

House sparrow status signalling theory no longer flies

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Credit: AI-generated image ([disclaimer](#))

The size of a male house sparrow's bib has long been associated with the bird's fighting abilities and status within the flock. But an international team of researchers has shown there is little evidence to support it.

For decades, evolutionary biologists have pointed to the [house](#) sparrow

as a textbook example of the status signalling hypothesis at work.

But a multi-institutional study involving UNSW is about to suggest such a theory is for the birds.

Status signalling in the animal world refers to the way that physical characteristics convey information about the strength and rank of an individual in the group. Like stripes and badges on a military uniform, physical markings in the animal world can tell other members to be wary of challenging an individual bearing them.

In the world of birds, the size of the bib on the male house sparrow – a black patch on the plumage of the sparrow's throat – has been associated with the bird's level of influence in the flock. The bigger the bib, the better the fighting ability, with cuckoldry and reproductive success some of the potential associated privileges.

Study author, Associate Professor Shinichi Nakagawa of UNSW's School of Biological, Earth and Environmental Sciences says the status signalling hypothesis describes a system of survival that is designed to prevent the needless expenditure of energy.

"Avoiding unnecessary fights is important so many animal species have evolved signals to indicate their fighting abilities," A/Professor Nakagawa says.

"The bib size of familiar house sparrow males has been an iconic example of such status signalling, often called the 'badge of status'."

So accepted is this view of house sparrow behaviour that Sir David Attenborough, in the acclaimed television series *The Life of Birds* (1998), devoted a few minutes of film to make an analogy between the size of the bib markings in sparrows and its corresponding military rank.

But how much evidence is there for the association between bib size and status in flocks of house sparrows?

Not much, the research paper suggests.

In a meta-analysis of both published and unpublished studies since the idea was first floated in the 1980s, A/Professor Nakagawa and his international colleagues found a number of trends that made them question the strength of the original hypothesis.

The first was that the published data from each subsequent study testing the hypothesis has shown a gradual decrease in correlation between the evidence and the original theory. In other words, as more and more data has rolled in over time, less and less of a correlation has been found.

"This is a very well-known phenomenon called 'the time-lag' bias," A/Professor Nakagawa says.

"The initial findings usually come from a study with a small sample size with a large effect, but later studies with larger sample sizes can reveal that the true effect is much smaller than the initial finding."

The effect size (ie. correlation) is a measure between -1 and 1 where a score of 1 indicates a perfect positive correlation between male bib size and social ranks, 0 represents none whatsoever, while—1 describes a perfect negative correlation. The authors observed that in the published studies, the effect size "decreased over time, and recently published effects were, on average, no longer distinguishable from zero".

But perhaps most telling was the data analysis of the unpublished studies. Not only did the male house sparrow's bib size correlate less to observed dominant behaviour, but the authors suspected this to be an example of 'publication bias'.

A/Professor Nakagawa explains:

"Publication bias is where non-significant results, like not being able to find a relationship or negative results, are less likely to be published," he says.

"There are many reasons for this but two major reasons are: first, journals are less likely to take negative results as the authors might have had 'wrong' study designs or sample size too small to detect an effect and second, authors do not bother publishing for the same reasons."

Interestingly, A/Professor Nakagawa was involved in earlier published studies that supported the idea of bib size correlating with status signalling.

"The original meta-analysis was conducted during my Ph.D. more than a decade ago," A/Professor Nakagawa says.

"Yes, I did indeed find a strong relationship between the bib size and male social ranking. However, I was using the published work up until then. Given that set of the published studies, I did not find any evidence of publication bias.

"What this shows is the importance of updating a meta-analysis."

So if there is now doubt surrounding the relationship between the male house sparrow's bib-size and [status](#), do the markings mean anything at all? A/Professor Nakagawa believes they do, and says this will be the subject of further study.

"One thing we know for sure is that the bib size is an age indicator," he says.

"Also, females seem to prefer older males as their partner, especially when it comes to extra-pair mating. But we do not really know whether females are using the bib size to assess male age or not. So it will be great to find this out."

More information: Alfredo Sánchez-Tójar et al. Meta-analysis challenges a textbook example of status signalling and demonstrates publication bias, *eLife* (2018). [DOI: 10.7554/eLife.37385](https://doi.org/10.7554/eLife.37385)

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