY

S. K. Howe*, R. D. Crawford, J. M. O'Keefe, and L. E. Dodd
Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 (SKH and LED)
Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign, Urbana, IL 61801 (RDC and JMO)

Previous research showed Indiana bats, *Myotis sodalis*, prefer rocket box style bat boxes over other roost styles. However, we know less about how Indiana bats acclimate to rocket boxes over time. Our objectives were to evaluate maternal Indiana bat roost preference for several rocket box designs over multiple years and across varied solar treatments at Veterans Memorial Wildlife Management Area in Scott County, Kentucky. In 2019 we deployed 20 rocket boxes of five designs across four landscape positions (open, forest, east-facing, west-facing), adding to 19 existing bark-mimic roosts at the site. During 2019 and 2020, spotlight checks and exit counts were performed 3–4 times per week from May to August. In rocket boxes, mean daily abundance and total abundance nearly quadrupled from 2019 to 2020. In both years, mean daily abundance was highest for boxes receiving east or west solar exposure, with low abundance rates for interior forest boxes; however, bats primarily utilized forest boxes in May prior to colony formation. Boxes receiving open solar exposure had no bats either year. Mean daily abundance also increased as the season progressed in both years. Increased roost use was most pronounced for vent-removal and chimney designs in 2020, but bats used all designs to some extent. The higher number of bats using rocket boxes in 2020 is likely related to the time it took for bats to discover the novel roosts. However, other factors could have contributed to increasing use across years, e.g., bats developing search images for the roost or assessing microclimate through trial and error.

8. BIG BATS BINGE BAD BUGS: VARIATION IN CROP PEST CONSUMPTION

M. J. Hughes, E. C. Braun de Torrez, and H. K. Ober
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Florida Fish and Wildlife Conservation Commission, Gainesville, FL, 32601
Department of Wildlife Ecology and Conservation, University of Florida, Quincy, FL, 32351

Generalist predators such as insectivorous bats influence pest abundance and arthropod communities, which can reduce pesticide use and increase agricultural production. In order to maximize this ecosystem service, managers need a more nuanced understanding of the influence of bats on arthropod pests. We used high-throughput metabarcoding of DNA extracted from bat feces to investigate diets of 180 bats across agricultural and pine habitats. We detected 23 species of agricultural pests, including pests responsible for severe economic damage, including *Helicoverpa zea* (Corn earworm), *Spodoptera frugiperda* (Fall armyworm), *Chloridea virescens* (Tobacco budworm) and *Chrysodeixis includens* (Soybean looper). Incidence of pest consumption was high: 61% of bats had consumed at least one pest species with each bat consuming an average of 1.7 pest species. Bat characteristics and seasonality were generally

more effective than geographic features and weather conditions in predicting pest consumption patterns. The large foliage-roosting species (*Lasiurus seminolus*) consumed larger pests and a greater variety of pest species than smaller crevice, cavity, and cave roosting bat species (*Nycticeus humeralis, Myotis austroriparius*). Likelihood of pest consumption was higher in the late summer than during spring or early summer, and higher among larger bats, independent of species. Our finding of widespread pest consumption by bats contributes to mounting evidence worldwide of the important role bats play in agricultural systems and highlights the value of incorporating bat conservation into integrated pest management programs globally.

9. POTENTIAL FOR NEONICOTINOID INSECTICIDE EXPOSURE IN BATS OF THE CORN BELT

D. Z. Jensen*, R. B. Gillespie, J. M. Gonzalez, and S. M. Bergeson
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Environmental Resources Center, Purdue University Fort Wayne, Fort Wayne, IN 46805 (RBG)
USDA-ARS, National Soil Erosion Research Laboratory, West Lafayette, IN 47907 (JMG)

Neonicotinoid insecticides (clothianidin, imidacloprid, thiamethoxam) have been widely promoted as an effective means of agricultural pest management due to their acute toxicity in invertebrates while having minimal toxic effects on vertebrates. While mounting evidence suggests neonicotinoid exposure is responsible for large-scale mortality events of non-target invertebrates, such as bees and other insect species, minimal research has been conducted to investigate the impacts of neonicotinoid exposure on mammals. This includes insectivorous bats, which forage within neonicotinoid contaminated environments. We began a multi-year study in the summer of 2020 to investigate if bats had been exposed to neonicotinoid insecticides, if bat diet was a potential vector of exposure, and the effects of neonicotinoid exposure on bat body condition. During our 1st year of sampling, big brown bats *(Eptesicus fuscus)* and their invertebrate prey items were sampled from four DeKalb County, Indiana sites that had recorded concentrations of neonicotinoids in adjacent streams. We captured a total of 38 big brown bats over 4 total net nights and collected 52 tissue samples (blood and fur). We also sampled potential flying invertebrate prey items using malaise traps. Body conditions of big brown bats captured in this agriculturally dominated (and historically neonicotinoid exposed) landscape are lower (0.35 ± 0.01 g/mm) than those from more forested landscapes (0.44 ± 0.06 g/mm). While analyses of neonicotinoid concentrations in potential prey items, bat fur, and bat blood are still on-going, these results suggest that neonicotinoids may have a negative effect on bat body condition.

10. SUMMER ROOST HABITAT AND DISTRIBUTION OF EASTERN SMALL-FOOTED BATS IN THE OUACHITA MOUNTAINS OF ARKANSAS

V. Kearny[1]*, R. Perry[2], T. Risch[1], and V. Rolland[1]
[1] Department of Biological Sciences, Arkansas State University, P.O. Box 599, State University, AR 72467
[2] Forest Service Southern Research Station, PO Box 1270, Hot Springs, AR 71902

The Eastern Small-footed Bat (*Myotis leibii*, MYLE), a rare species found throughout eastern North America, was listed as endangered by the International Union for Conservation of Nature in 2018 yet denied listing under the Endangered Species Act by the United States Fish and Wildlife Service in 2013, largely due to insufficient data. Abundance and distribution data are lacking, because MYLE seem to appear in clusters, resulting in hit-or-miss searches. Similarly, in Arkansas, MYLE's abundance and distribution is unclear and its roosting habitat preferences are unknown. Our objectives were to 1) map MYLE distribution in the Ouachita Mountains and 2) determine roost characteristics at the local and landscape scales. Using acoustic monitoring, rock formation searches, and mist-netting, we found 150 MYLE within 91 rock crevice roosts averaging 1.54 ± 0.08 cm in width during 2019 and 2020. Generalized linear mixed models indicated rock feature type, elevation, site area, and amount of vegetation cover to be the most important characteristics in predicting probability of MYLE presence. While MYLE appear in clustered, high-elevation areas, within the Ouachita and lower Arkansas Valley regions, these characteristics could simply be a confounding factor indicating where and how talus slopes form, a rare and potentially limiting habitat type in Arkansas. However, we found MYLE to prefer higher elevation roosts even within a site, suggesting elevation is an important characteristic at the local level.

11. WINTER-ROOSTING TRICOLORED BAT STRUCTURE SURVEYS ON EGLIN AIR FORCE BASE AND HURLBURT FIELD, 2019-2020

L. Ketzler
U.S. Fish and Wildlife Service, 1 SOCES/CEIE Bldg. 90053, 415 Independence Rd., Hurlburt Field, FL 32544

Tricolored bats (*Perimyotis subflavus*) were petitioned for federal listing in 2017, and are found on both Eglin Air Force Base and Hurlburt Field, FL. In areas where caves are not available for winter roosting, this species sometimes uses a variety of human structures instead, such as bridges and culverts. Maintenance, repair, or replacement of these structures could cause negative species impacts if performed during winter. To identify which structures tricolored bats might be using on Eglin and Hurlburt, we used acoustic bat detectors and infrared video cameras to survey 57 structures across both bases from December 2019 to February 2020. We identified two structures that were used as roosts by unidentified bat species, and we detected tricolored bats at two other structures. We detected six bat species at 19 structures and identified two natural tree roosts, indicating that both Eglin and Hurlburt practice excellent habitat management for foraging and tree-roosting bats. We believe that the generally warm weather observed during the 2019/2020 winter encouraged bats to remain roosting in natural roosts. Surveys for winter 2021 are ongoing, with some modifications to the survey protocol, and we seek input on additional improvements.

12. THE INFLUENCE OF COMMERCIAL FORESTRY PRACTICES ON SEASONAL BAT SPECIES OCCURRENCE AND RELATIVE ACTIVITY IN CENTRAL LOUISIANA

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In the southeastern U.S., where forests are the primary land cover type and trees are often harvested for production purposes, understanding how commercial forestry practices influence bat distributions is critical for bat conservation and management. Our goal was to examine the influence of commercial forestry practices on seasonal bat species occurrence and relative activity in loblolly pine (*Pinus taeda*) forests of central Louisiana. We deployed passive acoustic bat monitors at sites representing four treatments (group selection harvest, thinned, control, and bottomland hardwood habitat) during seasons that corresponded with "non-breeding" (January–February) and "breeding" (July–August) periods. We also collected environmental data at the landscape and local scales to characterize our study sites. We detected *Lasiurus borealis*, *Myotis austroriparius*, *Perimyotis subflavus*, *Tadarida brasiliensis*, and *L. cinereus* during both seasons, and additionally detected *Nycticeius humeralis* and *Eptesicus fuscus* during the breeding season. As expected, we found that bat activity (call files/night) was significantly lower during the non-breeding season (average 3.8 call files/night) compared to the breeding season (average 65.0 call files/night). *P. subflavus*, *N. humeralis*, and *L. borealis* were more active in group selection harvest compared to other treatments during the breeding season, but otherwise seasonal activity was similar across treatments for each species. The results of our occupancy analyses suggested that the predicted probability of *M. austroriparius* occupancy decreased with increasing snag density during the non-breeding season, but increased with increasing snag density during the breeding season. Also, the predicted probability of *E. fuscus* occupancy decreased with increasing tree species diversity at a landscape scale and increased with increasing percent shrub cover at a local scale. Our research is ongoing and will help identify forest management practices and habitat characteristics that promote high bat species diversity and activity and will improve our knowledge on the natural history of southeastern bat species.

13. TRICOLORED BATS MOVE TO COLDER MICROCLIMATES AFTER SEVERE POPULATION DECLINES FROM WHITE-NOSE SYNDROME

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Tricolored bats in northern South Carolina and Georgia declined by >90% after the arrival of white-nose syndrome (WNS). The high mortality may be due to the relatively warm temperatures found in these sites (12-13°C). Data from the northeastern U.S. and models based on fungal growth and bat energetics suggest that bats that select colder, drier sites within hibernacula are more likely to survive WNS. The objective of this study was to determine whether tricolored bats in a hibernaculum in northwestern South Carolina changed their roosting behavior over time to use colder parts of the site and whether microclimate selection of bats was related to changes in population numbers. We censused Stumphouse Tunnel during the last week of February 2014 through 2020. Stumphouse is 493 m long with three sections separated by brick walls and closed at the end. Each year we counted every bat in the tunnel and for each recorded the distance from the entrance, the section (A, B, or C), and the wall temperature next to each bat. Prior to WNS (2014) there were 321 tricolored bats, but numbers steadily declined to a low of 31 in 2018 after the detection of WNS in 2015. Numbers of tricolored bats rose to 36 in 2019 and to 41 in 2020. Mean wall temperatures in Sections A, B, and C over all years were 7.4°C, 9.0°C, and 11.7°C, respectively. The percentage of bats using Section A increased from

1.9% in 2014 to 37.5% in 2019 and 46.3% in 2020 and the percentage of bats using Section C decreased from 95.6% in 2014 to 56.2% in 2019 and 48.8% in 2020. These results suggest that bats are changing their behavior to roost in the coldest sections of the tunnel which may be resulting in an increase in survival.

14. INVESTIGATING THE THEORY OF ISLAND BIOGEOGRAPHY IN RELATION TO WOODLAND ISLANDS IN THE INDIANA AGRICULTURAL LANDSCAPE USING CAMERA TRAPPING METHODS

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Habitat fragmentation caused by both urban and agricultural development has led to an increase in habitat "islands" surrounded by a sea of agriculture. In much of Indiana, woodland habitat islands are surrounded by crop and pasture lands. This study sought to evaluate whether species richness followed the ideas of the Theory of Island Biogeography. Using camera trapping methodology, we sampled nine isolated woodland areas in the counties surrounding Muncie, Indiana during September and October 2020. Based on a target species list chosen before data collection, preliminary analysis suggests that a "island" size is not indicative of higher species richness. This presentation will focus on which species were observed throughout the sites, both predicted and unpredicted. We also examine which other factors from the Theory of Island Biogeography may be influencing richness.

15. URBAN ROOST SELECTION OF FLORIDA BONNETED BATS

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The Florida Bonneted Bat (*Eumops floridanus*) is a federally endangered species endemic to Florida, with a geographic distribution believed to be among the smallest of all bat species in North America. The first documentation of Eumops in the US was in Miami, FL in the 1930s (then referred to as *Eumops glaucinus*). We examined historical records of these bats in the greater Miami region throughout the past 80 years by exploring publications and museum records. We also documented new roosts by radio-tracking bats we captured in semi-natural areas. Results indicate that throughout the past 8 decades, Florida Bonneted Bats in this urban region have consistently roosted in buildings and rarely roosted in other structures, in contrast to other portions of their range where they roost in trees and bat houses and have never been documented in buildings. Although the location of Florida Bonneted Bat roosts within the Miami region has shifted slightly away from the most densely populated region where they were first identified, reports of buildings used by these bats has been confined to a small ($40km^2$) portion of the city throughout the past 60 years. Florida Bonneted Bats regularly selected buildings with

a particular architectural style (i.e., Mediterranean revival, characterized by stucco exteriors, open chimneys with integrated arch covers, and clay tile roofs). To ensure adequate conservation measures are put in place to minimize harm to this species in urban areas, we highlight 4 topics that we believe should be addressed through targeted educational campaigns, and we suggest 4 topics in need of additional research.

16. WINTER BAT ACTIVITY IN WORKING FOREST LANDS IN THE SOUTHEASTERN US COASTAL PLAIN: PRELIMINARY RESULTS

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Insectivorous bats in temperate zones have evolved strategies, including migration or hibernation, to face the challenges of reduced resource availability and increased energy demand during winter. However, in the southeastern U.S. Coastal Plain, many bats are year-round residents and remain active throughout the year. Some species (e.g., *Lasiurus cinereus*) migrate from colder areas to the Coastal Plain seeking milder winter conditions. Habitat use by these bats outside the growing season, including selection of foraging areas, remains understudied. Therefore, our goal is to evaluate factors influencing winter activity and foraging habitat of bat communities on working forest lands in the southeastern US Coastal Plain. From January to March 2020, we deployed Anabat Swift acoustic detectors at 82 sampling points in loblolly pine (*Pinus taeda*) working forests in southeastern Georgia (n = 42) and southeastern Louisiana (n = 40). We recorded 6,848 bat passes during 246 detector nights. We detected bats at 95% (78/82) of sampling sites, identifying seven species (*Eptesicus fuscus*, *Lasiurus cinereus*, *Lasiurus intermedius*, *Lasionycteris noctivagans*, *Nycticeius humeralis*, *Peromyotis subflavus* and *Tadarida brasiliensis*) and two additional species groups (*Myotis* spp. combined and *Lasiurus borealis*/*L. seminolus* combined). *Lasiurus cinereus* was detected at the most sampling sites (n = 70) followed by *L. borealis*/*L. seminolus* (n = 61). Additional sampling will occur in 2021 and 2022 within South Carolina, Mississippi, Alabama, and North Carolina. By providing baseline information on winter bat communities and foraging habitat associations, our results can inform managers of habitat features important to wintering bats when planning harvest operations, and thus increase conservation opportunities within these working forests.

17. CURRENT DISTRIBUTION AND RELATIVE ABUNDANCE OF EASTERN SPOTTED SKUNKS ACROSS THEIR RANGE

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Evidence suggests the range of Eastern Spotted Skunks (*Spilogale putorius*) has contracted and their abundance has declined in the past 70 years, leading to conservation concerns. We

summarized county records of Eastern Spotted Skunks collected during 2000–2020 to determine their current range and relative abundance. We accumulated 1,174 records from 257 counties across their historic range in the United States, with 901 records from 197 counties considered verified. Verified records included museum specimens, photo-documented occurrences, and captures by researchers. We created two distribution maps; one of their current range based on all occurrence records and another from only verified records. Records indicated Eastern Spotted Skunks persisted across a large portion of 1900–1920 range, and were relatively abundant in the Interior Highlands, Appalachian Mountains, central Texas, central South Dakota, and south Florida. Our results also suggest that their overall range has contracted since 1959. These data provide managers with information concerning where research and conservation efforts can be focused for this potentially declining species.

18. DO COVID-19 LOCKDOWNS ALTER URBAN BAT TEMPORAL ACTIVITY PATTERNS

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In various taxonomic groups animal activity differs on the weekend when human disturbance is at its peak (the weekend effect) but how do animals respond when human recreation ceases during weekends? The Covid-19 pandemic induced stay-at-home orders and eliminated the typical human weekday-weekend temporal patterns, providing us with a unique opportunity to investigate the effects of human disturbances on urban bats. We hypothesized that Covid-19 restrictions altered the weekday-weekend urban bat activity temporal pattern. We predicted that during the Covid-19 pandemic, 1) there would be no difference in bat activity on weekends from weekdays, and 2) the overall bat activity would be higher in 2020 than during the same time period in previous years. Using 2018-2020 year round bat acoustics monitoring data, we examined bat activity patterns between weekdays and weekends - before and during Covid-19 restrictions at four different sites (2 in the city center, 2 in the city periphery) in Greensboro, North Carolina, USA. We constructed generalized linear models to identify temporal patterns in bat activity. Our preliminary results suggest that prior to the Covid-19 pandemic but not during the pandemic, urban bat activity differed on weekends from weekdays. The total bat activity was higher in 2020 than the previous years. Overall, our study highlights that quick response to anthropogenic disturbance is a key factor in how animals adapt to urban landscapes.

19. ULTRAVIOLET FLUORESCENCE IN POCKET GOPHERS

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Ultraviolet fluorescent pelage is known from a limited number of mammal taxa. We provide the first observations of fluorescence in fossorial mammals. We documented ultraviolet fluorescence

in live *Geomys pinetis* (southeastern pocket gopher) specimens and in museum specimens of 4 additional geomyid species. Although unknown, the adaptive significance of fluorescence in pocket gophers is likely similar to previously documented terrestrial and arboreal species.

20. DECLINES OF TRI-COLORED BATS WINTERING IN FLORIDA CAVES

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White-nose syndrome (WNS) has caused large declines in the bats of eastern North America and occurs as far south as Georgia and Alabama, putting Florida on the leading edge of the disease. However, at this time, neither *Pseudogymnoascus destructans* (*Pd*), nor WNS has reached the state. To better determine the effects of WNS on tri-colored bats once the disease reaches the state, biologists have conducted annual surveys of selected hibernacula caves since 2015 and culverts since 2018. The total number of tri-colored bats (*Perimyotis subflavus*) in caves has declined from 2015 to 2020. In 2020, 25 caves surveyed experienced a decline in the number of tri-colored bats since the first year surveyed and only one cave saw an increase, resulting in a 73.9% decline of the cave-roosting population. In 2020, the total number of tri-colored bats in culverts that were surveyed declined slightly from 2018. Eight of those culverts experienced a decline in the number of tri-colored bats, while 5 saw an increase, with a resulting overall decline of 7.7% of tri-colored bats roosting in those culverts. The reason for this decline at most sites is unknown. However, over 130 bats died in one cave when it flooded in winter 2018. Further analysis incorporating covariates, including temperature, survey date, and region, will help determine the severity of these declines.

21. MULTI-DIMENSIONAL PREDICTORS OF BRIDGE ROOST USE BY GRAY BATS IN THE SOUTHERN APPALACHIANS

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At least ten species of bats, some rare or endangered, routinely use bridges in the southeastern US as active-season roost sites. Bridge-roosting bats may suffer unintended casualties by necessary structural upkeep projects; the successful detection of roosting bats is the first step in mitigating or preventing harm. Predictive modeling can provide agencies and contractors the ability to target likely-roost bridges, and better focus bat detection efforts prior to construction. From 2018 to 2020, we researched bridge use by bats in North Carolina's French Broad River Basin, with special attention towards the endangered gray bat (*Myotis grisescens*). Incorporating measurements across multiple spatial and dimensional scales, we are using an information-theoretic approach to test 18 competing hypotheses about bridge habitation, aiming to identify

the best predictors for bat presence and abundance. Of 266 total surveyed bridges, 102 provided adequate roosting crevices. Twenty bridges housed gray bats, occasionally alongside big brown (*Eptesicus fuscus*) or Brazilian free-tailed bats (*Tadarida brasiliensis*); an additional 17 bridges housed bats but were not used by gray bats. All species were more likely to use large, concrete bridges with deck crevices in areas of low urban development. Such bridges may provide more roosting sites and better access to high-quality foraging habitat. Further, in-progress analyses suggest solar radiation, stream size, and proximity to hibernacula may influence bridge selection by gray bats in the French Broad River Basin. We suggest prioritizing surveys of bridges with these characteristics in this region of western North Carolina.

22. QUANTIFYING RESOURCE PARTITIONING AMONG INSECTIVOROUS BAT SPECIES; A MULTIMETHOD APPROACH

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Palmetto Bluff, South Carolina acts as a potential haven to 13 species of insectivorous bats. The Lower Coastal Plain has not reported a case of *Pseudogymnoascus destructans (Pd)* since the emergence of the fungal pathogen to the USA. The warmer weather of the coast reduces hibernacula time for bats which is when they are more susceptible to *Pd* infections. The various species of bats compete to fill the same niche, this leads bat biologist to question how various species succeed. One method of relieving competition is by partitioning resources needed to live. This study attempts to quantify resource partitioning by measuring activity time, prey availability, and dietary preferences. These data collected serve as a preliminary analysis to identify patterns in insect populations and activity time among bat species. Insect samples were collected using CO2 traps and UV light traps. These samples were then counted and sorted to the order level using a dichotomous key. Three SM3 Bat and one SM4 acoustic monitors (wildlifeacoustics.com) were deployed in the same sites as insect traps to monitor bat populations and to quantify activity time. DNA collected from bat guano from 22 individuals (6 species) captured at the same sites but at different times is currently being sequenced to profile diets. Using cytochrome oxidase 1 (CO1) DNA sequences we can identify the species of insects found in the guano. The insect trap data shows a consistent decrease in Coleoptera and an increase in Lepidoptera, Hymenoptera, and Diptera as the night progresses. A regression shows a positive relationship between bat passes captured and gross weight of insects collected.