Mortua Avis: Window Strikes At City Tech

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Abstract

This paper seeks to analyze possible patterns in avian bird strikes that have taken place on the New York City College of Technology Campus. To answer this question, sample tissue was taken from 14 dead birds that suffered from window collisions. This tissue is to be DNA barcoded using a Proteinase K protocol and vertebrate COI primers for PCR amplification. From an environmental perspective, this study is important to understand the statics and patterns behind which birds are more prone to crashes and why.

Introduction

- Every year, in New York City alone, between 90,000 and 230,000 birds die due to window collisions.
- Over the course of two years, samples of bird tissue had been taken from various birds succumbing to window collisions at the City Tech College campus, resulting in 14 samples.
- This investigation is important to prevent more possible bird casualties, as the data can be applied to find possible solutions to bird window collision. With the constant threat to biodiversity bird populations resulting from human activity, it is essential that steps are taken to ensure the survival of both engaged and thriving bird species.
- The goals of this experiment are two-fold; First, to identify possible patterns within the birds that have flown into the window, such as migratory habits and bird species. The second goal is to determine what window design qualities can be implemented to prevent bird collisions.

Materials & Methods

Sample collection

Feet from dead birds found around 285 Jay Street (40.695475, -73.986581) were collected into microcentrifuge tubes and stored at -80°C. Samples were collected from September through November of 2019, with a single sample from September 2020.

DNA extractions and sequencing

Feet from window strike victims were processed for DNA using the Zymo Quick DNA Miniprep Plus kit. Briefly, feet were thawed from -80°C and a small portion of foot pad was dissected to extract DNA from.

PCR amplification was performed to sequence DNA and Amplicons were sequenced by Azenta and sequences were analyzed on DNA Subway Blue Line.

Literature Meta-analysis

Meta-analysis of bird strikes was performed using a geographically similar data set (Gelb et al., 2006) and a dissimilar data set (Sabo et al., 2016).

Results

Figure 1. Representative sample of samples found outside the Eastern courtyard of 285 Jay Street. https://photos.app.goo.gl/Pd4Gg4vNZjkYFE6o7

Sample Date	Sample Sequence	Identification	Family
190930	A	Tennessee Warbler (*Vermivora peregrina*)	*Parulidae*
191010	B	Blackpoll Warbler (*Dendroica striata*)	*Parulidae*
191015	C	Tennessee Warbler (*Vermivora peregrina*)	*Parulidae*
191024	D	White-throated sparrow (*Zonotrichia albicollis*)	*Passerellidae*
191024	E	Blackpoll Warbler (*Dendroica striata*)	*Parulidae*
191024	F	White-throated sparrow (*Zonotrichia albicollis*)	*Passerellidae*
191025	G	Swamp Sparrow (*Melospiza georgiana*)	*Passerellidae*
191104	H	Dark-Eyed Junco (*Junco hyemalis*)	*Passerellidae*
191104	I	White-throated sparrow (*Zonotrichia albicollis*)	*Passerellidae*
191104	J	Dark-Eyed Junco (*Junco hyemalis*)	*Passerellidae*
191104	K	Dark-Eyed Junco (*Junco hyemalis*)	*Passerellidae*
191106	L	Dark-Eyed Junco (*Junco hyemalis*)	*Passerellidae*
191121	M	Dark-Eyed Junco (*Junco hyemalis*)	*Passerellidae*
200921	N	Northern Flicker (*Colaptes auratus*)	*Picidae*

Table 1. COI Identification of Window Strike Victims

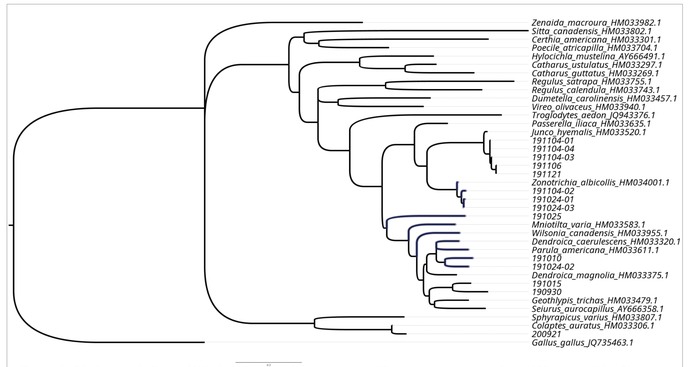

Figure 2. Phylogenetic Tree of Window Strikes. Species were verified against vouchers from NCBI nucleotide. Chicken was used as an outgroup.

Foot tissue from avian fatalities (Figure 1) were identified by DNA barcoding using the COI marker (Table 1). Comparison of barcode samples with reference sequences gathered on NCBI Nucleotide of representative species and Chicken were used to construct a phylogenetic tree (Figure 2). Setting the chicken as an outgroup permitted the clustering of the sequences to their identified targets. Even amongst these positive identifications, smaller sequence variations existed. The most prominent family identified belonged to *Passerellidae* (Figure 3). Species were categorized into residency status: Resident, Partial Resident, Migrant (Figure 4) and revealed that the most diverse category categorized within the migrant status. Trends from City Tech collisions trended with the more comprehensive archival data from Gelb et al. (2006) despite the vast difference in samples collected (Figure 5).

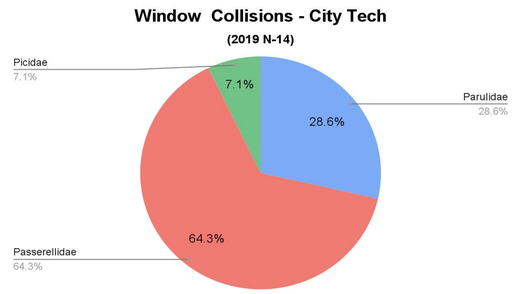

Figure 3. Window strikes representation by Family.

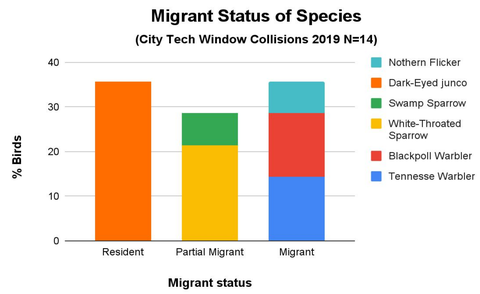

Figure 4. Migrant status of species

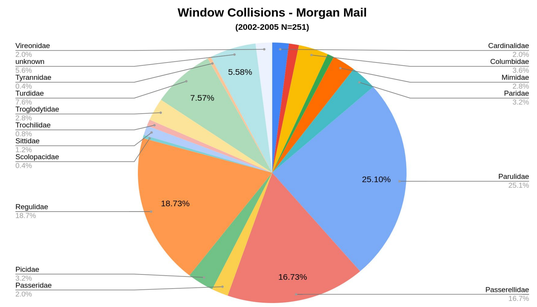

Figure 5.Archival window strikes in Manhattan. Gelb et al. (2006) performed an analysis from 2002-2005 of 251 windows strikes on the Morgan Mail building.

Discussion

The main takeaways from the data collected highlight that there are slight correlations in the susceptibility for window collision based on patterns in birds. Migratory and Partially Migratory birds made up a majority of the dead birds, and also showed greater levels of diversity in species However, because limited data was collected it is hard to make any real conclusions. These data coincide with prior literature and experiments. Although both resident and migrant birds collide into windows, the mortality of window collision is much higher and more frequent during migratory periods as illustrated by this collection from Fall migration. Extended longitudinal sample collection combined with genetic sexing may reveal additional factors involved in migratory patterns and collision susceptibility. Greater understanding of these trends would aid in designing mitigation strategies in intentional design of built environments.

Acknowledgements

The avian death trap known as 285 Jay Street, for which without there would not be a project.

References

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