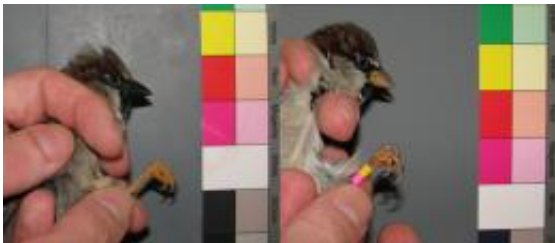


Status symbols of house sparrows: High testosterone darkens their bill

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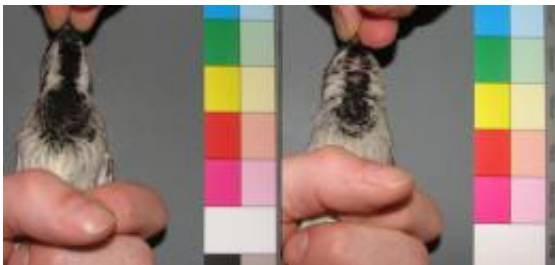
Dark and light bill of male House Sparrows during breeding and moulting time.
Image: Silke Laucht

(PhysOrg.com) -- The size of the black breast bib - the badge - and bill colour of male House Sparrows change over the course of the year. Such ornaments usually signal quality and dominance of a male to his conspecifics and are correlated with his testosterone levels. These levels are generally higher before and during breeding season than for example during moult in autumn.

A team of scientists at the Max Planck Institute for Ornithology in Seewiesen, Germany, recently demonstrated in a detailed study that only bill colour was correlated with the amount of testosterone in the blood. In contrast, the size of the badge was independent of [hormone](#) levels. (Published online in *Behavioural Ecology and Sociobiology*, May 29th 2010)

Sparrows live in [social groups](#). All year round males engage in aggressive interactions to establish dominance ranks. External traits such as badge and bill colour - so called ornaments - serve as signals for conspecifics. For example, the bigger the comb of a rooster the more dominant he is. The elaboration of many such sexually selected ornaments from all kinds of animals depends on the hormone testosterone, which also causes dominant and [aggressive behaviour](#). Nevertheless, these ornaments have inescapable costs because high blood testosterone levels suppress the immune system and stress resistance, and could thus eventually be costly for the animal. Therefore, ornaments are also called honest signals; only high quality animals can afford these costs.

Scientists at the Max Planck Institute for [Ornithology](#) in Seewiesen, Germany, were not only interested in the relationship between the elaboration of ornaments of male House Sparrows and blood testosterone levels but also if and how these relationships change over the course of a year. "The comparison of different seasons is a very important approach: the size of the badge is determined during moult in autumn, but maybe only important during the breeding season when the white feather edges are worn off and the black bib is clearly visible", says Silke Laucht who performed the study. This is why the researchers took small blood samples and photographs of the breast and the bill of 150 male sparrows during moult in early autumn, in January, March at the beginning of the breeding season and in June at peak breeding season.



After moulting, the black bib is partially hidden by white feather tips (right) and only becomes visible during breeding season. Image: Silke Laucht

Testosterone influences bill colour

As the scientists had expected, testosterone levels fluctuated in the course of the year and were the highest at the beginning and during the breeding season. They were at the lowest during moulting when the animals were the most vulnerable. Also the correlation between bill colour and testosterone levels was obvious: the more testosterone in the blood at a certain time of year, the darker the bill.

Concerning the badge, the researchers made a startling discovery: at no time during the year was there a correlation between the size of the badge and blood testosterone levels. Is the badge therefore not a dominance signal? "Other studies have found correlations between badge size and age and body size of the animals", said Laucht. Thus, the badge could be a signal for dominance not exclusively related to testosterone.

The detailed study revealed another surprise: males with the highest [testosterone](#) levels during the breeding season did not have inevitably the highest levels during moult. How can [ornaments](#) that are developed during moult honestly signal their information many months later during the breeding season? For Silke Laucht and her co-authors this is a contradiction that they want to solve next.

More information: Silke Laucht, Bart Kempenaers and James Dale, Bill color, not badge size, indicates testosterone-related information in House Sparrows, Behavioural Ecology and Sociobiology. Published online May 29th 2010 [doi:10.1007/s00265-010-0961-9](https://doi.org/10.1007/s00265-010-0961-9)

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