Photo Credit: Alyssa Watt

Identification of bat species in Suffolk County

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Bat infected with white-nose syndrome

Source: http://www.nimbios.org/workshops/WS_Bats

Abstract

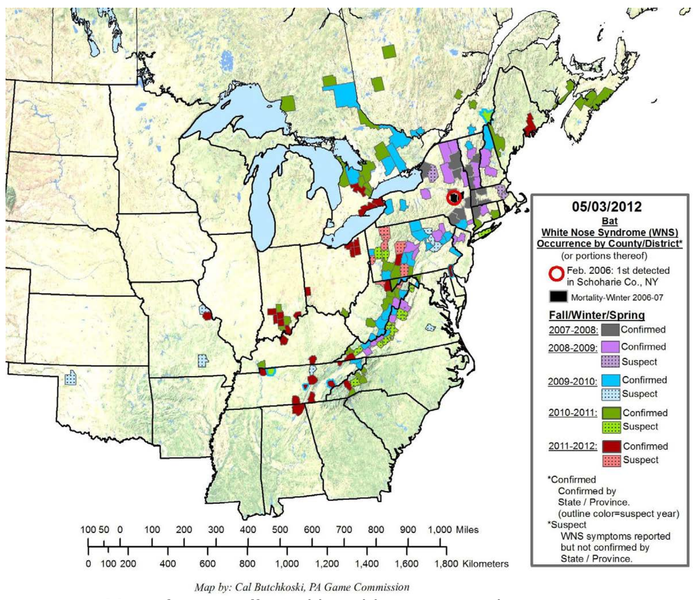
Bats produces ultrasonic calls that are used for foraging and navigation. These calls operate at different frequencies for different species of bats and can thus be used for identification. Acoustic surveys provide a relatively inexpensive and timely way to identify bat species covering a large area. Few surveys have been conducted in Suffolk County, New York and with the grim outlook for bats in the northeast attributed to the spread of white-nose syndrome, a fungal disease that is decimating bat populations, it is more important than ever to have information about the abundance and distribution of bats. Using binary acoustic technology 16 acoustic surveys were performed during the months of May through July along four predetermined routes. Several bat species have been identified to roost in Suffolk County during summer months including: *Eptesicus fuscus*, *Lasiurus borealis*, *Perimyotis subflavus*, *Myotis septentrionalis*, *Myotis lucifugus* and unknown myotis species.

Introduction

Bats are members of the diverse order of mammals, Chiroptera. Over 1,000 species have been found to live in all habitats excluding extreme polar and desert climates [1]. Bats are an important component of the ecosystem. Herbivorous bats serve as pollinators and seed disseminators where as insectivorous bats control insect populations [2]. Approximately 70% of bats, including bats in New York are insectivorous [3]. According to the New York Department of Environmental Conservation New York has nine species of bats: *Myotis septentrionalis* (northern long-eared bat), *Myotis lucifugus* (little brown bat), *Myotis sodalis* (Indiana bat), *Perimyotis subflavus* (tri-colored bat), *Eptesicus fuscus* (big brown bat), *Myptis leibii* (small footed bat), *Lasiurus borealis* (red bat), *Lasiurus cinereus* (hoary bat) and *Lasyionicterius noctivagans* (silver-haired bats) [4].

Currently bats are facing many threats to their population including habitat destruction caused by development projects or natural causes like fire, the construction of wind turbines, and the emergence of the fungal disease white-nose syndrome (WNS). Since 2006 WNS has been the leading cause of population declines in several species. WNS is a psychrophilic fungus characterized by white fungal growth on the muzzle, ears and/or wing membranes of hibernating bats [5]. WNS was first documents in Howe's Cave, west of Albany, New York in 2006 and within 2-years of its emergence surveys suggest that bat populations have declined by at least 75 percent. Scientists hypothesize that the interruptions in winter roosting causes bats to lose their fat resources at an accelerated rate and does not leave them with enough to survive until spring [6]. According to the New York State Department of Environmental Conservation species that have been hit the hardest by WNS are the little brown bat, northern long-eared bat, and the tri-colored bat that suffer population declines of more than 90 percent [7]. Indiana bats have also declined significantly by about 60 percent [8].

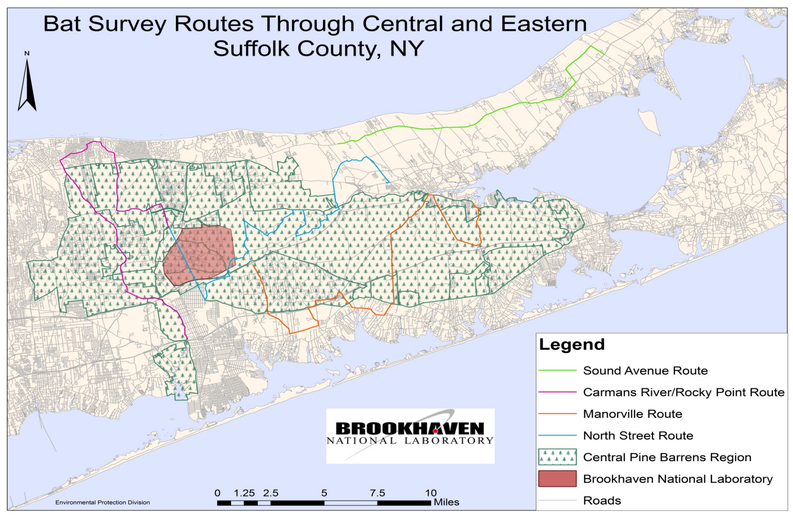
Research on bat populations in Suffolk County will allow scientists to document what species are being impacted most by population threats. Furthermore by understanding what bats are most affected this research can be used to aid conservation efforts. Conservation efforts include determining how far the disease has spread and measuring the impact of the disease on bat populations.



Map of areas affected by white-nose syndrome
Source: http://www.fws.gov/whitenosesyndrome/

Study Area

Three of four routes for acoustic surveys, Carmans River, North Street and Manorville, were established within Long Island's Central Pine Barrens. The Pine Barrens contains over 100,000 acres of protected terrestrial and marine environments [9]. The forests and woodlands of the Pine Barrens are comprised of pitch pine-oak communities with scattered wetlands. The Pine Barrens contains several water sources including several ponds, marshes, and the Carmans and Peconic Rivers. The fourth route, Sound Ave, extended along the North Fork of Suffolk County. This route was selected to encompass an agricultural landscape for acoustic surveys.



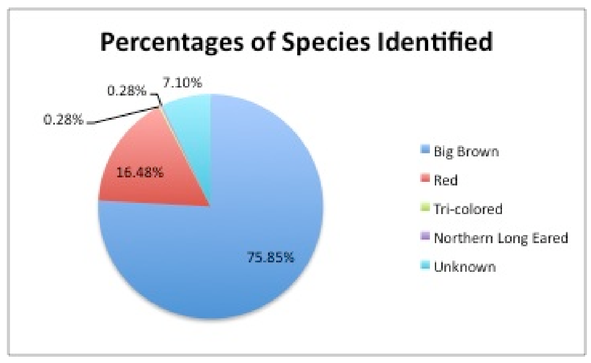
Materials and Methods

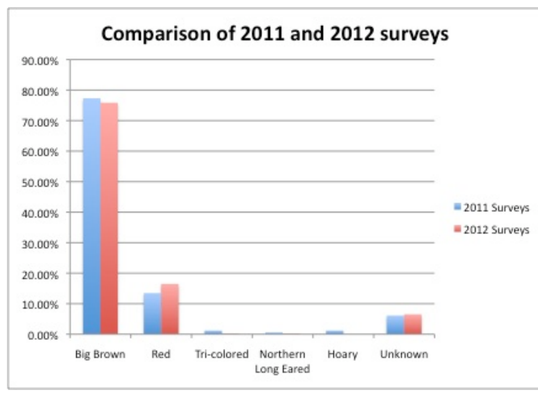
Four predetermined survey routes were chosen to avoid high trafficked and high-speed areas. Each route was run four times for a total of 16 surveys. Surveys were initiated 30 minutes after local sunset during peak bat activity [10]. Vehicles drove between 18-20 mph towards the shoulder of the lane. Attached to the roof of the vehicle was an f/125 bat detector and a GPS connected to a laptop with compatible software. SPECT'R® software was used to record ultrasonic bat calls and convert bat calls down to a sound within the human hearing range [11]. Delorme Street Atlas software was used to guide the driver along the survey route and to track where each bat along the route was encountered. Before and after each survey the weather was recorded.

Recorded audio files were ran through SCAN'R® program used to separate bat calls from other noises. The program sorted the file into two lists; a list of failed files and a list of passed files [12]. Passed files were archived and further analyzed by separating out search phase calls of five or more pulses. These sonogram thumbnails were then analyzed using a chart designed by Carl Herzog, New York State's Conservation Wildlife Biologist, using minimum frequency, constant frequency and slope of the call at critical frequency.

Results

After analyzing audio files recoded from mobile acoustic surveys, several bat species were identified in Suffolk County, Long Island during the summer months. Species identified include *Eptesicus fuscus* (big brown), *Lasiurus borealis* (red), *Perimyotis subflavus* (tri-colored), *Myotis septentrionalis* (northern), and an unknown myotis species. Of the positive bat calls *E. fuscus* represented 75.85% of the calls, *L. borealis* represented 16.48% of the calls, *P. subflavus* represented 0.28% of the calls, *M. septentrionalis* represented 0.28% of the calls and 7.10% of calls were unidentified. Compared to the species identified during surveys conducted during the summer of 2011 there is an absence of *Myotis liebii* (small footed) and *L. cinereus.* The amount of bat calls recorded this summer is more than twice the number recorded during summer surveys in 2011. Despite this difference the species make-up and percentages of bats detected are similar.





Discussion

Out of New York's nine species of bats, the search phase calls of four bat species were recorded and analyzed. Several species of New York's bats were absent from surveys including *M. lucifugus*, *M. leibii, L. cinereus* and *L. noctivagans*. In accordance with New York Department of Environmental Conservation *M. septentrionalis* and *P. subflavus* appear to be less abundant than other species of bats. *E. fuscus* and *L. borealis* bats seem to flourish in comparison to other species of bats. A few calls were tentatively identified as *M. sodalis* but since myotis bats have overlapping calls the files could not positively be identified. In order to have an accurate inventory of bat communities in an area one cannot rely on acoustic sampling alone. To have an accurate inventory, acoustic sampling should be paired with various capture techniques.

Acoustic sampling was an appropriate method for a preliminary survey because it is not expensive, not as time consuming and covers a broader area than capture techniques like mist netting. Each sampling measure has inherent biases but by combining several methods more reliable information of bat communities can be collected. Problems associated with acoustic surveys include: variable activity patterns, imperfect detections, background noise of vehicles and streams that can interfere with calls, map problems and dense vegetation that can cause bats to produce less diagnostic calls within steeper call slopes and shorter call durations [13].

In order to obtain population information of bats- age, sex ratio, reproduction and parasite load- mist netting or some other capture technique must be used [14]. After the acoustic surveys were performed a limited amount of mist netting was conduct at Brookhaven National Laboratory and Wertheim National Wildlife Refuge. Mist netting in these areas of Suffolk County resulted in the capture of *E. fuscus, L. borealis* and *M. septentrionalis*. Similar to acoustic surveys mist netting has its limitations. Unlike acoustic surveys, setting up the nets is time consuming. The sample of bats captured when mist netting can be biased because the nets need to be set up in an area where there are flyways or by water sources with good canopy cover [15]. These nets will miss the flight paths of some species and can be avoided by more alert bats [16].

In the future, researchers should try mist netting at areas along the survey routes to try and obtain a more accurate idea of the population. By combining different sampling strategies researchers will get a more holistic idea about summer bat populations. This will then allow researchers to track changes in bat populations.

Acknowledgements

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