



Research Experiences for Undergraduates (REU) 2011

Abstract

GILMAN, T., JHWUENG, T., BOTESTEANU, D., GOGLIO, F. and Y. YONG. How does the effort a mother bird expends on her offspring depend on the attractiveness of her mate? National Institute of Mathematical and Biological Synthesis, University of Tennessee, Knoxville, TN, Department of Mathematics, Mount Holyoke College, South Hadley, MA, Department of Biology, University of Wisconsin at Madison, Madison, WI and Department of Mathematics and Statistics, University of Florida, Gainesville, FL.

The Differential Allocation Hypothesis (DAH) proposes that selection would favor individuals in a population that invest more resources in their current reproductive attempt when paired with a high-quality mate, at the expense of future reproductive attempts. Additionally, it is argued that differential allocation should take place to a greater extent in polygamous species than in those that are strictly monogamous, since these species are more likely to engage in extra-pair copulations or mate switching. In this study, a two-fold approach was used to investigate the circumstances in which DAH would occur: firstly, a mathematical model was developed to illustrate the relationship between male attractiveness and female fitness, while taking into account viability and sexual selection, and also allowing varying levels of extra-pair paternity (EPP). The model provides a theoretical framework for determining whether DAH depends on EPP, assuming that male attractiveness only signals indirect fitness benefits. Secondly, meta-analytical techniques with correction for phylogeny were used to examine data from 31 empirical studies of 20 species of birds, using egg size and egg androgen content as response variables. A multiple regression model was formed using data collected from existing literature on avian species to determine the correlation between the male's attractiveness and EPP in the context of DAH. The goal was to verify the predictions of the theoretical model with empirical evidence.