

FEMALE GOULDIAN FINCHES USE HEAD COLOUR TO DECIDE THE SEX OF THEIR YOUNG

by

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DECISIONS, DECISIONS!!

Photo: Mike Fidler

Researchers from Macquarie University studying the behaviour of the Gouldian Finch have made an interesting discovery - females have the ability to deliberately overproduce sons when breeding with a male of a different head colour!

The two-year captive breeding study carried out by Drs. Sarah Pryke and Simon Griffith at the *Save The Gouldian Fund* research facility at Martinsville, NSW, has produced some clear evidence that Gouldian Finches are capable of deliberately biasing the gender of their eggs.

Their findings were published in March, 2009 in the prestigious international journal, *Science*.

Gouldian Finches are unique in that they can have either red (30% of individuals), black (70%) or yellow head colours while being members of the same species. Individual Gouldians discriminate between black-headed and red-headed mates demonstrating mate preferences for their own head colour. However, amongst wild populations of Gouldians up to 30% of breeding pairs are of mixed head colours. Studies on the breeding of mixed pairs in captive birds revealed a high offspring mortality. Throughout offspring development from egg to sexual maturity (160 days) mixed pairs have 40.2% greater mortality of sons and 83.8% greater mortality of daughters than broods produced from same head colour pairs.

Two hundred female Gouldians (100 red-headed and 100 black-headed) were randomly paired with either a black or red male known head colour genotype. That is the males were either black, red or red split for black-headedness in a visually isolated cage. Once their offspring reached independence, after 60 days, the male and the young were removed, and 18 days later the female was re-paired with a male of the opposite head colour. Each female therefore bred twice, once with a male of her own head colour and once with a male of the opposite head colour. Females in mixed head colour pairs produced broods with male biased sex ratios (82.1% males), whereas females in matched head colour pairs produced an unbiased sex ratio (45.9% males).

To determine if the females in mixed head coloured pairs overproduced sons, independent of any mortality effects resulting from breeding with genetically incompatible mates, researchers artificially blackened the heads of red males before pairing them to red and black females and allowing them to breed. They found that black females paired to these red males who had been artificially blackened to resemble black males, produced a sex ratio that did not differ significantly from equality (55% males) despite their mates still being genetically red males. Interestingly, this ratio was similar to the ratio of male offspring produced when red females were paired with red split black males (56%). Red females paired to experimentally blackened red males produced significantly more males (72%) despite having fully genetically compatible mates in these black-headed partners. Change the colour of the male's head with dye and the sex ratio changes. Females gain greater fitness benefits from overproducing sons when paired with a non-preferred male because of the severe mortality effects on daughters in mixed head coloured pairs.

The researchers also looked at the relative investment by females in reproduction. They found that individual females in mixed pairs produced significantly fewer eggs (3.39 plus or minus 1.07) than when breeding in matched pairs (5.67 plus or minus 0.89). Females in mixed pairs also laid significantly smaller eggs than when breeding with a male of the same head colour. Egg volume was unrelated to the sex of the resulting offspring, but a positive correlation was found with the mass of the chick when measured 2 days after hatching. It was also found that when chicks from both mixed and matched pairs were fostered to nests of matched pairs they grew faster than fostered chicks in mixed nests irrespective of their genetic origin. The difference between the mass of chicks between nests reared by foster parents of mixed and matched pairs (9.1%) appeared to be due to a per capita increase in providing food to the chicks by the mothers (not the fathers) in matched pairs. These effects were also present in pairs where the male's head was artificially blackened.

This discovery has important implications for how we conserve and ultimately save this beautiful finch in the wild and highlights just how little we know about this iconic Australian bird.

For many years aviculturists have been mystified in trying to come to terms with the many aspects involved in the keeping and breeding of Gouldian Finches. These new findings will greatly assist those seeking to set up breeding programmes for these gems of the avian world.

[This research makes a strong case for keeping each head colour separate, and not having aviaries containing a mixture of head colours. Ed.]