Shorebirds prefer a good body to a large brain

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In the African Jacana (Actophilornis africanus), the female mates with several males and it is the males who raise offspring. Credit: Daniel Sol.

In many animal species, males and females differ in terms of their brain size. The most common explanation is that these differences stem from sexual selection. But predictions are not always certain. A team of researchers at the Centre for Ecological Research and Forestry Applications has discovered that a group of coastal birds, shorebirds, do not choose their mates by brain size but "on their physiques".

Some authors have suggested that sexual selection could promote brain enlargement in males, in other words, that females prefer males with more developed cognitive abilities. Others, however, have suggested that females should have larger brains because they are generally the sex that raises offspring.

"In this study we ask what role sexual selection plays in the brain size evolution of a group of birds, namely shorebirds. This group's choices are not random, as this family shows great diversity in its mating systems. This makes them an excellent model to study to research the role of sexual selection on brain size evolution," Daniel Sol, a researcher at the Spanish National Research Council (CSIC) in the Centre for Ecological Research and Forestry Applications (CREAF) and co-author of the study published in the *Journal of Evolutionary Biology*, explains to SINC.

The study, which analysed over 180 species, revealed a "surprising" fact to the researchers: polyandrous species - those in which one female mates with various males - have smaller brains relative to their bodies than monogamous and polygynous species, in the latter of which a male mates with several females.

"These results contradict many theories which suggest that sexual selection has played an important role in brain size evolution because if this were the case, polygynous species would also present sexual dimorphism - different sizes between males and females - but according to our analysis, this is not the case," the CREAF researcher continues.

"So we might ask ourselves the question: why do polyandrous species have smaller, more dimorphic brains? The answer is that we don't know. However, in the study we present some results that suggest a possible explanation: that sexual selection might have acted by increasing body size in females instead of reducing their brains."

The conclusion: the scientists have found that in this family of birds, body size evolves much more quickly than brain size. As brain size is measured relative to body size, increased body size leads to a reduction in relative brain size.

A bigger brain is not needed to take care of children

This study also negates another widespread idea: that parental care requires greater cognitive

abilities and thus relatively larger brains.

"If this were the case, females of polygynous species would have larger brains than males because they have to look after their offspring. In reality, however, males and females don't differ in the relative sizes of their brains," Sol clarifies.

Finally, the fact that polygynous species do not have smaller brains than monogamous species negates the "social intelligence" hypothesis, which speculates that brain size has increased in species in which relations between partners or group members are more complex and require greater cognitive abilities.

According to the expert, this is due to the fact that in monogamous species, in which the male and female continually interact and have to coordinate with each other to raise offspring, sexual relationships are expected to be more complex than in polygynous species.

"We must tread carefully when deducing that differences in sexual dimorphism in brain size are due to sexual selection. With the evidence we have to date, we cannot conclude that sexual selection has been a significant force in brain size evolution," Sol emphasises.

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