

In bird couples, who is taking care of the kids?

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In the Chinese penduline tit, there are three different arrangements for parental care: only by the father, only by the mother, or by both. This picture shows a male and female building the nest. Credit: Jinshan Jiang

Sex roles in birds describe sex differences in courtship, mate

competition, social pair-bonds, and parental care. Different explanations have been put forward to explain these differences but none are based on a comprehensive study. Therefore, an international team of experts set out to analyze data on 1,800 of the approximately 9,000 different species of birds as their study organisms. The results show that adult sex ratios are the main driving force for differences in sex roles. A paper on this study was published in *Ecology Letters* on 25 February.

In birds, there can be huge differences between the sexes, both in characteristics, such as size or color, and in behavior, such as courtship or parental care. "There are differences between bird species but there is also quite a bit of variation within species," says Jan Komdeur, Professor of Evolutionary Ecology at the University of Groningen. All this may affect how birds can adapt to changing circumstances, such as [climate change](#), and cope with anthropogenic threats, such as habitat loss. It is therefore useful to know exactly how differences in [sex roles](#) have evolved.

Choosier

A classic explanation is that of gametic investment: females produce just a few eggs each year but each rich with nutrients, while males have nearly unlimited supplies of tiny sperm in their semen. "The idea is that this makes females choosier," explains Komdeur. However, this alone is not enough to explain all sex role differences. Other contributing factors that have been proposed are climate, life histories, and social factors. "However, no comprehensive analysis has been performed of their effect across bird species."

Back in 2014, Komdeur discussed this with his colleague Tamás Székely, Professor at the Milner Centre for Evolution in the UK, who spent several months at the University of Groningen as a visiting scholar funded by the Dutch Research Council NWO. "We got in touch with a

postdoctoral researcher, Alejandro Gonzalez-Voyer, who was keen to undertake such an analysis." This task turned out to be of Herculean proportions: there are around 9,000 [bird species](#) and he had to collect data on sex roles and variables that might affect them for all of these.



In the pheasant-tailed jacana, males take care of the eggs and the young as is shown in this picture. Credit: Ghulam Rasool

Complex

The sex roles in this study were competition and attraction of mates, pair-bonding, and parental care. Sexual size dimorphism, sexual dichromatism, social mating system, and parental investment in post-

mating care were used as proxies for these roles. Four drivers for differences in sex roles were analyzed: the climate in which each species lives, life-history (such as the life span), social environment (especially the sex ratio in adult birds), and phylogeny (the ancestry of a species).

"The job was more complex than we had anticipated," acknowledges Komdeur. "It could take up to a week to assess one species. Some 6,000 birds were investigated and, in the end, we obtained a full data set for 1,800 species. Only those were used in the analysis." The results showed that climate, life histories, and phylogeny had no significant effect on sex roles in [birds](#). "This is surprising since the literature suggests that climate and life history are important; however, this was often based on studies with just a few species."

Sex ratio

The only factor that significantly influenced sex roles was the social environment, specifically the adult sex ratio. "One explanation for this is that when there is a surplus of males, they have to compete fiercely for a mate and will have less energy to care for the young." On the other hand, when there is a surplus of females, they do not have to spend a lot of energy on finding a mate and, therefore, can invest more in their young.

The scientists made sure that the statistical power of a comparison between 1,800 species was enough to detect significant contributions to sex roles. They also corrected for other possible confounders. Overall, the biologists found a lot of variation in sex roles within species. "It is very rare that sex roles are completely fixed in a species." The adult sex ratio is determined by a difference in mortality between the [species](#) and this may be driven by climate changes. These processes should be investigated in a new study. Komdeur says that "we do not know everything but our study does show that the [social environment](#) is an important driver of sex roles."

More information: Alejandro Gonzalez-Voyer et al, Sex roles in birds: Phylogenetic analyses of the influence of climate, life histories and social environment, *Ecology Letters* (2022). [DOI: 10.1111/ele.13938](https://doi.org/10.1111/ele.13938)

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