How does noise pollution affect the frequency/pitch of bird calls between the wetlands at Caven Point and the Urban green spaces of Lincoln Park West?

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Introduction

Urban noise pollution is trending upwards as cities are growing and becoming densely populated. Jersey City is ranked the third noisiest city in the United States (www.steelguardsafety.com), with the majority of the noise pollution being the lower frequencies of industrial machinery and traffic noise. Bird calls generally range from 1 kHz to 8 kHz, but due to the greater prominence of urban noise pollution, birds may adjust their vocalizations by increasing the frequency of their calls in response to noise pollution. Changes in bird calls due to urban noise pollution demonstrates the impact of human activity on the natural world. It causes changes in organisms' behavior to better adapt to the alterations in their surroundings. We completed this observational experiment on the Gray Catbird (*Dumetella carolinensis*). It was hypothesized that Catbirds in noisy areas will have higher-frequency calls than birds in quiet areas.

Hypothesis

- The Frequency of Gray catbird calls in the urban greenspace habitat of Lincoln Park West will be higher compared to the frequencies of Grey Catbird calls heard in the Wetland habitat of Caven Point.

Variables

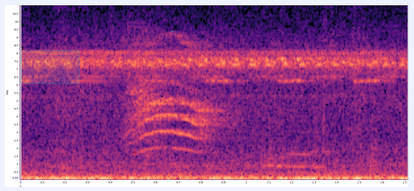
- Independent Variable: The noise pollution levels (site noise high/low): Caven Point is low, and Lincoln Park West is high
- Dependent Variable: The frequency/ pitch of the Gray Catbird calls
- Control Group: The low/normal noise pollution site: Caven Point (closest to natural, unaffected bird habitat)
- Constants (Controlled Variables): Time of day, observation duration, species of the bird, number of visits per site

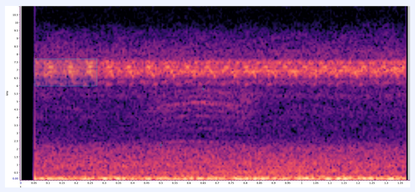
Methodology

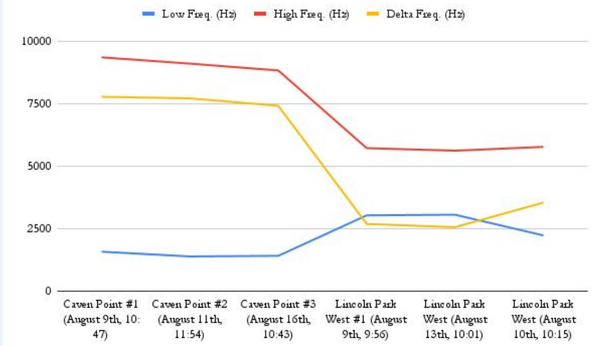
1. During the same time range of two different days (9:45 A.M. - 11:45 A.M.), two samples of the Gray Catbird's calls were recorded using Merlin Bird ID (a bird identification and recording app).
2. This was repeated for each of the two locations of high urban noise pollution (Lincoln Park West) and low urban noise pollution (Caven Point, Liberty State Park).
3. The recordings were then uploaded to the Raven Lite program, and each individual bird call was isolated.
4. The waves were then analyzed to determine whether there is a difference in frequencies (high and low) between the calls of the Gray Catbirds located in areas of high versus low noise pollution.

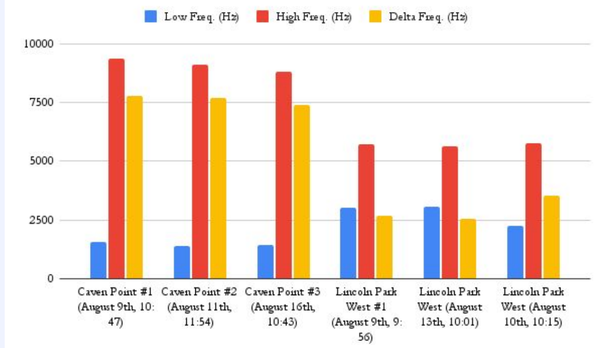
Results

Sample:	Low Freq. (Hz):	High Freq. (Hz):	Delta Freq. (Hz):	Ambient Noise Freq. (Hz):
Caven Point #1 (August 9th, 10:47)	1578.608	9357.990	7779.382	6061.856-8145.619
Caven Point #2 (August 11th, 11:54)	1389.175	9105.412	7716.237	7274.227-7387.887
Caven Point #3 (August 16th, 10:43)	1414.769	8832.746	7417.977	7035.607-7774.855
Lincoln Park West #1 (August 9th, 9:56)	3033.468	5722.803	2689.335	6066.936-7736.618
Lincoln Park West (August 13th, 10:01)	3058.960	5620.838	2561.878	5888.497-8182.717
Lincoln Park West (August 10th, 10:15)	2230.491	5773.786	3543.295	5952.225-7685.636









Conclusion

- Low frequencies and high frequencies in Gray Catbird calls increased and decreased respectively in places with higher urban noise pollution (1389.175-7779.382 Hz at Caven Point, 2230.491-3543.295 Hz at Lincoln Park West).
- The delta frequency/range of the frequencies in Gray Catbird calls decreased (7417.977-7779.382 in Caven Point, 2561.878-3543.295 Hz in Lincoln Park West).
- Frequency of ambient noise remained generally constant (5888.497-8182.717 Hz).
- Type of ambient noise varied, biophonic at Caven Point and anthrophobic at Lincoln Park West.

Future Directions

- Analyze the frequency of other native bird species:
  - Song Sparrow,
  - Northern Cardinal
  - American Robin
- Measure frequency of bird calls in places with higher levels of urban noise pollution in addition to urban green spaces.
- Compare bird call frequencies of different types of ambient noise:
  - Biophonic
  - Anthrophonic
  - Geophonic.
- Measure and compare decibel measurements of bird calls.
- Analyze if there are seasonal variations of bird calls during mating season.

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