Structure and Temperature of Brown Thrasher Nests in an Early Successional Habitat

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Introduction

Many invasive plants are on the rise globally (Richardson & Rejmánek, 2011). Because many avian species nest in trees or shrubs, their reproduction faces . Being able to nest successfully is necessary for birds to pass on their genes (Soler et al., 1998). The size of a nest can influence the number of nestlings that can be raised, but constructing a larger nest requires greater investment from a parent (Slagsvold, 1982). Additionally, environmental factors, particularly temperature, are crucial for birds to account for when assembling their nests (Schaaf & Peña, 2020).

Many bird species will show a preference for nesting in invasive plants over native plants (Schlossberg & King, 2010, Gleditsch & Carlo, 2014). Examining how major nest traits differ is important for long-term understanding of the impacts that invasive plants will have on ecosystems. Examining temperature differences between native and invasive nest sites will help elucidate the forces that influence nest success.

Brown Thrashers (*Toxostoma rufum*) are passerine birds that nest in early successional habitats, where they can have access to their preferred nest sites, habitats that possess high shrub density (Holoubek & Jensen, 2016). By studying thrasher nest temperature and structure in a habitat containing high quantities of both native and invasive plants, impact to bird nesting can be examined.

Methods

Data was collected at the Taylor Fork Ecological Area, an early successional habitat a short distance from the Eastern Kentucky University campus. Nests were located during the breeding season and removed from their site after it was deemed completed or abandoned, and were therefore no longer in use by thrashers. While some species reuse nests, thrashers do not reuse at a meaningful rate (Cavitt et al., 1999).

To record temperature, 1-Wire Thermochrons (hereafter referred to as IButtons) were deployed inside the nest. IButtons were placed in the center of the cup, where eggs would have sat, and took measurements every five minutes. For nests that had been removed, either the original nest or, in the case of the original nest being too fragile, an alternative nest was deployed back in that nest's location. In order to prevent loss of IButtons, a piece of string was attached to IButtons, while the other end was tied around a branch.

Measurements were taken from different points along the circumference of the nest, then averaged. Calculated measurements were developed from Soler et al. 1998. Nest volume was calculated from the formula $\frac{2}{3} \pi * a^2 b$, where a was the radius and b the height of that portion of the nest. A principal component analysis was performed for nest measurements. IButton records were compared to a weather station at Taylor Fork Ecological Area, which collects data at five minute intervals. Nest principal components and temperature were compared between native and invasive using Wilcoxon tests.

Results

Nest measurements did not differ greatly between native and invasive nests Outside diameter was smaller than 1933 measurements, but not 1977. (Table 1). PC1 had the highest loading scores for outside diameter and outside circumference, followed by thickness of the nest cup (-0.440, -0.410, 0.386). PC2 was most highly associated with inside diameter and inside circumference (0.589, 0.587) (Figure 1).

Table 1. Mean measurements (cm) for nests by substrate nativity. Standard deviation in parenthesis. Historical values taken from Erwin, 1933 and Partin, 1977.

Measurements	**Native**	**Invasive**	**1933**	**1977**
Outside Diameter	15.55 (2.63)	16.42 (2.11)	18.9	14-15.7
Inside Diameter	9.37 (1.93)	9.75 (1.32)	8.9	8.4-10.0
Depth	4.10 (2.00)	5.06 (1.65)	5.7	4.9
Height	9.49 (1.51)	10.06 (1.97)	N/A	8.9
Cir. Inside	30.21 (7.82)	31.67 (4.21)	N/A	N/A
Cir. Outside	52.30 (9.52)	55.74 (8.94)	N/A	N/A

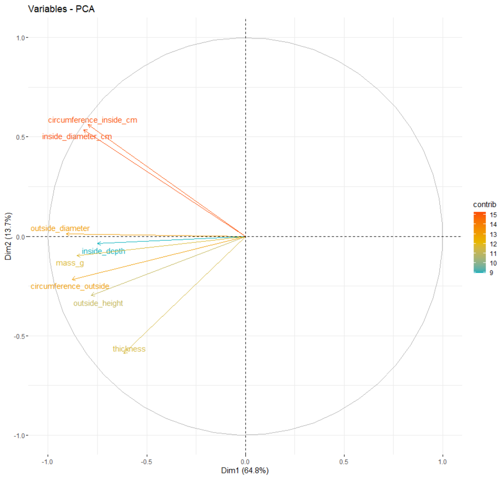

Figure 1. Principal Components of nest measurements.

Comparing principal component values between nativity, native and invasive substrates did not see any meaningful difference. While principal components varied more greatly for invasive species, principal components had similar average values (Figure 2). Nest temperature varied over the course of each day. Median temperature sat below was lower at the weather station from the hours 0-8 and 17-23. During the hours of 9-16 nest temperature was higher compared to the weather station (Figure 3).

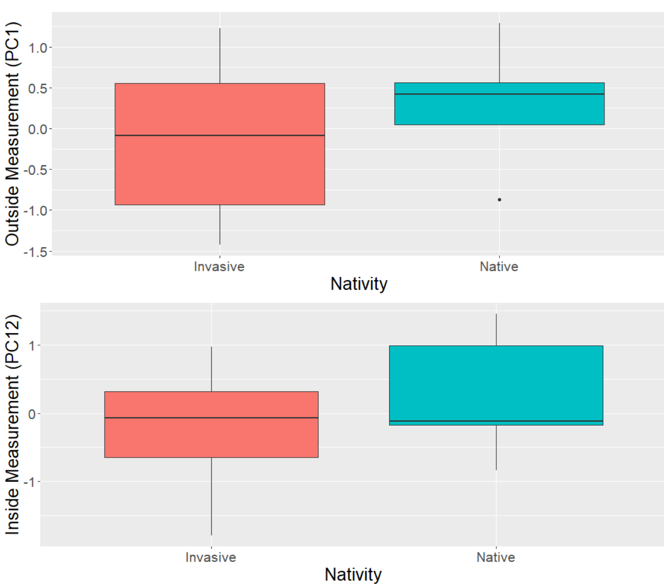

Figure 2: Comparison of Principal Components by whether a nest is native or invasive. For both components there is no significant difference between native or invasive nests. (PC1 P = 0.514, PC2 P = 0.679, N = 15)

Figure 3. Temperature differences between weather station and brown thrasher nests over the day at Taylor Fork Ecological Area in Richmond, Kentucky. Nests constructed in native nests saw significant hourly differences from nests constructed in invasive species (Wilcoxon Test p = <0.001, N = 14498).

Discussion

Whether or not our data can be applied to numerous locations remains unclear. All nests were examined in an early successional habitat. Other habitats, such as fence rows, may experience different conditions than ours, which limits the application of this data. Future research, expanding both the quantity of nests and of habitats, could help examine whether these trends are consistent across numerous habitats. Historical examinations of thrasher nests found heights and depths similar to ours, though our outside diameter seemed lower than the previous high.

Of the nests we observed, native nests saw significantly higher variation in temperature than their invasive counterparts. In previous studies, temperature as an aspect of invasive nesting sites has been generally overlooked, and the more stable temperatures we observed could be indicative of a cause for a preference for invasives.

Citations

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