

The Zebra Finch: a synthesis revised

Richard Zann was a highly respected and passionate ornithologist with a first-rate reputation nationally and internationally for his work on Australian birds. Unassuming, modest and supportive to both students and colleagues, he was often referred to as the gentle man of Australian ornithology. In 1998, the significance of his long-term studies of austral birds and, in particular, the Zebra Finch (*Taeniopygia guttata*), was marked by the award of Australia's most prestigious accolade for ornithology, the Serventy Medal (Anon. 1998). But probably the most long-lasting impact Richard Zann had on austral ornithology was through his book *The Zebra Finch: A Synthesis of Field and Laboratory Studies* (Zann 1996), which has acted as a functional user's guide for those working on this remarkable little bird. Since the book's publication, the species has become arguably the 'lab rat' of ornithology, used extensively worldwide in studies across the fields of evolutionary biology, behavioural ecology, physiology, neurobiology and genetics. The aim of this Special Issue, which is in memory of Richard, is to review much of the most notable work conducted on the Zebra Finch since 1996, and thereby create not only an update to Richard's 1996 book, but a new synthesis of our understanding of this species.

In February 2009, 173 people were killed in bushfires that raged across Victoria, Australia, particularly north-east of Melbourne. Tragically, Richard, his wife Eileen and their daughter Eva were among those killed (see Clarke 2009). This volume not only marks Richard's contribution to ornithology over the last 40 years, but we hope is a positive response to this Black Saturday tragedy.

Fourteen years ago, the genome of only one free-living organism had been sequenced. Now genomics is a field in its own right, and the Zebra Finch genome has been sequenced (Warren *et al.* 2010) – only the second bird genome available. In this Special Issue, Christopher Balakrishnan *et al.* discuss this milestone, the advantages of having access to a songbird genome, and the potential of genomic resources for the study of both the Zebra Finch and birds in general. Tim Birkhead reviews how the Zebra Finch became established as the species of choice for the study of sperm competition and what it has revealed about post-copulatory sexual selection. The ultimate evolutionary consequences of current levels of phenotypic variation in both wild and captive populations of Zebra Finches are explored by Barbara Tschiren and Erik Postma, who also address how far the species can be used to test evolutionary patterns and selection processes. Recently, the Zebra Finch has also been used to investigate the role maternal effects in determining offspring quality and success, and this is reviewed by Simon Griffith and Katherine Buchanan.

The Zebra Finch has also become the model species for investigating the functional control of song learning and song production, as discussed by Mark Hauber *et al.*, as well as the neural mechanisms underlying these traits, outlined by Sarah London and David Clayton in this issue. Zebra Finches are also used for the study of cognition, and the potential for future developments in this area is assessed by Sue Healy *et al.* Although



the ecology of the Zebra Finch has been extensively investigated, much less is known of this species' physiological control of behaviour and reproduction within its arid environment. The current state of our understanding of how the physiological system has adapted to the unpredictable environmental conditions it experiences is summarised by Nicole Perfito in this issue. Collectively, these papers review the work conducted on this species in the past 15 years and confirm the fundamental importance of the Zebra Finch for so many areas of study in biological sciences.

In bringing this collection of papers together, we acknowledge the wonderful contributions of many authors and reviewers and the support of the journal's Editorial Board. The Zebra Finch is by no means a phoenix, but we are delighted to see the widespread international acknowledgement of the importance of Richard Zann's contributions to ornithology in both hemispheres. We like to think that Richard would have enjoyed this volume and we publish it to mark his pivotal role in establishing the Zebra Finch as a model species in so many areas of avian science.

Katherine L. Buchanan, Editor
Simon C. Griffith, Guest Editor
Sarah R. Pryke, Associate Editor

References

- Anon. (1998). Serventy Medal Citation. *Emu* **98**, 242. doi:10.1071/MU98035
- Balakrishnan, C. N., Edwards, S. V., and Clayton, D. F. (2010). The Zebra Finch genome and avian genomics in the wild. *Emu* **110**, 233–241. doi:10.1071/MU09087
- Birkhead, T. R. (2010). Post-copulatory sexual selection and the Zebra Finch. *Emu* **110**, 189–198. doi:10.1071/MU09086

- Clarke, M. (2009). Obituary: Richard A. Zann, 27 November 1944–7 February 2009. *Emu* **109**, 179. doi:[10.1071/MUv109n2_OB](https://doi.org/10.1071/MUv109n2_OB)
- Griffith, S. C., and Buchanan, K. L. (2010). Maternal effects in the Zebra Finch: a model mother reviewed. *Emu* **110**, 251–267. doi:[10.1071/MU10006](https://doi.org/10.1071/MU10006)
- Hauber, M. E., Campbell, D. L. M., and Woolley, S. M. N. (2010). The functional role and female perception of male song in Zebra Finches. *Emu* **110**, 209–218. doi:[10.1071/MU10003](https://doi.org/10.1071/MU10003)
- Healy, S. D., Haggis, O., and Clayton, N. S. (2010). Zebra Finches and cognition. *Emu* **110**, 242–250. doi:[10.1071/MU10004](https://doi.org/10.1071/MU10004)
- London, S. E., and Clayton, D. F. (2010). The neurobiology of Zebra Finch song: insights from gene expression studies. *Emu* **110**, 219–232. doi:[10.1071/MU09079](https://doi.org/10.1071/MU09079)
- Perfito, N. (2010). The reproductive and stress physiology of Zebra Finches in context: integrating field and laboratory studies. *Emu* **110**, 199–208. doi:[10.1071/MU09091](https://doi.org/10.1071/MU09091)
- Tschirren, B., and Postma, E. (2010). Quantitative genetics research in Zebra Finches: where we are and where to go. *Emu* **110**, 268–278. doi:[10.1071/MU09092](https://doi.org/10.1071/MU09092)
- Warren, W. C., Clayton, D. F., Ellegren, H., Arnold, A. P., Hillier, L. W., Künstner, A., Searle, S., White, S., *et al.* (2010). The genome of a songbird. *Nature* **464**, 757–762. doi:[10.1038/nature08819](https://doi.org/10.1038/nature08819)
- Zann, R. (1996). ‘The Zebra Finch: A Synthesis of Field and Laboratory Studies.’ (Oxford University Press: Oxford, UK.)