Dichromatism in Passerine Males and Other Aspects of Sexual Selection

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1. Summary of PhD Thesis

The main goal of the presented thesis was to test some of the predictions of hypotheses concerning delayed plumage maturation (DPM) in the Black Redstart (*Phoenicurus ochruros*), a species suitable for such a study due to its high breeding density in urban habitats. I studied arrival pattern, size, quality and distributional pattern of territories and aggressive behaviour of subadult and adult males, and hormonal correlates of plumage colouration in Black Redstart.

The birds inhabiting South Moravian villages did not show differential timing of arrivals between yearlings and older birds in the resource-rich environment. On the other hand, under suboptimal conditions in Prague the yearlings were delayed of three days on average compared to the adult males. There is the possibility for the young birds of this species to sample the situation on a potential breeding site during autumnal singing period and flexibly fit its migrating behaviour according to the circumstances. In such a case the reduction investment hypothesis is the best explanation for different arrival timing of yearling and adult males in Black Redstart.

To test predictions of status signal hypothesis, which claims that the adults less frequently attack dull coloured subadult males, and consequently DPM facilitates survival of subadults during the first breeding season, the experiments were performed in two habitats in the Prague suburbs; a housing estate and garden city. Subadult and adult males of Black Redstart (*Phoenicurus ochruros*) were exposed to stuffed dummies of both age categories. Contrary to predictions of SSH, brown (subadult like) coloration of the dummy had no suppressive effect on defensive behaviour of the resident males. On the other hand, subadult males were more active in vocal territorial defence such as singing and producing snarl and whistle sounds during the experiments. The defenders of smaller territories generally behaved more aggressively than defenders of large territories in habitat of garden city, and especially adult males responded more aggressively against dummies in this habitat. In housing estate, the habitat of evenly distributed resources (i. e. vertical surfaces), the birds tended to observe the dummy prior to attack it directly.

Territory size, distributions of territories and habitat selection were studied in Black Redstart (Phoenicurus ochruros) populations in three urban habitats of Prague (Czech Republic). We tested if the territory size and quality of territories occupied by adult and subadult males differed from each other. This difference was not statistically significant. Moreover, males of particular age-class were not spatially clustered. Microhabitat analysis shows that the habitat selection depends on the presence of buildings. Apparently buildings offer a good nesting, singing and foraging places for the Black Redstart. The territory size of Black Redstarts differed between habitats, being largest in the garden city, intermediate in the old housing estate and smallest in the new housing estate.

To examine proximate mechanisms of DPM, we assessed levels of testosterone (T) in circulating blood of subadult and adult males. The results confirmed seasonal T pattern typical for most temperate passerines, however, there were no marked differences between males of different colouration and/or age neither during the breeding season nor in the autumn and winter months. Nevertheless, analysis of blood samples collected during the moult, i.e., at

the time of plumage development, revealed significantly higher T levels in males moulting to adult colour than in those moulting to subadult one. This statistical association may suggest a certain role of T in regulation of DPM. This view may be indirectly supported by the fact that body weight as a fundamental covariate of physiological and life history variable is not correlated with T levels and do not differ between males moulting to subadult and adult feather coat.

In conclusion, these studies generally support the reduction investment hypothesis as an explanation of DPM in Black Redstart, although the distributional pattern of territories matches the female mimicry hypothesis better. However, I found no evidence sharply in violation of reduction investment hypothesis.

The last paper concerns about another phenomenon related to sexual selection, i. e. extra-pair paternity. Females of many socially monogamous bird species engage in - or even actively seek - copulations outside their social pair bond. However, in socially monogamous birds with low breeding abundance, such as the red-backed shrike *Lanius collurio*, extra-pair paternity (EPP) was thought to be an exceptional and random incident. Here we provide evidence that EPP in the red-backed shrike increases with breeding density and results in male-biased brood sex ratio. Drawing on samples collected in an unusually dense red-backed shrike population in the Czech Republic, we show through DNA microsatellite typing that among 65 chicks from 15 nests, 10 individuals (26.5%) had been sired by males other than the nest-attending social mate. All 10 extra pair young were of male sex. In all cases, genetic fathers of extra pair young stemmed from neighbouring territories. Extra pair fathers had significantly longer tarsi than social mates, indicating that female choice was a function of age-dependent body size. Our findings support sex allocation theory, which suggests that promiscuous females mating with higher quality males should produce mostly sons.