

Too crowded, can't breed? **—Does density influence breeding success in collared flycatcher?**

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Collared flycatcher *Ficedula albicollis* is a small black and white song bird. It migrates every year, winters in central Africa and breeds in Europe and southwestern Asia. Naturally, it breeds in the tree holes. However, the tree holes are not many enough and limit the population of collared flycatcher. When man-made nest boxes were provided to enlarge the bird's choice, they were preferred over natural tree holes by the flycatchers.

On the island of Gotland in Sweden, woodlands are fragmentized by roads, houses and farms. Some of them have been hanged with nest boxes during the past 32 years. A defined fragment of woodland with nest boxes is called a plot. When a plot is established or new boxes are added in a plot, the breeding flycatcher population always increases fast at first, and then fluctuates. Breeding density is the density of breeding flycatcher pairs in a plot. As we can control the density by adding nest boxes, an experiment was done in a single plot last year.

I changed the box density in that plot by adding new boxes. High and low breeding density levels were created in five smaller sub-plots with similar habitats. Nest boxes were checked frequently to count the number of eggs, nestlings and dead chicks before fledging. Individual breeding success of collared flycatcher was measured as two formats: fledgling number (number of nestlings survived to fledge) and nesting success (number of fledglings per egg). The result of the experiment showed that high density of flycatchers had lower breeding success. This was mainly caused by food limitation. With limited food in a habitat, higher density leads to higher competition. At the same time, an individual will get less food. Lesser food fed to nestlings increased their mortality.

In another analysis, data of density and breeding success in 12 old plots from 1988 to 2011 was used. The population becomes more stable after a plot is established more than 3 years. So I only used the data of plots more than 3-year-old. When choosing a place to breed, collared flycatcher uses different information. One important cue is the performance of itself and other birds from its kind. That is, a collared flycatcher makes the habitat choice by thinking about the breeding success from previous year. Although the habitat quality changes by year, individuals could still make a best choice for itself. Ideally, every individual should try to get the highest breeding success by finding a proper breeding place. After competition and judgement, all individuals should get the same breeding success in different habitats. Thus, individual breeding success should be almost the same regardless of density. That was what I found in the old plots.

In conclusion, whether density influences breeding success or not depends on food limitation and individual choice.