

Acadian Flycatcher Nest Placement: A Strategy for Survival

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Introduction

Reproductive success is a key feature in the stability of a population and is governed by environmental parameters such as food availability, nest location, and predator-prey interaction. Nest predation has been shown to be the leading cause of nest failure for many bird species (Mullin and Cooper, 2002). The Black Rat Snake (*Elaphe obsoleta*) is a known predator of several avian species, including the Acadian Flycatcher (*Empidonax vireescens*).

Acadian Flycatchers position their nests on thin, flexible branches of understory trees. This placement may serve as a defense against predators. The weight of an adult snake on flexible branches may cause enough deflection and limb movement to compromise the predation attempt. Conversely, nests positioned on flexible, peripheral branches may have an increased chance of damage due to high winds (Wilson and Cooper, 1998). Branches of an intermediate diameter may not support the weight of an adult Black Rat Snake, but are strong enough to resist possible weather damage, thus raising nest survival odds. To test the hypothesis that Acadian Flycatchers choose branches of an intermediate diameter, I measured microhabitat characteristics at eleven Acadian Flycatcher nests and tested control trees of similar dimensions for branch deflection upon application of a model snake.

Materials and Methods

Study Site: The study was conducted in the south-central region of the Missouri Ozark Forest within the Current River Conservation Area in Shannon county. Acadian Flycatchers utilize this region as summer breeding grounds. Canopy trees included oak (*Quercus sp.*) and hickory (*Carya sp.*) while the understory included red maple (*Acer rubrum*), American hornbeam (*Carpinus caroliniana*) and flowering dogwood (*Cornus florida*) and other species.

Microhabitat Characteristics of Nests: Study nests occurred in the three species of understory tree mentioned above. Nests are woven of fine material and are typically located on peripheral edges of understory trees (Wilson and Cooper, 1998). Nests are often positioned on a thin bifurcate limb (primary branch). Microhabitat characteristics of eleven Acadian Flycatcher nests were recorded.

- tree species
- nest height
- nest distance from main trunk
- trunk circumference
- diameter of branch on which nest was positioned

Measurement of Primary Branch Deflection:

I tested control trees for maximum deflection when a snake model was positioned along the branch. I determined primary branch (see above) diameter by comparison with commercially available dowel rods. Branches were ultimately grouped by diameter into three size categories (sample size per species).

- small: ~ 0.3 cm ($n = 4$)
- middle: ~ 0.6 cm ($n = 8$)
- large: ~ 0.8 cm ($n = 4$)

For each species and size category, I recorded the initial angle with the horizontal of the primary branch using a carpenter's protractor. A snake model (1.55 m section of flexible metal drain hose with a mass of 465.7 g) was positioned on the primary branch and the model was laid along the branch to mimic an arboreal snake predation event. I then recorded the final angle of the branch below the horizontal. The angle (A) of deflection for each branch was calculated as $A_{deflection} = A_{final} - A_{initial}$.

Statistics

Statistical analysis for this study was conducted using the software SYSTAT. Deflection data for each category of each tree species was tested for normality using the One-sample: Kolmogorov-Smirnov test with Lilliefors probability. The Levene's test, a nonparametric test for homogeneity of variance, was used to test differences in variability of deflection data between the three species of tree and within the three branch diameter categories. Differences in average deflection among the categories were assessed using the nonparametric Kruskal-Wallis test.

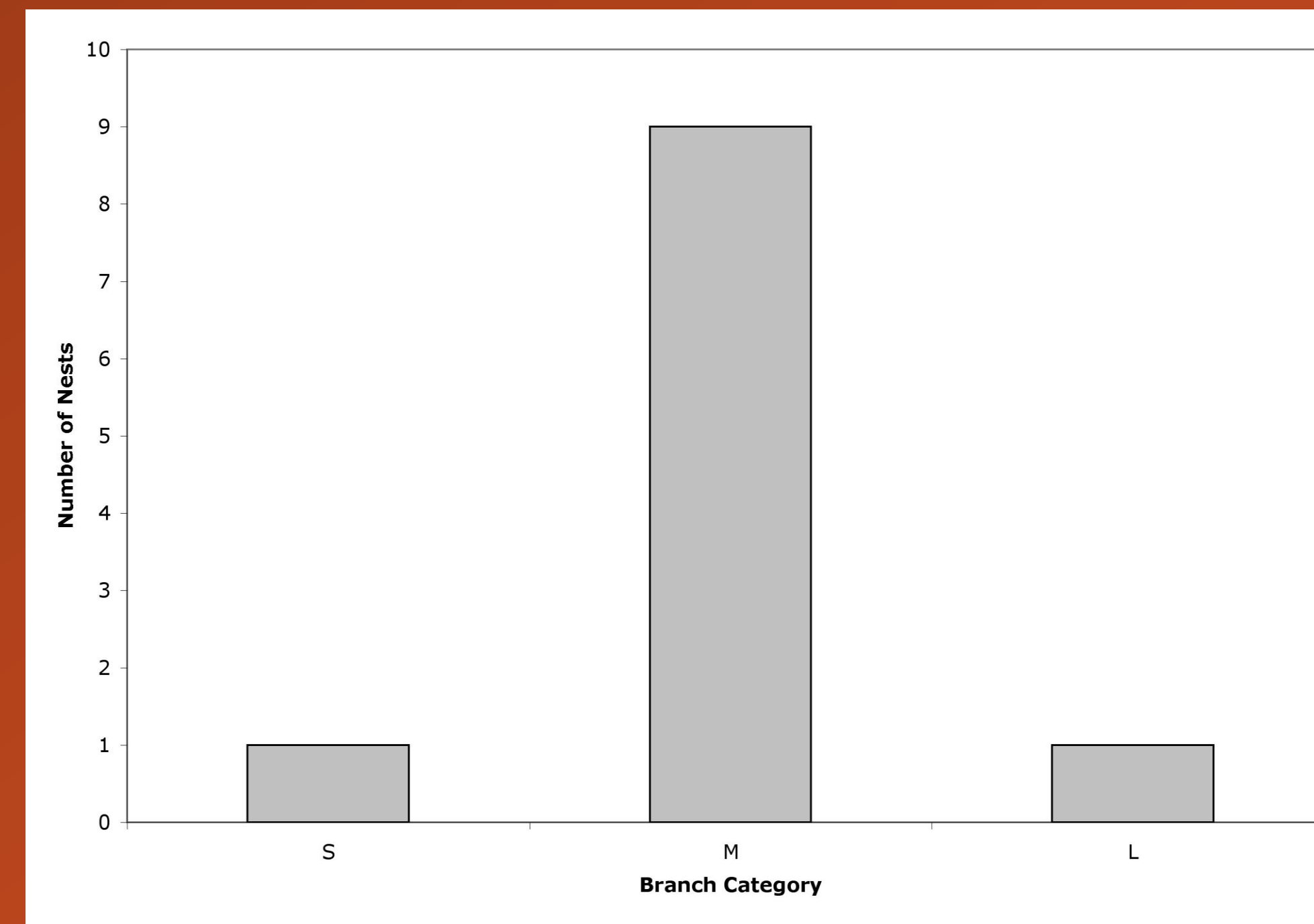


Fig. 1. Nest distribution across branch category ($n = 11$)

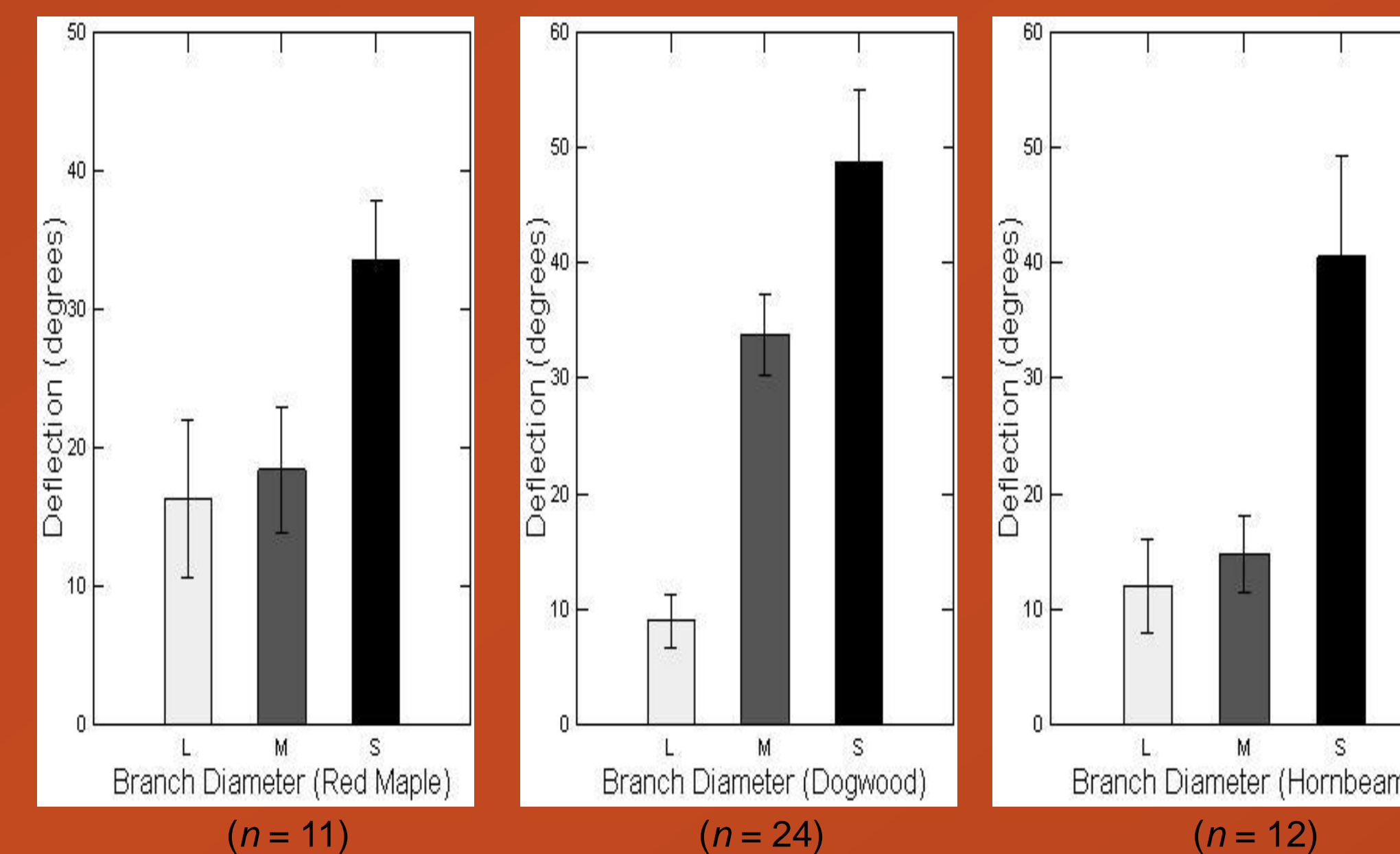


Fig. 2. Average deflection of branch category for three understory tree species

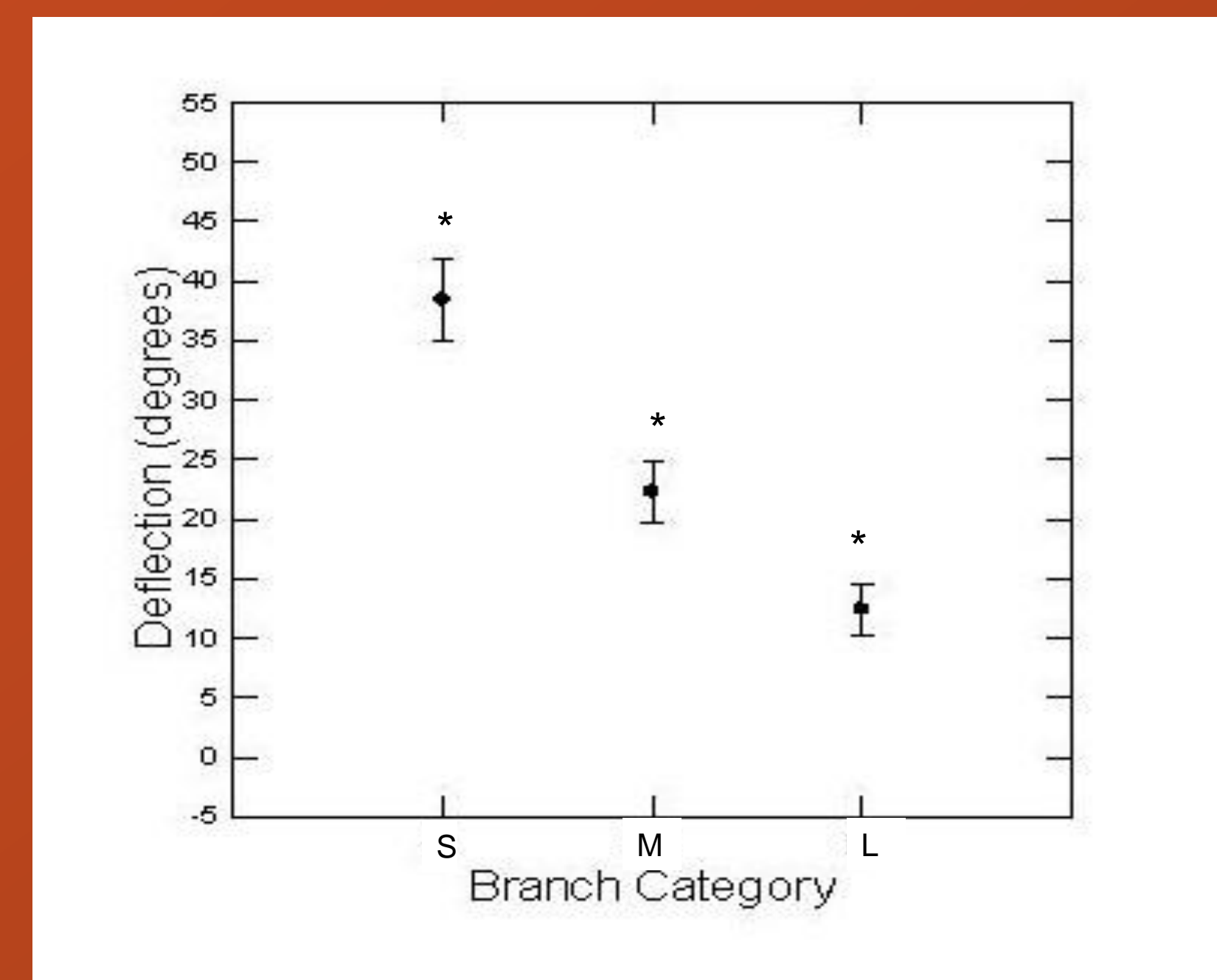


Fig. 3. Average deflection per branch category ($n = 47$)
* denotes significant difference

Results

Of the 11 Acadian Flycatcher nests measured, 5 were in red maple, 5 were in flowering dogwood, and 1 was in an American hornbeam (Fig. 1). 1 nest was located on a primary branch with a diameter ≤ 0.3 cm (S), 9 were located on a primary branch with a diameter between 0.5 cm and 0.6 cm (M) and 1 nest was located on a primary branch with a diameter ≥ 0.8 cm (L). There was no difference in variability of deflection among the tree species (Levene's Test, (A) $F = 0.72$, $p = 0.52$, (B) $F = 0.32$, $p = 0.73$, (C) $F = 0.07$, $p = 0.93$, (D) $F = 0.91$, $p = 0.44$, Table 2 and Fig. 2).

There was no difference in the variability of deflection between categories (Levene's Test, $F = 0.829$, $p = 0.458$). There was a significant difference between the average deflections of each category (Kruskal-Wallis's Test, $H = 19.6$, $p = 0.0006$). The S category had the greatest average deflection while the L category had the least average deflection (Refer to Table 1 and Fig. 3).

Discussion

As evidenced by Fig. 1, 9 out of the 11 (82%) Acadian Flycatcher nests measured were placed on branches of the M category suggesting that this species of bird preferentially chooses branches of an intermediate diameter for nest placement. For this study, tree species was inconsequential because there was no difference in the variability of deflection among the three different species (red maple, dogwood, American hornbeam) in which Acadian flycatchers nested.

There was significant difference between the average deflections of the three branch categories (Small, Medium, and Large) (see Fig. 3). The S category had the greatest average deflection while the L category had the least average deflection. The M category had an average deflection intermediately located between S and L. Although nest placement on branches of the S category might provide protection from predators due to large amounts of fluctuation and limb movement, such placement could increase the chance of damage due to high winds. Conversely, nest placement on branches of the L category may provide safety from high winds, but allow predators to more easily access the nest. The data presented within this study supports the hypothesis that Acadian Flycatchers preferentially choose branches of an intermediate diameter, which in turn have an intermediate average deflection, for their nest locations. This choice may represent a survival strategy in which a compromise between safety from predators and high winds is reached, increasing overall nest survival.

Acknowledgements and References

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