

## INSIDE JEB

## Zebra finches adapt to cope well with extreme conditions



Zebra finches drinking at a water trough at Fowler's Gap Field Station.  
Photo credit: Simon Griffith.

Cossetted domestic zebra finches have a cushy lot compared with their rugged wild cousins in the Australian outback. 'Maximum daily air temperatures routinely exceed 40°C and intense sun adds to the heat load the birds must endure while foraging and drinking', says Christine Cooper from Curtin University, Australia. But even these robust little creatures could begin to succumb to the heat as climate change takes hold. 'Extremely hot weather can cause large numbers of birds to die', explains Cooper. However, it wasn't clear whether the diminutive aeronauts have sufficient physiological versatility to protect themselves from the extremes that may yet come. As adaptability is going to be key to the survival of many species, Cooper and her colleagues Laura Hurley and Simon Griffith from Macquarie University, Australia, and Pierre Deviche from Arizona State University, USA, wondered how the gregarious finches cope after riding out a heatwave, on average summer days and when the weather is scorching.

'Fowler's Gap is a research and sheep station in a remote, dry region of Australia, with huge expanses of low, sparse vegetation', says Cooper, who travelled there to investigate the free-ranging zebra finches. 'Before the study, the birds had experienced a long, hot dry period of 2 years without rain', says Cooper; however, the staff had previously installed a drinking trough, which was popular with the finches. Keeping an eye on the weather conditions between December 2018 and February 2019, the duo caught visiting zebra finches when the temperature had been very high (above 39°C) for 3 days, or relatively mild (between 27 and 36.3°C). Holding the birds in captivity briefly, Cooper and Hurley weighed them, measured their body temperature, metabolic rate and water loss rate at 30°C and 40°C, as well as collecting tiny blood samples to find out how well the birds dealt with stress after periods of hot and milder weather.

Despite the different conditions that the birds had experienced in the run up, they all weighed around 11 g. They were not

dehydrated – even though some had experienced temperatures in excess of 45°C – presumably because they were regularly gulping down water at the trough. The tiny birds also managed to protect themselves from dangerous water loss by letting their body temperatures rise from ~38°C to ~41.5°C at 40°C. However, the finches that had been captured after a cooler period were less well prepared for 40°C heat than the birds that had just ridden out a heat wave; the cooler birds lost 1.2% body water per hour compared with the heatwave birds, which only lost 0.97% body water per hour. In addition, the birds that had just experienced a heatwave were able to reduce their metabolism and the consequent heat production when the temperature was high.

In short, the birds that had just emerged from a heat wave were better prepared for hot conditions than their cooler counterparts. And, when the duo checked for signs of stress in the birds' blood, there was no evidence that the zebra finches that had just passed through a heatwave were struggling any more than their cooler counterparts. The stress hormone levels in their blood were essentially identical, regardless of the conditions, meaning that the birds didn't seem to get too bothered about being hot.

At the moment, thanks to their versatility, wild zebra finches cope well with the extreme temperatures that come their way during sizzling Australian summers and Cooper is keen that scientists take this ability to adjust into account when predicting how species will cope as climate change sends the mercury higher.

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