

Summary

Social monogamy, closely associated with bi-parental care, is the most frequent pairing system found in birds. Because females invest more into the reproduction, they are usually considered to be the sex that chooses the partner. To satisfy female preferences in the mate choice males in various species developed a number of traits that signalize their quality. What qualities are signaled by these traits and what mechanisms are responsible for the emergence, development and maintenance of these traits is the subject of a number of evolutionary-ecological studies.

By pairing with an appropriate male female can obtain direct or indirect benefits to its own fitness. The good parent theory suggests that male secondary sexual traits signalize male ability to provide parental care (a direct benefit). An indirect benefit is presented by the quality of the genetic material that the female obtains from male for her offspring. According to the good genes hypothesis females use secondary male ornamentation to assess genetic quality of males. One of the most studied secondary sexual ornaments that can advertise male quality and may be used in mate choice by females is the plumage colouration. In many avian species there is sexual dimorphism in the plumage colouration and there is also growing evidence that intensity of male colouration may positively correlate with male reproductive success. Three basic types of pigments (carotenoids, melanin or porphyrin) as well as the feather structure are responsible for plumage colouration in birds. In my thesis I have focused on carotenoid-based colouration. It is often assumed that sexual selection can drive the evolution of carotenoid-based ornament expression in a condition-dependent manner, which might explain the role of the traits as honest indicators of health.

However, females may not select their mates based on such an absolute criteria, i.e., simply prefer males that exhibit the most elaborate ornaments. As predicted by the “genetic complementarity” model of sexual selection, females may use relative, self-referential criteria when choosing their partners, i.e., they choose partners according to their own genotype in the process of disassortative mating.

The strength of sexual selection is adequate to the variability in reproductive success that has generally been expressed as variation in the number of young the male sires. Variation in the number and quality of social mates has traditionally been recognized as the main source of variance of male reproductive success. This is valid especially in polygynous species, where some males pair with more than one female. However, with the spread of molecular methods it has been shown that 86% of bird species are genetically polygamous. In monogamous species, especially species with one brood in season, the extra-pair fertilizations (EPF) may represent an important way how to increase the individual reproductive success. Hence, extra-pair fertilization might play an important role in sexual selection. The rate of extra-pair fertilizations in a certain species depends on a number of factors such as population density, sex ratio, breeding synchrony and female motivation, which can depend on need of parental care or male attraction.

This PhD thesis focuses on mechanisms of mate choice in a socially monogamous passerine, the Scarlet rosetfinch *Carpodacus erythrinus*, and uses extra-pair fertilizations as a model system for testing the above mentioned hypotheses. It contains four chapters representing three published articles and one submitted manuscript. In the first part of the thesis information on how extra-pair fertilization increase the opportunity for sexual selection in a long-distance migratory passerine, the scarlet rosetfinch, is provided. The second part adds information about the contribution of EPF to selection of carotenoid-based secondary male ornamentation. Third article investigates the impact of MHC class I variability on within-pair and extra-pair fertilization success. The idea that secondary male ornaments signalize his provisioning rates as well as the prediction that the intensity of male parental care is affected by occurrence of extra-pair young in his nest are examined in the last article.