

USE OF DNA BARCODING TO DISTINGUISH BETWEEN MORPHOLOGICALLY SIMILAR RED BATS

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Eastern Red Bats (Lasiurus borealis)

- Habitat: Wooded and riparian areas
- Range: Southwestern Texas to northeastern British Columbia
- Nationally, 22% of the bat fatalities at wind energy facilities
- Previously observed at wind energy facilities in south Texas

Geluso and Valdez, First Records of the Eastern Red Bat in Arizona, Utah, and Western New Mexico, 2019



Western Red Bats (*Lasiurus blossevillii*)

- Habitat: Wooded and riparian areas
- Range: Northwestern U.S. to South America
- Not previously observed in the south Texas region
- Plausible reason to believe that they have expanded their range recently and have been observed at wind energy facilities

Geluso and Valdez, First Records of the Eastern Red Bat in Arizona, Utah, and Western New Mexico, 2019



Wind Energy in the United States

- By 2017, ~8% of energy in the US was produced by wind energy
- Was projected to increase to 20% by 2020 before the pandemic
- Largest source of renewable energy in the US
- Texas is the state with the most installed wind energy in the country
- We have observed bats being killed regularly at these wind energy facilities



Issues in Ecology, Impacts to Wildlife of Wind Energy, 2019

Goal of Ultrasonic Acoustic Deterrents (UADs) – Reduce Bat Fatalities



RESOURCES

Previous Research

- Lack of representation of *L. borealis* and *L. blossevillii* in previous field tests of UADs makes it hard to draw conclusions for these species. Are UADs successful?
- A study focused on identifying yellow bat (Lasiurus) carcasses from wind farms, found 4 species of Lasiurus bats at wind farms in the Rio Grande Valley Region
 - First genetic evidence of the presence of western red bats in this area
- Successful studies in UAD effectiveness for L. cinereus and T. brasilliensis
 - Frequency differences from the eastern and western red bats
 - Important in calibration of UADs



Chipps et al., Genetic Approaches to Understand Bat-Wind Turbine Impacts, 2020 Weaver et al., Ultrasonic Acoustic Deterrents, 2020

Current Research

Collaboration with Texas State University

- Studying the effect of different acoustic signals on ~6 different species of bats
- Hays County, Texas
 - Excellent bat biodiversity – easy to safely capture and release several bat species
 - National leading producer of wind energy
 - Shorter cold season



Current Project

Collaboration with Texas State University

- Goal is to use DNA barcoding to determine the correct species identification of the "eastern" red bats tested in the flight cage experiments
- Are some of the "eastern" red bats really western red bats?
- Do eastern and western red bats respond similarly or differently to the UADs?



Methods

- Sample Collection and DNA Extraction
 - 19 fecal samples were obtained from "eastern" red bats that were used in the flight cage experiments
 - Samples were preserved in urea
 - DNA was extracted via QIAmp stool extraction kit
- DNA Amplification
 - Amplified a 120bp section of the cytochrome oxidase I (COI) region – barcoding region
- Genetic Analyzer
 - Sequences analyzed on ABI 3130XL Genetic Analyzer
 - Compared to GenBank Voucher sequences to generate species ID



Anticipated Results

- Results will be used to analyze previous data from flight cage experiments in order to better calibrate UAD studies in experiments
- We anticipate findings will show evidence of both eastern and western red bats in the flight cage experiment dataset
- If so, those data will need to be reexamined for species-specific differences



Discussion

UAD studies have proved effective for two other bat species

- Potential for success with eastern and western red bats
- Importance in collaboration between governing entities and institutions – Texas scientists, TPWD, technology developers, and wind energy companies
- Knowledge of bat diversity is key for developing fatality mitigation strategies in the future
 - With more data, we can predict high-risk areas for fatalities and develop strategies in response

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