



Starling Shenanigans

“In most avian cooperative breeders, 40 to 60 percent of offspring are a result of extra-pair matings, but in superb starlings, only about 14 percent are fathered by other males.” – D. Rubenstein

The superb starling (*Lamprotornis superbus*), one of about 110 starling species in the world, lives a communal existence in east Africa replete with sexual intrigue.

About 40 percent of starling species are cooperative breeders; the raising of young is shared by the breeding pair and relatives like older siblings, uncles, aunts and cousins. But superb starlings go one step further. They are plural cooperative breeders, forming family groups of up to 30 individuals with several breeding pairs sharing a pool of helpers. This web of relationships is further complicated—the mated pairs are not always faithful. Promiscuity rates among superb starlings vary, but can rise to over 30 percent of offspring within a group. Interestingly, it is the females who seek extra-pair matings.

What drives some birds to cheat while others remain faithful and still others completely forgo reproduction? Dustin Rubenstein, an evolutionary biologist at Columbia University in New York, has been examining the factors that influence superb starling mating behavior for over ten years. Three reports describe his findings, which are also summarized in the July/August 2009 issue of *Natural History*.

For decades biologists have understood that when individuals forgo breeding to help others reproduce, their assistance extends only to kin. In this fashion they still perpetuate their own genes, obeying a fundamental rule of natural selection. Many bird species practice cooperative breeding, and biologists have long suspected that environmental conditions like a shortage of food may cause some birds to become helpers.

The first study by Rubenstein and his colleague, Irby Lovette, in the August 21, 2007 issue of *Current Biology* provides an answer. They looked at 45 species of African starlings, of which 23 are cooperative breeders, to determine what environmental factor(s) result in cooperative breeding. They found that cooperative breeding is most closely associated with semi-arid savanna habitats, which differ from forests and deserts. Savannas show more variability in average yearly rainfall than any other habitat. The unpredictability causes some birds that might otherwise breed to hold off until they are certain of adequate rainfall—and insects. This flexibility allows the group to take full advantage of the temporal environmental conditions. “When you don’t know what conditions you will be facing in the next breeding season, it pays—in an evolutionary sense—to live and breed in family groups because more chicks survive over the long haul”, said Rubenstein. Thus in each breeding season a calculation is made: stay home and raise relatives or move out and establish a new nesting site.

How birds make this decision was investigated by Rubenstein in another study in the August 5, 2008 issue of *General and Comparative Endocrinology*. For ten breeding seasons, from 2001 to 2005 (birds breed March-May and in November), Rubenstein and his colleagues studied a group of superb starlings in Kenya. During the dry season (pre-breeding) birds decide their future breeding roles. Each dry season the team captured about 35 pre-breeding birds and measured blood levels of two hormones, prolactin (PRL) and corticosterone (Cort). PRL is associated with egg-laying and feeding of chicks, while Cort is associated with a variety of stressors, including low social rank. They found that the decision to breed is linked to hormone levels. High levels of PRL make birds breeders, while those with high levels of Cort become helpers.

The third study in the May 25, 2007 issue of the *Proceedings of the Royal Society* investigates what is perhaps the most interesting question of all. What prompts some birds to practice promiscuity?

Rubenstein and his team followed seven family groups over ten breeding seasons in Kenya. During two of these seasons they collected DNA samples from 476 birds, including 247 nestlings. By using a set of DNA sequences that varies greatly among individuals, they could determine the paternity of the nestlings. Fourteen percent of the nestlings were sired by an extra-pair male. Half the males were from within the family group and half from other family groups. Why did some cheating females choose males within the group, while others went further astray?

The scientists found that in prior years females who mated with within-group males had fewer helpers. By mating with an extra-pair male the female gained another helper, giving her a chance to raise more young. But outside-the group males do not become helpers, so why did other females seek them out?

Females who cheated with outside-the group males were pair-bonded to males genetically very similar to themselves. By mating with strangers they introduced new genes into their brood. "We can break down the reasons why superb starling females are not faithful to their mates and see that they have different extra-pair mating strategies," concludes Rubenstein. "It adds a whole new layer of complexity to the story."

The story is that female superb starlings trade sex for help in rearing their young or to give them better genes. You might say they cheat for the sake of the children.

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