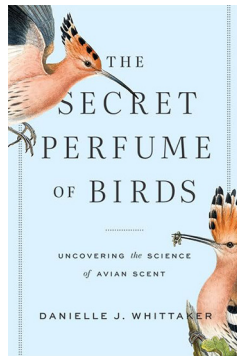


The Secret Perfume of Birds: Uncovering the Science of Avian Scent

By Danielle J. Whittaker. 2022. Johns Hopkins University Press. 296 pages, 11 black and white photos, and 14 black and white illustrations, 36.95 CAD, Hardcover. Also available as an E-book.

When Whittaker was a post-doctoral researcher, she was annoyed by the conventional wisdom that said birds did not possess a sense of smell. There were acknowledged exceptions—such as vultures that can smell carrion—but it didn't make sense to her that a whole class of animals would lack this ability. She felt that researchers “were asking the wrong questions, muddling the answers, and coming to unsupported conclusions” (p. 8). Her scientific pursuit of this question, and the convoluted route she took to do so, is the basis of *The Secret Perfume of Birds*.



Olfaction is the ability to smell, named for the olfactory bulb, which is the part of the brain that receives information from receptors in the nose. (Throughout the book, specialized words are in italics; a definition is given either within the text or in a footnote and then explained in more detail in the nine-page Glossary.) When she began her research, Whittaker was particularly interested in how birds use odours in social and reproductive behaviour. Her study subjects were Dark-eyed Juncos (*Junco hyemalis*) because they are common and, as ground feeders and nesters, are also easy to observe and catch. She felt that her research conclusions might apply to other birds with similar biologies, too. Juncos also do well in captivity, which allowed Whittaker and her colleagues to design experiments in a laboratory setting and test various hypotheses. She started with

two basic questions: Did Dark-eyed Juncos detect the smell of other juncos of the same species or unrelated species? If so, what role did these chemical odours play in social and reproductive behaviour?

The uropygial gland, also known as the preen gland, is unique to birds and is located on the dorsal base of the tail. It has long been known that birds spread the gland's secretions (called preen oil) on their feathers to protect them from the elements and ectoparasites, and to maintain their appearance for attracting mates. Preen oil is also the source of body odours in birds. Each species has a specific blend of volatile and semi-volatile chemical compounds in its preen oil, and each individual has different quantities of these compounds, resulting in a unique olfactory signature. Whittaker wanted to know what information these compounds convey about an individual, such as overall health and readiness to breed. She found that scent is helpful to avoid mating with close relatives and preen oil-based odours can predict which individuals have higher numbers and better survival rates of offspring.

The complexity of the research grew when Whittaker and her colleagues discovered that it is a diverse array of symbiotic bacteria living in the uropygial gland that produces the odours important for reproductive behaviour. Social and sexual behaviour then spreads these bacteria quickly between individuals. Whittaker, who studied primates in Indonesia for her Ph.D. in anthropology, linked this research back to her earlier interest in the genetic basis of mate choice through the major histocompatibility complex (MHC). The MHC is a large family of genes that are part of a vertebrate's self-recognition system: proteins coded by MHC genes allow the animal's immune system to detect both itself and any foreign substances

that shouldn't be there. A diverse MHC will result in a less diverse microbiome because the immune system can identify and kill more species of bacteria. Thus, an individual should choose a mate that has more dissimilar MHC genes to ensure more diverse bacteria are identified and killed. It is also possible that mates who have more similar MHC genes seek out extra-pair copulations to ensure their offspring will have more dissimilar MHC.

Whittaker's research on avian scent and odours has also broken away from the gender bias in ornithology, where male birds are typically studied more frequently than females. Males may have the brighter plumage, but when it comes to producing scent females are the champions. In conducting a meta-analysis of studies of avian odours, Whittaker and her colleague Julie Hagelin discovered that females have larger uropygial glands (which produce higher concentrations of chemical compounds), greater diversity of volatile compounds in their preen oil, and more varied bacteria. Both sexes rely on chemical signals for stimulating reproduction, mate attraction (in competition with others of the same sex), and parental care. Whittaker wonders

if one of the reasons that the existence of chemical communications in birds has been overlooked for so long is that many of the lead people researching it, especially early on, have been women. (p. 220)

This book is a good example of the scientific method, whereby a researcher forms a hypothesis and tests it, and if the data don't support their original hypothesis, they investigate why they don't and revise their hypothesis. In Whittaker's book, the phrase "it didn't quite turn out as expected" (p. 168) is a common refrain, one not admitted by enough scientists. Whittaker is obviously enthusiastic about her research and the natural world, with a buoyant and at times humorous writing style, poking fun at herself and the situations she found herself in during her research. In this book she has made a complex topic very accessible.

The only error I noticed is on page 2, where Whittaker states that there are nearly 20 000 species of birds—perhaps this total included subspecies? The latest estimate from the International Ornithological Congress is around 11 000 species (IOC 2023). In case the level of detail in this book isn't sufficient for some readers, the 21-page References section, organized by chapter (in smaller font, so there are lots of them), should enable anyone to access more information.

Literature Cited

International Ornithological Congress (IOC). 2023. IOC world bird list version 14.1, updates. Accessed 20 March 2024. <https://www.worldbirdnames.org/new/updates/>.

CYNDI M. SMITH
CANMORE, AB, CANADA