Digest: Cooperative breeding strategies in birds are shaped by avian predator richness

Marquette Mutchler¹²

¹University of Chicago, Chicago, Illinois.

²The Field Museum of Natural History, Chicago, Illinois.

E-mail: mmutchler@uchicago.edu

Abstract

Despite their prevalence, family-living and cooperative breeding in birds have received little examination as to how and why they vary across species. Investigating the evolution of these social systems, Bliard et al. (2024) found that the presence of avian predators is associated with birds’ social systems, with increases in predator presence corresponding to multiple shifts from non-family-living to cooperative breeding. Phylogenetic comparative analyses indicate that factors outside the breeding season can select for family-living and cooperative breeding.
Cooperative breeding, a widespread form of helping where more than two individuals care for offspring or other group members (Ben Mocha et al. 2023), has historically been studied from an angle that seeks to find drivers of this behavior by comparing cooperative breeding and non-cooperative breeding systems (Drobniak et al. 2015). Unlike this historical framework, Bliard et al. (2024) search for drivers of cooperative breeding by using a steppingstone model, which reduces the issue of a binary comparison between generalized systems. This steppingstone model, first outlined by Griesser et al. (2017), considers more than a binary view of social systems, with family living a possible precursor to cooperative breeding. While the idea of family living, which involves the delayed dispersal of offspring, is not new and has been considered an important part of cooperative breeding behavior for some time (Emlen 1982; Koenig et al. 1992), the important distinction in this model lies in the multiple transitions from non-cooperative to cooperative systems (Griesser et al. 2017).

In their recent study using the steppingstone model, Bliard et al. (2024) sought to examine whether the presence of avian predators of adult birds is associated with the occurrence of cooperative behaviors, specifically family-living and cooperative breeding. Using a dataset containing pertinent information on 2,984 bird species and employing the steppingstone framework, the authors categorized each species by their social system, splitting the continuum of behaviors into three categories: no sociality, family-living, and cooperative breeding. To examine predator presence, they first estimated predation pressure through the characterization of predation risk based on all avian predators documented for each of the 2,984 bird species in their dataset. Further filtering, based on the average weights of prey for better estimates of corresponding predators, provided accurate predator richness estimates. This aided in the estimation of which predators directly prey upon which bird species and allowed the authors to directly assess the associations between social system and predation risk. In addition to this broad analysis, Bliard et al. (2024) explored the role of other
variables and confounders, such as habitat openness, various environmental variables (e.g. mean and within-year temperature and precipitation variance), and whether excluding Holarctic and migratory bird species would impact their findings.

Bliard et al. (2024) found that there is a likely association between the presence of avian predators and birds’ social systems. This pattern was not affected by the additional environmental confounders tested, nor by exclusions of Holarctic and migratory species. These results support the idea that higher predator pressure facilitates delayed dispersal of avian prey species, which is a step thought to precede cooperative breeding behaviors (Fig. 1).

The results of Bliard et al. (2024) further support the growing body of work that has investigated case-by-case associations of benefits gained when participating in social behaviors and the later evolution of cooperative breeding (e.g., Brown and Brown 1984; Griesser and Ekman 2005; Griesser, Nystrand, and Ekman 2006; Kingma et al. 2010). While this new article is correlational, it provides a strong connection between predation pressure and the subsequent evolution of delayed dispersal behaviors and cooperative breeding using a novel application of the stepping-stone framework.

Additional examinations of alternative strategies that mitigate predation pressure through non-sociality-based behaviors, such as in non-family-living and non-cooperative breeding species in high-predation areas, could further aid in understanding broad evolutionary patterns of these social behaviors. Several species-specific studies directly measure predator gradients (both on adult birds and offspring), where alterations in reproductive measures such as clutch size and parental visitations are prevalent both in species that do not form social units (Lima 2009; Fontaine and Martin 2006) and in those that do (Eggers, Griesser, and Ekman 2008). While these works do not directly connect sociality and the effects of predation fear, and likely do not have the power to do so, assessing these trade-off behaviors, as well as other eco-climatic variables by incorporating the same framework as Bliard et al. (2024), could help complete our understanding of the evolution of cooperative breeding.
References


Figure 1. Inexhaustive flowchart that highlights possible behavioral pathways under elevated predation pressure regarding the evolution of cooperative breeding. Illustrations (from left to right): Black-billed Cuckoo (*Coccyzus erythropthalmus*), Siberian Jay (*Perisoreus infaustus*), Florida Scrub-Jay (*Aphelocoma coerulescens*) by Marquette Mutchler.