hot hatch

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Zebra Finches prepare their chicks for warm conditions

In general, science advances in small increments. A study is designed after careful consideration of what is known about a question or problem. Observations are made, experiments are conducted, data are analysed and a paper is written and hopefully published. The process is rather like building a wall; each new study represents a single brick added to a particular layer of understanding in a structure that may have been under construction for centuries.

Occasionally, however, a serendipitous observation leads to findings so startling and unprecedented that they leave the scientific community dumbstruck and in an instant change the perspective from which we view an entire field of enquiry. In August 2016, a paper published in the journal *Science* revealed a wholly unexpected new mechanism whereby birds prepare their offspring for warm conditions.

Mylene Mariette and Kate Buchanan of Australia's Deakin University were working with a captive breeding colony of Zebra Finches *Taeniopygia guttata* when they noticed that the parents gave a distinct call when alone with their eggs. The incubation call was different to the contact calls that adults use to communicate and because only finches whose partners were away from the nest gave the call, it seemed to the researchers that the call was being directed at the eggs. Mariette and Buchanan also noticed that these vocalisations occurred only on hot days and only within about five days before hatching.

Intrigued by these observations, they recorded the incubation calls and designed an experiment to establish what effect, if any, the calls were having on the developing embryos. They removed eggs from nests and placed them in artificial incubators and then used speakers to play incubation calls to one group of eggs and adult contact calls to a second group. As soon as the eggs hatched, the chicks were placed back in their parents' nests and their subsequent development monitored.

The differences between the chicks from the two groups were profound. Those that heard the incubation call during the five days before they hatched were smaller and more vocal than chicks from the control group. But the differences went far beyond body mass and begging behaviour. Chicks that heard the incubation call before hatching went on to show higher breeding success when raising their own young under hot conditions. Conversely, individuals from the control group that did not have incubations calls played to them before hatching were more successful when breeding under cool conditions.

Recent findings from Australian Zebra Finches suggest that southern African species such as Black-faced Waxbill may have the ability to programme their chicks for a warmer future.

The implications are staggering: Mariette and Buchanan have shown that Zebra Finches – and very likely other species – can programme their offspring to cope better with hot conditions in later life. Although it has been known for some time that birds can communicate with embryos via incubation calls, the idea that acoustic communication between adults and their eggs can lead to such profound and long-lasting physiological and behavioural effects is unprecedented.

This remarkable study raises a host of questions and will no doubt trigger a flurry of similar studies on other species. Its findings also offer a glimmer of hope in the context of climate change, as they suggest that some species may be better able to adapt to hotter conditions than we currently appreciate.

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Reference

Mariette, M.M. and Buchanan, K.L. 2016. 'Prenatal acoustic communication programs offspring for high posthatching temperatures in a songbird'. *Science* 353: 812–814.