

Effects of temperature and food on bird incubation behavior

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Introduction

➤ The reproductive period of all organisms is a critical stage, affecting the fitness of individuals and the viability of populations.

➤ In birds, adult behavior during incubation is critical not only for egg incubation but because trips to and from the nest can draw the attention of predators and reduce the chances of nest success (Skutch 1949, Martin et al. 2000).

➤ Minimizing such trips can be difficult for species that live in hot or cold environments, where keeping the eggs at a suitable temperature for embryonic development requires energy expenditures above the adult's resting metabolic rate (Vleck 1981, Williams 1996). The extra foraging trips required to meet increased energetic demands may be especially important in species that have uniparental incubation (only one sex incubates).

➤ I studied determinants and consequences of incubation behavior in the Northern Mockingbird (*Mimus polyglottos*), a species in which only females incubate and males do not provide food to the females.

Hypothesis

Incubation behavior is primarily determined by two factors: food availability and ambient temperature.

Methods

➤ Weekly Mockingbird nest searches were conducted on the University of Florida campus. Once found, each nest was randomly assigned to one of four treatments, according to a 2 x 2 factorial design.

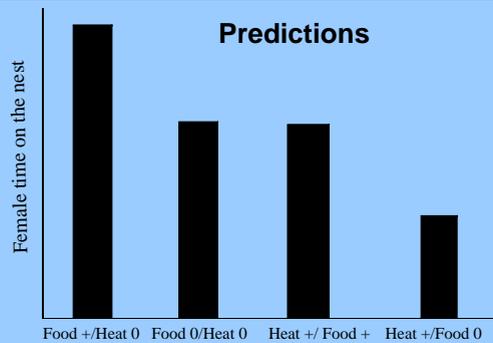
➤ In nests assigned to "temperature+" treatments, I used 12 watt light bulbs covered with aluminum foil and powered by rechargeable batteries, to increase the temperature near the eggs to 37°C. This is close to but not above the lethal temperature for the embryo (Webb 1987, Deeming 2002).

➤ To manipulate food availability I set up two artificial feeders per territory after at least half of the clutch had been laid. Feeders were stocked every day with mealworms.

➤ Incubation behavior was recorded by direct observations of banded individuals and by Hobo data loggers (Onset Computer Corporation, MA, USA) placed in each nest.

➤ When the female was off the nest, I quantified by direct observation the amount of time she foraged, rested, walked/flew, and interacted with other individuals. These observations were conducted for eight hours (sunrise-14:00) for each bird in each treatment, stratifying time of day and time since clutch initiation.

➤ There were 16 to 19 independent nests for each combination of food and temperature treatments (70 nests, total). For all of these nests, I have observational data on what the female was doing when she was off the nest. For a total of 52 nests (an average of 13 nests per treatment), I have complete information from data loggers on when the female was on or off the nest.



➤ Females in habitats with high food availability will spend more time on the nest, as hunger levels will be lower and foraging time off the nest will be lower (Zimmerling and Ankney 2005).

2) Females on nests in hotter microclimates will decrease time on nest and thereby increase total number of trips to the nest per day, as predicted by Conway and Martin (2000).

3) Because food and heat influence time on the nest in opposite directions (predictions 1 and 2), females that experience both hot microclimates and high food abundance should spend an intermediate amount of time on the nest.

Results

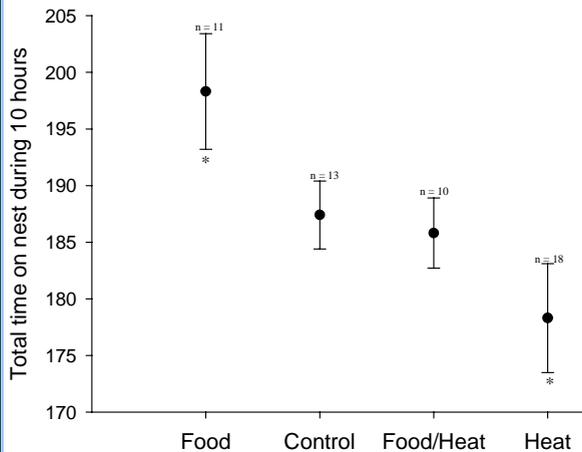


Figure 1. Total time among all the nest during 24 hours period, during ten days, the bars are the standard error.

*ANOVA df 3, F 3.58, p = 0.02

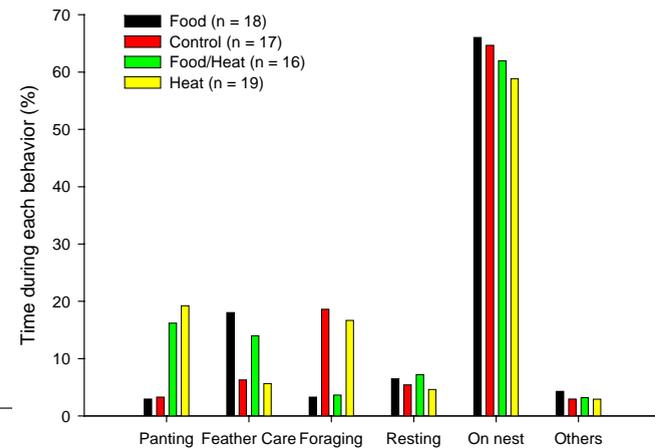


Figure 2. Continuous eight hours observations on incubating females Mockingbirds

Conclusions

➤ Food and heat affect the female's time on the nest, as predicted

➤ Food and heat have opposite effects on the female's time on the nest.

➤ Females with food supplements increased time spent on plumage care.

Acknowledgment

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