Source: Brookhaven National Laboratory

A Preliminary Species Census of Chiroptera in Central Suffolk County, New York

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Source: Brookhaven National Laboratory

Abstract

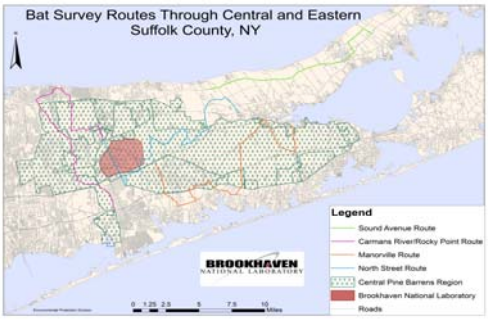
Many species of Chiroptera are able to produce ultrasonic sounds that are functionally generated for feeding and navigation purposes. These high-frequency pitches are not only functional for the mammal itself, but also aid scientists in identifying different species of Chiroptera. There have been very few studies of the Chiroptera species, summer roosts, and foraging behaviors performed on Long Island, New York. We have been collecting acoustic data to determine the various species of Chiroptera located in central Suffolk County during the summer months. Using a binary acoustic frequency detector and its complementary computer software, which converts echolocation ultrasounds into sounds audible to the human ear, we collected our data from four different predetermined routes at the peak hours of activity. After collecting these data, we analyzed each call, matching up the frequency of the pitch to the correlating Chiroptera species. Of the 16 acoustic surveys we completed and analyzed, we identified seven different species currently roosting in central Suffolk County; including, *Eptesicus fuscus, Lasiurus borealis, Lasiurus cinereus, Perimyotis subflavus, Myotis septentrionalis, Myotis leibii,* and an unknown Myotis species. The most prevalent of these species, *E. fuscus*, was identified multiple times in nearly all of the surveys completed. One issue with our research is that the results are slightly biased to Chiroptera that forage along road corridors, which does not fully account for those species that forage in dense forests or above the tree canopy. To eliminate this bias, we would have to set-up mist nests above the tree canopy and deep in the forests to capture and identify those species that utilize that habitat. Another issue with our research lies in the analysis of the frequencies of each call. Though we are able to positively identify some species with ease, other species emit variable calls, which makes identification much more difficult and less exact. These species cannot be positively identified and must be labeled "unknown" until a more precise means of identification through computer software is created. By knowing which species of Chiroptera visit Long Island during the summer months, we will be able to complete future studies regarding each species' roosting and foraging behaviors, fluctuations in numbers in populations of each species, or shifts in geographic distribution.

Introduction

Recently, the mammal order Chiroptera (commonly known as bats) has attracted a significant amount of attention due to the decline in several species' populations. Many of these species have experienced drastic declines and shifts in population, distribution, and abundance in the United States' Northeastern region. The drop in numbers may be attributed to various factors, such as human disturbance and expansion, deforestation, climate change, disease, and wind turbines [1]. One disease in particular, white-nose syndrome (WNS), which many scientists claim is spreading rapidly to several states in the New England and Mid-Atlantic regions, is responsible for hundreds of thousands of mortalities in cave-dwelling bats [2]. The implication of these combined factors results in the rapid decrease of individuals in bat populations, as well as a significant increase in scientific studies conducted on bat populations. We have conducted a considerable number of acoustic surveys to determine the various species of Chiroptera that roost in central Suffolk County during the summer months. Our objective in conducting this research is to facilitate a better understanding of which species reside on Long Island, so that further studies may be completed on the fluctuating numbers in populations of each species or the shifts in geographic distribution. These studies will ultimately assist in efforts to promote bat species conservation.

Study Area

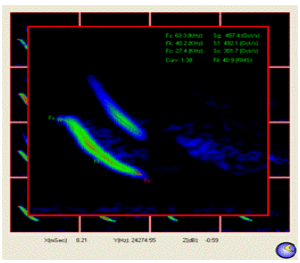
The area in which our research was conducted consisted primarily of the Pine Barrens in central Suffolk County, Long Island, New York. The Pine Barrens encompass several ponds and marsh complexes, as well the Peconic and Carmans Rivers, and occupies 102,500 acres in its entirety. We traveled throughout and around a significant portion of the Pine Barrens. We also extended our research onto the North Fork on our Sound Avenue route, to account for the agricultural landscapes that may host bats' summer roosts. In addition, we conducted a limited number of static surveys around the Brookhaven National Laboratory located in Upton, New York.



Methods and Materials

Surveys were completed around central Suffolk County four times each, on four separate predetermined routes. These routes were selected due to their presumed likelihood of containing bats in summer roosts. The routes were conducted during the peak hours of activity for most Chiroptera species, beginning one-half hour after sunset [3]. A binary acoustic frequency detector was used to receive the bat calls and provide recordings of the ultrasonic frequencies onto a laptop through its complementary computer software, Spect'R®. This binary acoustic frequency detector and a GPS locator were placed on the roof of our vehicle. While on route, a software program (DeLorme 2009) logged our specific GPS locations in accordance with the time. During the survey, we traveled at an average speed of 20 miles per hour, which is comparable to the speed of a bat itself. Before and after the survey was in session, we collected weather data.

After collecting these data, we ran every sound file captured by Spect'R® through another computer program, Scan'R®, which isolated each bat vocalization and separated out positive bat calls to be analyzed by hand [4]. We then went through each sequence of bat calls, further separating files with search phase calls from calls consisting of approach phase or feeding buzzes. We analyzed the search phase calls, noting the minimum frequencies of each call and matched up the frequency of the pitch to the correlating Chiroptera species as specified on the chart designed by New York State's Department of Environmental Conservation Wildlife Biologist, Carl Herzog. We then carefully cataloged this information for its use in additional and future Chiroptera studies in central Suffolk County.



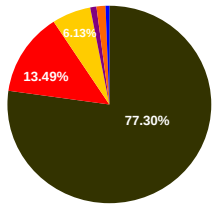
Scan'R® Image of a Bat Call

Source: http://binaryacoustictech.com/batpages_files/scanr.htm

Results

Based on the data obtained and analyzed from our mobile acoustic surveys, we have identified seven different Chiroptera species roosting in central Suffolk County, Long Island. These species include *Eptesicus fuscus* (big brown), *Lasiurus borealis* (red), *Lasiurus cinereus* (hoary), *Perimyotis subflavus* (tricolored), *Myotis septentrionalis* (northern long eared), *Myotis leibii* (eastern small footed), and an unknown Myotis species. Out of 163 positive bat calls received, analyzed, and logged, 77.30% of those calls were identified as *E. fuscus*. *L. borealis* comprised 13. 49% of the identified species, while *P. subflavus* and *L. cinereus* each made up 1.22% and *M. septentrionalis* made up 0.61% of the identified Chiroptera. *L. cinereus* and *M. leibii* was also identified in the limited number of static acoustic surveys conducted at several ponds located on Brookhaven National Laboratory's property; however, results of these data can not be quantified. The remaining 6.13% of positive bat calls analyzed were unable to be definitively identified and must be placed under the unknown Myotis classification.

Percentages of Species Identified in Central Suffolk County



Big Brown	77.30%	Red	13.49%
Unknown	6.13%	Hoary	1.22%
Tri Color	1.22%	Northern Long Eared	0.61%

Discussion

Scientific studies conducted on bat populations usually consist of either acoustic surveys or mist-net captures (however, using both methods combined is considered more thorough). Our research was conducted using acoustic technology due to the lack of time, animal handling expertise, and funds. Acoustic survey methods were appropriate for our research because they are more effective in sampling a larger area than mist-netting capture techniques [5].

However, there are some biases and challenges associated with acoustic surveying methods. One bias that the acoustic method introduces is the tendency to favor species that forage along road corridors, failing to account for the species that hunt and feed in dense forests [6]. To eliminate this bias, we would have to set-up mist nests above the tree canopy and deep in the forests to capture and identify those species. We experienced another obstacle with our research while attempting to analyze the frequencies of each call. Though we are able to positively identify some species with ease, other species emit variable calls that make identification more difficult and less exact. These species cannot be positively identified and must be labeled "unknown" until a more precise means of identification through computer software is created [6].

As seen from our results, big brown bats make up a significant percentage of the bats found roosting in central Suffolk County, New York. As acknowledged by Carl Herzog, corroborating evidence from summer mist-netting research conducted in other areas of the state suggest that big brown bats are high in abundance in New York [7]. However, he also noted that acoustic detection methods favor big brown bats due to their tendency and preference to forage along roads and open canopies [7].

The outcome of our data is significant because it demonstrates the shift in species abundance with a serious decline of *M. lucifugus* (commonly known as the little brown bat) found in central Suffolk County. According to data logged in the early 1970s little brown bats "...appeared to be the most numerous summer bat over most of Eastern Long Island," [8]. Many scientists attribute the significant decline in abundance and distribution of the little brown bat species across New York State to their susceptibility to WNS. The New York State Department of Environmental Conservation claims that little brown, northern long eared, and tricolored bats have been the most affected by the disease, with population declines of more than 90% since 2006 [9]. A similar scientific study conducted in New England claims that the Myotis species detected during the summer months have declined 72% since 2006, consequently drawing the conclusion that the decline in summer activity and abundance are likely from winter mortalities due to WNS [10]. Brooks also notes, "This conclusion is reinforced by the lack of a simultaneous decline in the summer activity of bat species less impacted by white nose syndrome," which would include big brown bats.

Our preliminary research of the Chiroptera species will allow future studies to be conducted on Long Island regarding population distribution and abundance.

Acknowledgments

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Holy Cross

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