

SEXUAL IMPRINTING SUPPORTS THE EVOLUTION OF NOVEL MALE TRAITS BY TRANSFERENCE OF A PREFERENCE FOR THE COLOUR RED

by

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Summary

We investigated if sexual imprinting on birds with a red artificial trait can influence female preference for mates bearing other novel, *i.e.* not-imprinted traits in male Javanese mannikins (*Lonchura leucogastroides*). We tested two groups of females in mate choice tests. One group of females was sexually imprinted on parent birds adorned with a red feather on the forehead. The other group was raised by normal unadorned birds and was assumed to be sexually imprinted on the normal unadorned phenotype. Females could choose between unadorned and adorned males in simultaneous double choice tests. The adorned males were ornamented with three different kinds of artificial ornament, which differed from the learned red feather on the forehead in a specific manner. The novel traits were a blue feather which differed from the familiar red feather in colour only, red stripes at the tail which had the same colour as the red feather but differed in shape and position at the body, and blue stripes at the tail (same colour as the blue forehead feather), which were different from the red feather in all three qualities.

Females which were sexually imprinted on the red feather showed a similar strong preference for the red stripes at the tail as for the learned red feather. These same females showed no preference for males bearing a blue feather on the forehead or for males bearing blue stripes at the tail. This shows that sexual imprinting on a red trait leads to a preference only for another novel red trait due to transference of a preference for the colour red. The control females which were raised by unadorned birds responded on average indifferently to males bearing any of the artificial traits, *i.e.* some females rejected adorned males, some

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females preferred adorned males. To latter females it seems that a novel male ornament is somewhat attractive independent of any previous learning.

Sexual imprinting on the red feather can influence female mate preferences for mates bearing other novel artificial traits due to transference of a preference for the colour red. Transference of colour preference makes it possible to react to a stimulus that differs from the imprinting stimulus in size, shape or position and therefore might play an important role in the evolution of conspicuous male traits.

Introduction

Female mate choice is one of the most powerful driving forces in sexual selection. Females choose males on the basis of secondary sexual ornaments and prefer to mate with those males bearing the most elaborate trait(s) (overview in Andersson, 1994). Thus, female mate choice leads to the exaggeration of conspicuous ornamental traits in males. This has been shown in many studies in which male traits have been artificially enlarged or diminished (Andersson, 1982; Møller, 1994). Female mate choice can not only lead to the exaggeration of already existing male traits but it can also lead to the evolution of novel traits. Jones & Hunter (1998) showed that naturally crestless least auklets (*Aethia pusilla*) preferred conspecifics of the opposite sex adorned with a forehead crest as a novel trait for this species. Witte (1991) and Witte & Curio (1999) found in the Javanese mannikin (*Lonchura leucogastroides*), a monomorphic estrildid finch, that females exhibited a preference for naturally unattractive males and reproduced with them when those males were adorned with a red feather on the forehead as an evolutionarily novel trait. In two other estrildid finches Tyler Burley & Symanski (1998) showed that zebra finch females (*Taeniopygia guttata castanotis*) and both sexes of the monomorphic long-tailed finch (*Poephila acuticauda*) exhibited a preference for mates with a white crest as an evolutionarily novel trait. Additionally, Burley and her co-authors have shown that in zebra finches coloured leg bands have a significant influence on the attractiveness in males and females (Burley, 1986a; Burley *et al.*, 1982), on the sex ratio in offspring (Burley, 1981), on parental investment in the current brood (Burley, 1988), and on reproductive success (Burley, 1986b). Thus in birds, females often show a preference for mates with novel traits.

The sensory exploitation hypothesis (Ryan, 1990) provides an explanation for the initial evolution of novel male traits. This hypothesis holds that females have a hidden preference for male traits before those traits are