

## Abstract

Eastern Bluebirds (*S. sialis*) are known cavity nesters; however, they can often be found using nest boxes. Both the male and female Eastern Bluebird share the responsibilities of caring for their young. Typically, one pair will stay together for several seasons (All About Birds). Eastern Bluebirds often demonstrate assortative mating, or choosing a mate with a temperament resembling one's own (Burdick, 2018). Individuals who have a partner with a similar temperament will better protect their nest and have more successful fledglings. What remains unknown in past research is whether bluebirds choose a mate who will equally share the work of raising nestlings and whether equally partitioning pairs will have a higher nestling success rate.

In this study, we will observe six Eastern Bluebird pairs and how they care for their young. We hypothesize that equal partition between parents will result in a higher rate of nestling success. Six nest sites will be observed using trail camera images. Short videos shall be taken each time a parent visits the nest. Both the male and female will be individually recorded for the number of times they visit the nest. To determine nestling success, the number of eggs will be counted at the beginning of the study and the number of surviving young will be counted at the end of the study. Nests containing a similar number of surviving young to the starting number of eggs shall be considered the most successful. We expect to see a higher nestling success rate with pairs who partition equally versus pairs who do not. Based on the results of this study, other bird species that are known to partition in nest care can be compared. Learning how these birds partition will help us understand their natural behavior in parental care which could be beneficial for future endeavors in conservation. Based on the results of this preliminary study, a more comprehensive study can be done on Bluebirds as well as other birds who share parental duties.

## Introduction & Research Questions

Parental care is defined as behavioral traits shown by parents to help improve their offspring's fitness (Porrás-Reyes, et al., 2021). As nestlings grow, their demands for parental care change (Porrás-Reyes, et al., 2021). The parents are able to adjust their ability to provide and meet the needs of their young (Porrás-Reyes, et al., 2021). Eastern Bluebirds are a biparental species, and each parent may adjust to the nestling's needs differently. Along with parental care, nest defense has also been thought to increase nestling success (Burtka & Grindstaff, 2015). It has been seen in other biparental species that individuals who chose a mate with a similar personality will have a higher rate of nestling success (Burtka & Grindstaff, 2015). It has also been seen that parents who defend their nest similarly have offspring with larger mass sizes (Porrás-Reyes, et al., 2021). Based on this information, it could be assumed that parents who defend their nest similarly have larger nestlings that grow faster, leading them to fledging faster. What is unknown is whether bluebirds choose a mate who will equally share the work of raising nestlings and whether equally partitioning pairs will have a higher nestling success rate.

### Our research attempts to answer these questions:

- Do parents who partition equally have a higher rate of nestling success?
- Do young fledge sooner when parents partition equally?

## Design & Methods

### Experimental Design:

#### Independent Variable:

The level of equality in which the parents divided their workload

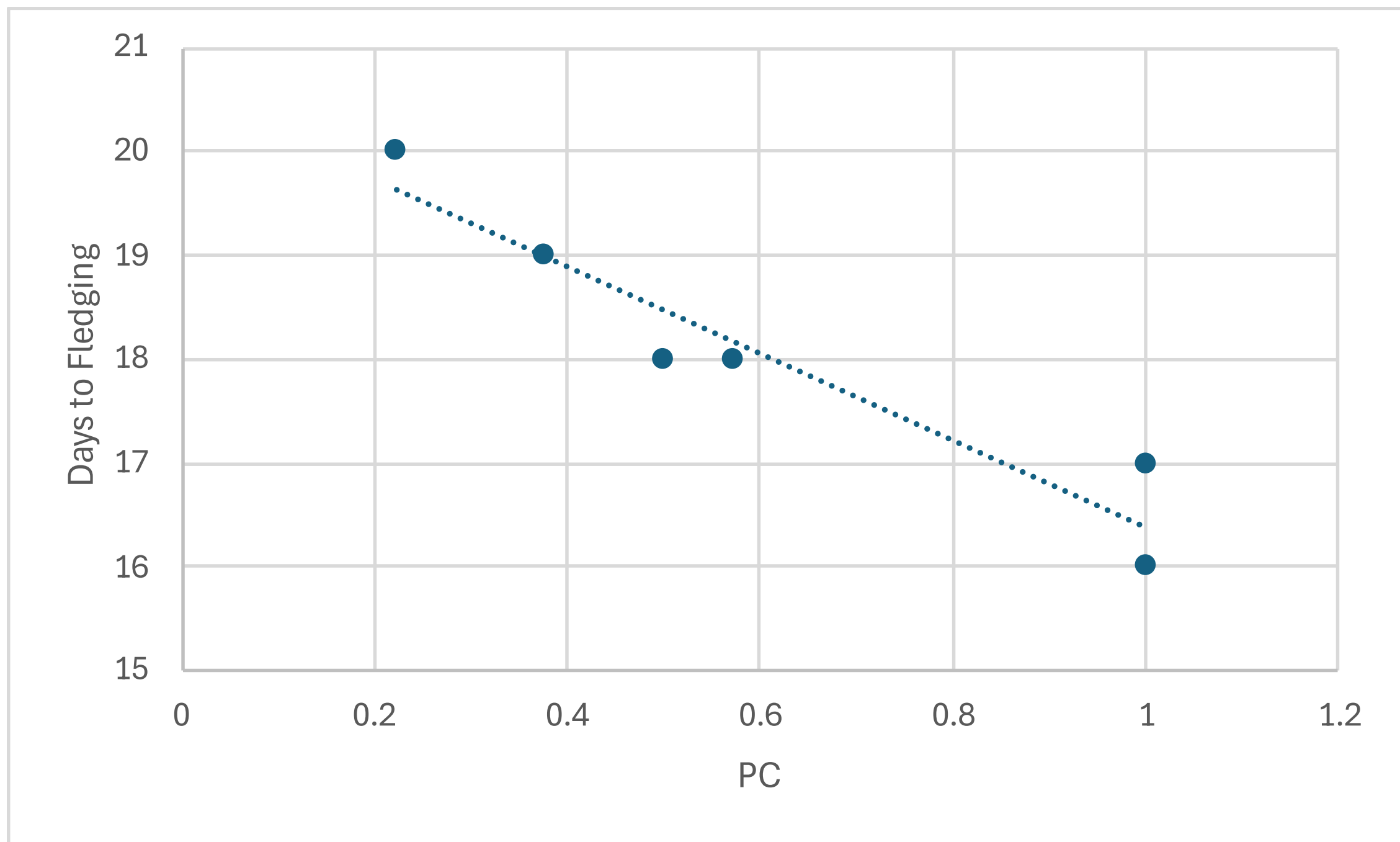
#### Dependent Variable:

The quality of young and the amount of time to fledging

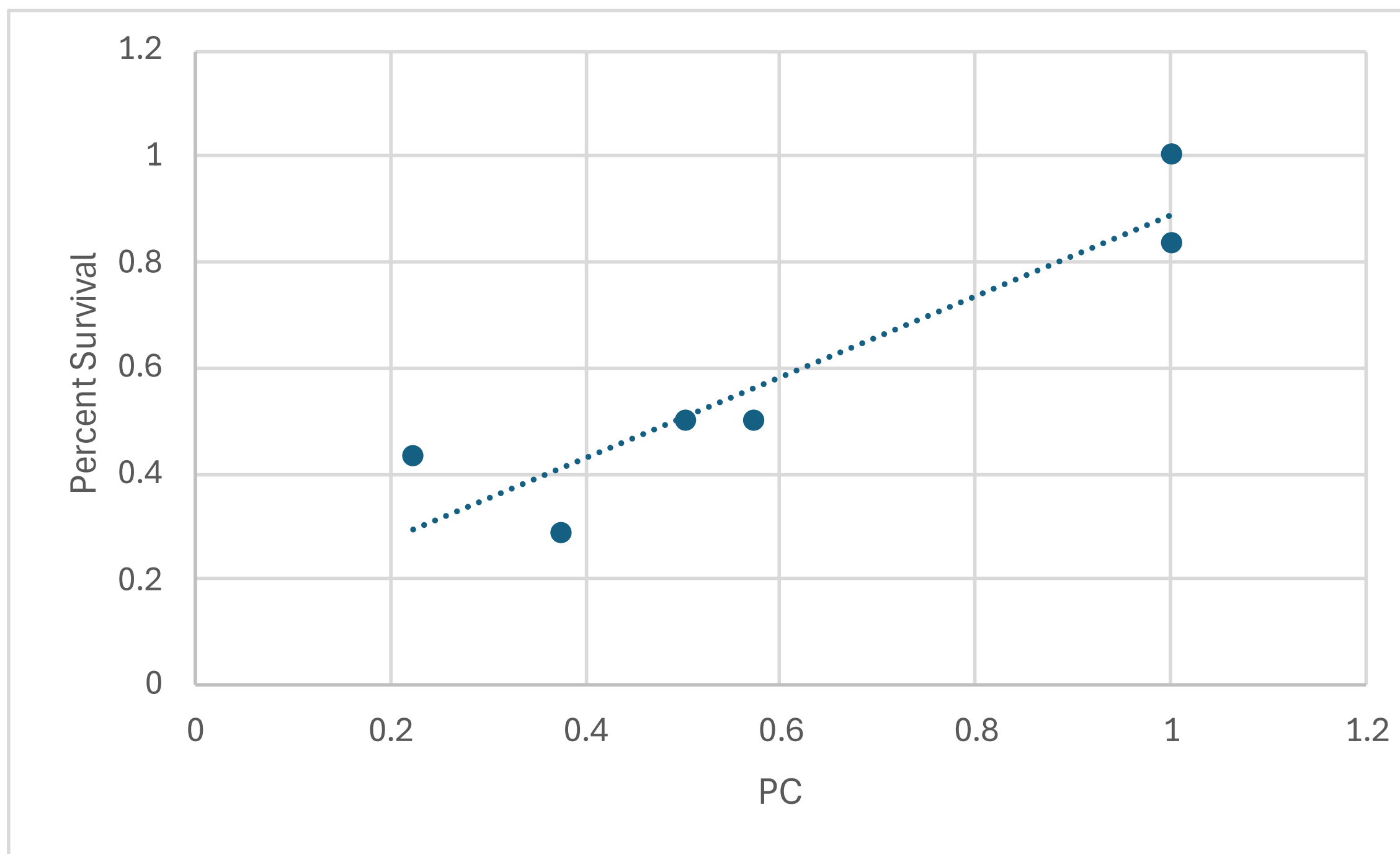
### Methods:

Six nest boxes were selected for the study and were ensured to be inhabited. A trail camera was placed in front of each box in a direction that allowed for an optimal view of the entrance. These cameras took pictures as the parents visited/fed the nestlings. The number of visits per hour was tracked based on the number of pictures (videos) taken of each parent for each hour. To determine nestling success, the boxes were examined for eggs, and the number for each nest was documented. The date the chicks hatched, the duration it took for them to fledge, and the number of young that survived till fledging were also recorded. The independent variable measured was the level of equality in which the parents divided their workload. The dependent variable consisted of the quality of the young and amount of time to fledging. The duration to fledging (in days) and percent survival were separately compared to the parental parity coefficient or PC (see Figures 1-2). The PC value refers to the visits of the parent less involved to visits of the one more involved (Leniowski, 2018). The closer the number of visits are between parents, the closer the PC is equal to 1 (Leniowski, 2018). As PC increases, the days to fledge increased and percent survival decreased.

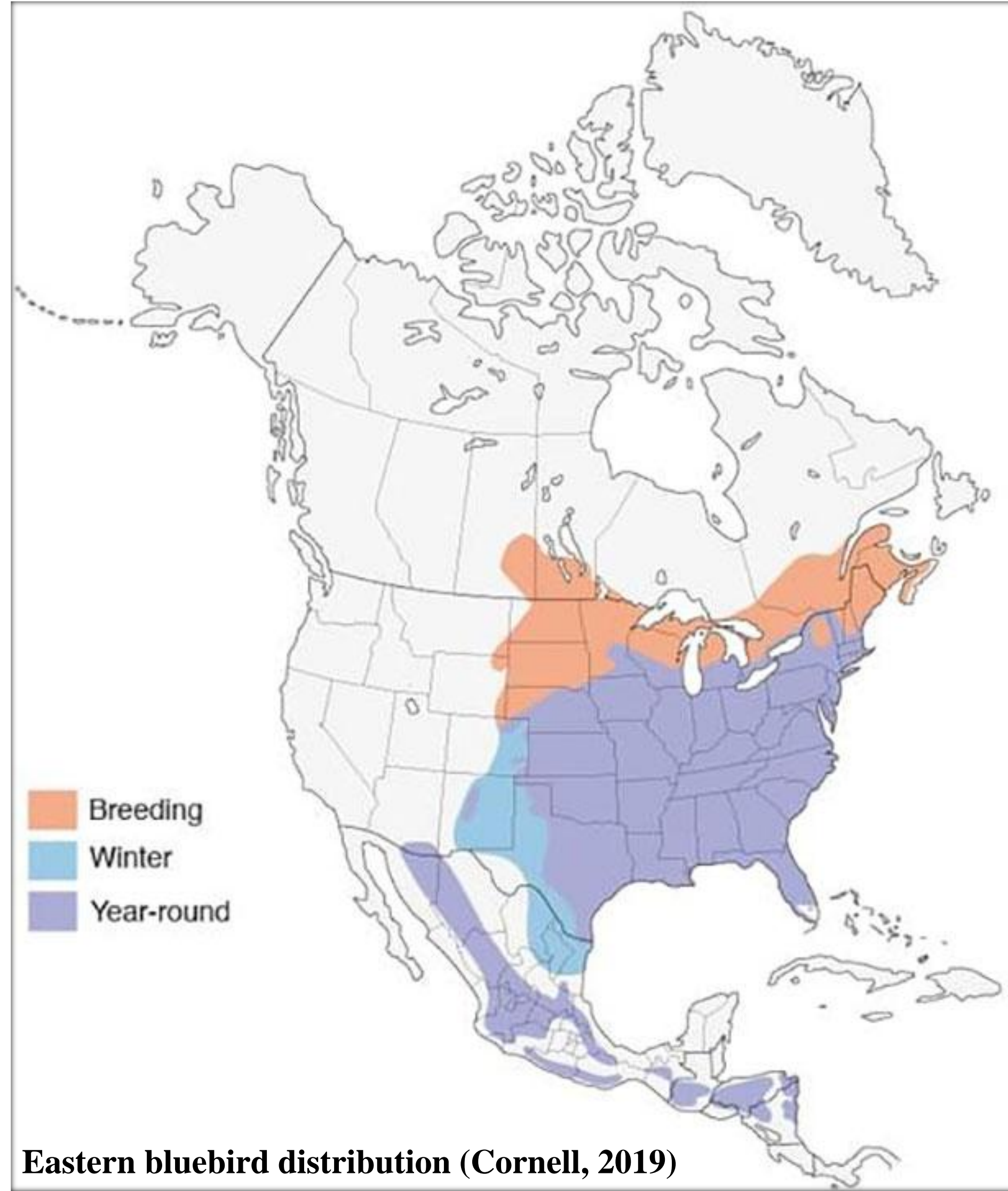
Male (left) and Female (right) Eastern Bluebirds (Ebird, N.d.)



**Figure 1.** The parental parity coefficient (PC) shows how equally parents partition work. The days to fledging variable shows the number of days from the hatch date to leaving the nest.



**Figure 2.** The parental parity coefficient (PC) shows how equally parents partition work. The percent survival variable shows what percent of eggs survived to fledging.



Male (left) and Female (right) Eastern Bluebirds (Ebird, N.d.)



## Results & Discussion

### Expected Results:

We are analyzing parental share in feeding nestlings based on visits per hour from the male and female. Using mock data, we were able to show what we expect our upcoming results to be. Nestlings whose parents equally shared feeding duties fledged sooner than offspring whose parents had more disparity ( $r = -0.95$ ,  $d.f.=5$ ,  $p=0.003$ ) (Figure 1). Parents who equally divided parental workload had a higher number of surviving nestlings ( $r = 0.92$ ,  $d.f. = 5$ ,  $p = 0.008$ ) (Figure 2).

	visits/ hr					
	nest 1	nest 2	nest 3	nest 4	nest 5	nest 6
female	5	7	3	8	4	2
male	10	7	8	8	7	9
number of eggs	4	5	7	6	4	7
number of nestlings	2	5	2	5	2	3
days to fledging (day)	14	12	16	13	15	17
percent survival	0.5	1	0.285714	0.833333	0.5	0.428571
parental parity coeff	0.5	1	0.375	1	0.571429	0.222222

Table 1. Mock data for six nests

### Discussion:

We expect more successful broods from equal parity parents because

- 1) other bi-parental species have exhibited similar results (Leniowski, K., & Węgrzyn, E., 2018)
- 2) Eastern Bluebirds have demonstrated assortative mating in other nesting qualities, but assortative mating in terms of parental parity is unknown (Burdick, C., 2018)
- 3) Parental care is costly, so equal parity among parents allows them to share energetic expenditures and prevents conflict among them (Leniowski, K., & Węgrzyn, E., 2018).

## Broader Impacts & Future Work

### Broader Impacts:

- Sheds light on the benefits of cooperative parenting in birds that exhibit bi-parental care.
- Provides insight into factors influencing mate choice in Eastern Bluebirds
- Aids in conservation efforts – could inform management practices for enhancing breeding success in cavity-nesting birds

### Future Work:

- Develop a more comprehensive study on other birds that exhibit bi-parental care

## References & Acknowledgement

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