Interspecific cross-fostering affects mate guarding behaviour in great tits (*Parus major*)

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Summary

Mate guarding is thought to decrease the likelihood of cuckoldry and, hence, increase the fitness of guarding males. Mate guarding is costly for males and must be traded off with other fitness-enhancing behaviours. Over several years, we have cross-fostered great tits (*Parus major*) to blue tits (*Cyanistes caeruleus*) and this experimental treatment has influenced the mate and rival recognition of cross-fostered birds. Here we show that cross-fostered great tit males mate guard their females less than do control great tits, regardless of whether the cross-fostered males were mated to great tit females or cross-fostered blue tit females. Cross-fostered great tit males sang more and interacted more frequently with blue tit males than did controls. Females paired to males of the two groups did not differ in the extent to which they initiated movements away from their mates. We conclude that the altered species-assortative behaviour resulting from interspecific cross-fostering influences mate guarding in great tit males, probably by cross-fostered males increasing investment in territorial behaviour at the expense of mate guarding, and/or by cross-fostered males mate guarding less due to a reduced affinity for their female. Such trade-offs may have a general significance for mate guarding species.

Keywords: mate guarding, territoriality, mate quality, sexual imprinting, cross-fostering, *Parus major*.

Introduction

Mate guarding is characterized by the male closely following the female during her fertile period. This behaviour has been observed in a variety of

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species, especially among solitary, territorial birds (Birkhead et al., 1987), and it is thought to reduce extrapair paternity in the nest of the guarding male (Birkhead & Møller, 1992). The effectiveness of mate guarding in preventing cuckoldry seems variable; mixed results emerge from correlative as well as experimental studies (reviewed in Chuang-Dobbs et al., 2001; Komdeur et al., 2007). Females may obtain extrapair copulations (EPCs) by performing extraterritorial forays (Neudorf et al., 1997; Dalziell & Cockburn, 2008) or through the approach of intruding males (Marthinsen et al., 2005; Woolfenden et al., 2005). The adaptiveness of EPCs for females is debated (Arnqvist & Kirkpatrick, 2005; Griffith, 2007), but mating outside the social bond may be beneficial for females if it increases the genetic quality of her offspring (Kempenaers et al., 1992; Foerster et al., 2003) and/or ensures sufficient fertilization in case her social mate is deficient in this respect (Krokene et al., 1998; Lifjeld et al., 2007). Alternative, nonexclusive hypotheses for the function of close proximity of partners include male protection of the female to avoid harassment by other males, and to avoid predation (reviewed in Birkhead & Møller, 1992).

Mate guarding is presumably costly for males, both in terms of time and energy (Grafen, 1980; Komdeur, 2001), and males must, thus, trade off mate guarding with other fitness-enhancing activities, such as foraging (Westneat, 1994) or gaining extrapair copulations (Marthinsen et al., 2005) or secondary females (Hasselquist & Bensch, 1991). In addition, intrinsic factors such as male age (Johnsen et al., 2003) and male quality (Kempenaers et al., 1995) may influence the costs and benefits of mate guarding. Guarding of paternity may also be achieved by alternative behaviours, like frequent copulations and territoriality (Birkhead & Møller, 1992). Hence, many factors may contribute to the expression of mate guarding and may explain the observed variation in this behaviour both within and among species/populations (e.g., Birkhead & Biggins, 1987; Møller, 1987a). Both great tits (Bjørklund & Westman, 1986) and blue tits (Kempenaers et al., 1995) mate guard, although this behaviour has not been extensively studied in any of the species.

Here, we compare the mate guarding behaviour of great tit (*Parus major*) males that have been reared by great tits or blue tits (*Cyanistes caeruleus*), i.e., controls and cross-fostered males. Studying the mate guarding behaviour of cross-fostered great tit males is interesting because their species-assortative behaviour has been altered. They may mate with great tits as well