

## Hue of barn swallow breast feathers can influence their health, says study

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CU-Boulder Assistant Professor Rebecca Safran, colleagues and students are working on a long-term project looking at the reproductive strategies and evolution of North American barn swallows. Credit: Kevin Stearns

A new study conducted at the University of Colorado Boulder and involving Cornell University shows the outward appearance of female barn swallows, specifically the hue of their chestnut-colored breast feathers, has an influence on their physiological health.

It has been known that in North American barn swallows, both males and females, those with darker ventral feathers have higher reproductive success than those with lighter colors, said Cornell Senior Research Associate Maren Vitousek, who led the new research while a postdoctoral researcher at CU-Boulder. Although there is evidence that breast feather color is significantly influenced by genetics, melanin-based plumage color like that in barn swallows also has been tied to social status and even to circulating testosterone, she said.

The new study showed that both naturally darker barn swallow females and those with artificially darkened breast feathers also had lower levels of oxidative damage, which could ultimately make the [birds](#) healthier. Oxidative stress results when the production of harmful metabolites known as [free radicals](#) exceeds antioxidant defenses in the birds, which can lead to DNA, protein and fat damage in the birds, said Vitousek.

"Intriguingly, females whose feathers were darkened to resemble 'attractive' birds rapidly adopted the [physiological state](#) of darker birds, decreasing their level of oxidative damage," said Vitousek. "These results suggest the appearance of an individual may be an under-appreciated driver of physiological health."

A paper on the subject by Vitousek, CU-Boulder Assistant Professor Rebecca Safran and Indiana University Research Associate Rosemary Stewart appeared in the Aug. 21 online edition of *Biology Letters*, a publication of the Royal Society in London. The National Science Foundation, the Max Planck Institute in Radolfzell, Germany, and CU-Boulder funded the study.

A 2008 study led by CU-Boulder's Safran showed the testosterone of male North American barn swallows skyrocketed early in the breeding season when their breast colors were artificially enhanced by researchers, indicating the clothes—or in this case, the feathers—make the man. The study was the first to show significant feedback between physical appearance and physiology in birds, with implications for better understanding the ecology and evolution of physical signals such as feather color.

"Features of an individual bird's appearance are often signals of a physiological condition, health and status, but little is known about how these relationships are formed," said Safran of CU-Boulder's ecology and evolutionary biology department. "The twist in our new study is that the same color manipulation in males and females induced opposite effects on testosterone: It goes up in darkened males and goes down in darkened females."

For the new barn swallow study, Vitousek, Safran and a team of undergraduate and graduate students captured 60 female [barn swallows](#) with mist nets in Boulder and Jefferson counties near Denver. Thirty of the birds were used as the control group, while the other 30 had their ventral plumage darkened using a non-toxic marker. The testosterone, oxidative damage and antioxidant levels of all birds were measured at that time. The birds were then released back into the wild.

Between one and three weeks later, 19 of the artificially darkened females and 17 birds from the control group were recaptured, re-tested for testosterone, oxidative damage and antioxidant levels and then released back into the wild, said Vitousek.

**More information:** Female plumage color influences seasonal oxidative damage and testosterone profiles in a songbird, [rsbl.royalsocietypublishing.org ... .1098/rsbl.2013.0539](http://rsbl.royalsocietypublishing.org/doi/10.1098/rsbl.2013.0539)

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