hands off

The proof is in the poo

Birds encounter many challenges in their everyday lives, both natural (for example, encounters with predators and hostile conspecifics) and anthropogenic (such as exposure to toxic contaminants, noise and light pollution and rising temperatures associated with climate change). Just like us, birds respond physiologically when stressed. Studying these responses can tell us about birds' tolerance limits in the face of environmental pressures, which can help to inform conservation management actions as well as improve our understanding of bird biology. However, traditional methods for measuring physiology often cause considerable disturbance to birds, especially if they require repeated capture of individuals, obscuring the signatures of environmental stress. Finding less invasive ways to measure physiology in wild animals is therefore an important priority.

Recently, a team lead by FitzPatrick Institute PhD student Amanda Bourne took up this challenge. Amanda's research takes advantage of the habituated population of Southern Pied Babblers *Turdoides bicolor* at Kuruman River Reserve in the Northern Cape to assess whether group living can buffer the impacts of climate change. This could occur if, for example, sharing the workload of caring for offspring reduces the energy and water each individual must spend on keeping cool.

AMANDA BOURNE

Babbler footprints and a dropping from which valuable information on water use and energy expenditure can be collected.

Energy and water use can be estimated by measuring the turnover rate of oxygen and hydrogen atoms in a bird's body used during respiration and evaporative cooling. Traditionally, this requires birds to be captured, injected with heavy isotopes of hydrogen and oxygen ('doubly labelled water'), held in captivity for a brief period, then released and recaptured. During this process, blood is sampled three times to track changes in the proportion of heavy isotopes in the body.

Amanda has developed an alternative method that takes advantage of the babblers' tolerance of people to measure their water turnover without having to catch them at all. Studies suggest that lacing an animal's food with isotopic tracers is a feasible alternative to injecting them with doubly labelled water and other studies show that water extracted from urine or faeces can replace water from blood samples. Amanda combined these two techniques. She dosed her study birds by offering them beetle larvae injected with doubly labelled water, then followed them throughout the day and collected all their droppings. In the lab, Amanda extracted water from the faecal samples and was able to estimate each bird's use of water and energy without ever touching the birds.

To test whether her non-invasive method for measuring physiology gave results comparable to those obtained by using more traditional methods, Amanda captured eight babblers at another site (to avoid disturbing the habituated birds). She subjected these individuals to the usual round of capture and blood sampling, but also collected their faeces and was able to show that using faecal water was just as good as blood sampling. The new method was recently published in the leading journal *Functional Ecology* (Bourne et al. 2019, 33: 162–174).

HALCYONE MULLER

Amanda Bourne waiting for habituated Southern Pied Babblers to weigh themselves.

Using the new method, Amanda was able to show that energy expenditure of free-living babblers declines as air temperature rises, presumably because the birds slow down and seek shade when the going gets hot. It thus offers a non-invasive tool to track the physiological impacts of increasingly hot climates. But perhaps more importantly, her study demonstrates that valuable information on the physiology of wild animals can be collected without imposing capture or handling stress – a step in the right direction for both the welfare of animals in science and the validity of our measurements of stress responses in wild animals.

SUSIE CUNNINGHAM

For further information visit: *www.babbler-research.com* and *https://hbresearchproject.wixsite.com*

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