Summary of Findings

Bat Detections at Mackinac Island School Grounds

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ABSTRACT: Echolocation signals were recently recorded at the Mackinac Island school grounds to monitor local bat activity using a Wildlife Acoustics detection meter. Seven of nine bat species native to Michigan were identified using Kaleidoscope software to interpret recorded signals. Some signals are difficult for the software to precisely identify, therefore the number of signals recorded is more a qualified than a quantified value. Software interpretations of bat calls during this monitoring period resulted in about 70% of the signals being from the Little Brown Bat (*Myotis lucifugus*) and 20% of the signals being from the Eastern red bat (*Lasiurus borealis*). Silver-haired bats (*Lasionycteris noctivagans*) accounted for about 3% of the detections.

Introduction: Insect-eating bat populations across the country have plummeted in recent years due in large part to White-nose Syndrome, a lethal fungal disease caused by *Pseudogymnoascus destructans*. Little Brown Bats (*Myotis lucifugus*) have been reported to be the most common bat in most areas of upper Michigan. The purpose of monitoring activity on Mackinac Island in early September was to determine if unusually high activity due to migration prior to hibernation could be detected.

Methods

A Wildlife Acoustics SM4BAT-FS ultrasonic detection meter was set up on the Mackinac Island school grounds. The microphone was placed in the clearing near the playground. The co-ordinates were 45.970N, 84.465W.

The SM4BAT recorded bat ultrasonic echolocation signals from 30 minutes before civil sunset to 30 minutes after sunrise per the NABat (North American Bat Monitoring Program) protocol. Other recording parameters also met the NABat protocol as specified for the SM4BAT-FS. The microphone was elevated approximately 12 feet above the clearing floor. Figures 2 and 3 detail the equipment location and microphone placement.

Results

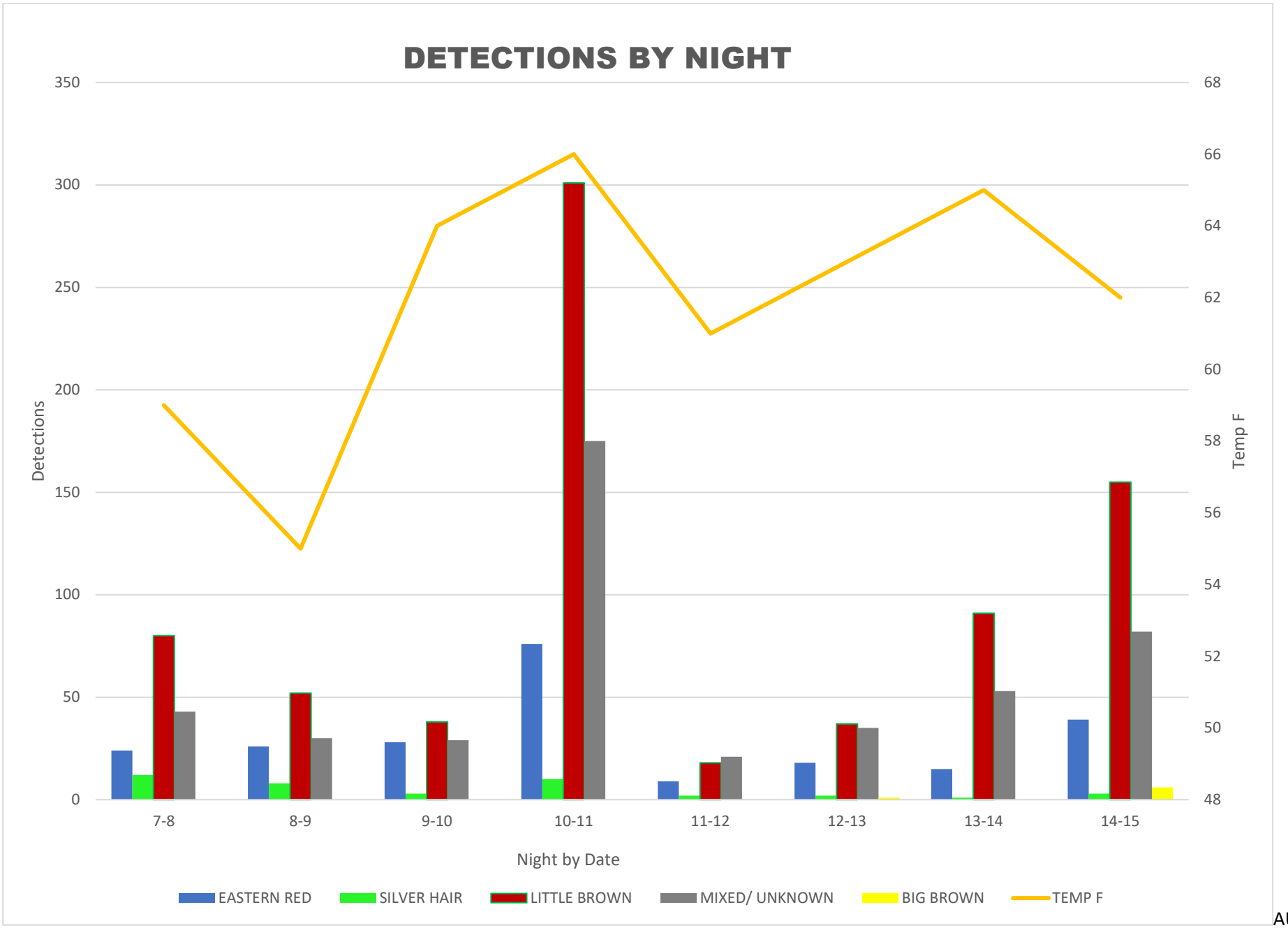
The BATSM4-FS registered a total of 1631 detections of bat echo location signals while recording from 30 minutes prior to sunset to 30 minutes after sunrise for 8 nights. A Wildlife Acoustics Kaleidoscope software analysis of the signals assigned an auto species identification (auto ID) to a total of 1,090 of the signals. Another 468 signals contained insufficient or conflicting information and were not assigned an auto ID. The software classified the remaining 73 signals as noise as they did not meet the requirements for bat echo location calls.

Table 1 breaks down the automatic species identification by date and number detected. The period column in Table 1 refers to the recording night as identified with the dates, i.e. 7-8 is the night beginning at sunset September 7 and ending at sunrise September 15. Figure 1 depicts the breakdown by night. Included in the chart in figure 1 is the plot for minimum temperature during the recording period.

TABLE 1
AUTO ID SPECIES DETECTIONS PER TIME PERIOD

PERIOD	BIG BROWN	EASTERN RED	HOARY	SILVER HAIR	LITTLE BROWN	INDIANA	TRI-COLOR	MIXED/ UNKNOWN
7-8		24		12	80	2	1	43
8-9		26		8	52	2	0	30
9-10		28	4	3	38	1		29
10-11		76	7	10	301	3	4	175
11-12		9	1	2	18		0	21
12-13	1	18		2	37	1	1	35
13-14		15		1	91		0	53
14-15	6	39	1	3	155	1	2	82

FIGURE 1



AUTO ID SPECIES DETECTIONS PER TIME PERIOD

Discussion

The detections observed on Mackinac Island are indicators of bat activity only. They do not corellate directly to the number of bats present. One bat, for instance, may make several passes near the microphone and thus be responsible for multiple detections in the same time period. Instances where the number of detections for one species number in the single digits, however, are indicative of a low number of animals or are false identifications assigned by the software. The large number of detections without assigned auto IDs suggests that the number of bats is probably higher than what is implied by the auto ID counts.

The auto ID function in the Kaleidoscope software identified seven of the nine species of bat found in Michigan. The auto ID is based on a comparrison of recorded signals to a library of signals obtained from bats in free flight in non-cluttered environments. Signals that match or those with a high probability of matching signals of a particular species are assigned the ID of that species. The Little Brown bat had the most detections followed by the Eastern Red and the Silver Hair. While there were detections attributed to the endangered Indiana bat, it is not known if these were true detections. Little Brown bat calls are sometimes mis-identified as Indiana calls and Mackinac Island is outside of the known range of Indiana bats.

On the night of September 10-11 the overall detected activity increased approximately 560% compared to the previous night of September 9-10 (Figure 1). The actual cause for this increase is not known. The number of Little Browns detected accounted for approximately 292% of the overall increase in detections. The following period, September 11-12, total detections fell to less than half of the September 9-10 number. The sudden increase and drastic decrease in signals may indicate that a migratory swarm of Little Browns passed through the area.

The ambient temperature also increased the night of September 9-10. This may have contributed to the increase in detections. The detection numbers do not closely follow the changes in temperature, however, so temperature is not likely the sole reason for the increase in detections.

Figure 1 also shows that the number of signals not automatically assigned an auto ID follows a similar trend as the detections auto ID'ed as Little Browns. The detections that are not assigned an ID may contain chirps from multiple species that meet pre-set requirements for length and frequency to initiate recording what is considered a "true" detection. The auto ID function also only contains reference signals for bats in free flight and not other types of activity. It is a reasonable assumption, however, that the species with the most detections of animals in free flight will most likely dominate the number of chirps detected in the signals not assigned an auto ID.

The Kaleidoscope software also provides a statistically derived number indicating the probability of the presence of each of the auto ID'ed species. The three species identified with the highest probability of presence were the Little Brown, the Eastern Red or Red, and the Silver Hair. Big Brown detections appeared on only 2 nights, September 12-13 and 14-15. The Big Brown, had high probabilities of presence on these specific days and was therfore included in Figure 1.

Additional Figures

2) Map/Image showing location of instrumentation
3) Photo showing microphone placement

FGURE 2 – INSTRUMENTATION LOCATION

FIGURE 3 – MICROPHONE PLACEMENT