

scientific study of bird song. For those starting out as students or postdocs, as I found myself, it is not an easy book in which to find the relevant information you may be seeking. There is also no attempt to provide an overview, nor to group or link the various chapters into a coherent framework. If one were seeking a musical analogy, it is relatively unstructured, complex and extremely variable, rather like jazz. Admirable as this is, Luis Baptista was more a devotee of the classics and I have a feeling he would have preferred the more controlled structure of a symphonic composition. In any case, the continuing evolution of white-crowned sparrow dialects in and around the bay of his beloved San Francisco provide an everlasting memorial to complement this written version of Nature's Music.

Literature Cited

- Zeigler, H.P. & Marler, P. (eds) 2004: Behavioral neurobiology of birdsong. Ann. N.Y. Acad. Sci., **1016**.

Attacking the Big Issues in Antipredator Defense

Caro, T., 2005: Antipredator Defenses in Birds and Mammals. University of Chicago Press, Chicago, IL, 592 pp., Paperback: \$38, or £27. ISBN 0-226-09436-7.

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Individuals of most species, at some point in their lives, must avoid predators. The importance of avoiding predators (getting killed has a serious negative impact on ones' fitness), and the ubiquity and diversity of antipredator behavior makes any general review a monumental task. Previous reviews by Cott (1940) and Edmunds (1974), while excellent in their own right, do not integrate the recent explosion of literature on adaptations to avoid predation. Thankfully, Tim Caro has taken on this task and in doing so, has produced a valuable synthesis of antipredator behavior, destined to be the 'go-to' book about antipredator behavior for the next 30 years.

He has focused on birds and mammals because his expertise lies with these taxa and because this literature alone is substantial (there are 86 pages of references at the end of this book!). The book is organized into 13 chapters; the first deals with defi-

nitions of predator recognition and the predatory sequence, while the last focuses on future research needs. The remaining 11 chapters focus on different aspects of antipredator behavior, chronologically arranged along a possible predatory sequence. These range from ways to avoid detection (such as background matching) to flight and other behaviors of last resort.

Caro's chapter on definitions is a perfect example of how precise thinking (a hallmark of his empirical work) should lead to precise definitions, and that precise definitions are required for compelling research. Among other things, he concludes that the functions of putative adaptations will emerge from descriptive rather than functional definitions.

Throughout the book I was struck by the strong historical approach he employed, as well as his razor-sharp interpretation of the literature. Together, this enabled him to highlight unanswered, or inadequately answered, questions. For instance, despite abundant opportunity, we still have no conclusive answer about the function of egg coloration (p. 45). We have a compelling need for the proper study of the relationship between coat color and natural history (p. 53). There has been no systematic investigation of the function of masquerade (p. 55). And he wisely points out that 'artifacts of research effort' may taint the generalizations that we can make across taxa (p. 200).

Caro constantly emphasizes the fact that predators have different hunting styles and preferences; thus there is no single way to solve problems and that we should not expect unitary solutions. He discusses meta-analyses and other comparative and literature reviews, when available, to try and make generalizations across taxa. However, he does not report any novel meta-analyses: the data cry out for them and those interested in comparative studies will find this book a gold mine of compelling, unanswered questions, and an easy entry into the literature.

The book is filled with neat factoids. I did not know that tail loss occurs in eight of 29 families of rodents. And, where else would you learn about Cott & Benson's (1970) study on 'The palatability of birds; mainly based upon observations of a tasting panel in Zambia'?

Perhaps I have lived in LA too long, but I could not help thinking how it would be great to have a companion documentary series. Many examples cry out for video accompaniment! It would be great to see fieldfares bombard their predators with feces and by doing so, reduce the water repellent and insulative capacities of their predators (p. 382). Or,

to watch the diversity of nest defensive behaviors (chapter 10), or mobbing (chapter 11). Or to see any of the amazing examples of background matching and other morphological traits discussed in chapter 2.

The writing is clear and precise. As with any lengthy work of scholarship, there are likely to be some errors and inevitable omissions. I found several imprecise interpretations of studies that I was familiar with, there are a number of typos in the species list found at the end of the book, and the occasional name was misspelled. A chapter devoted to group size effects puzzles over a seeming lack of such effects in some species, but loss of predators is one factor that has been demonstrated to influence persistence. In the antipredator vigilance section, the author did not distinguish between vigilance while foraging and entire time budget estimates of vigilance. He does not consider trait-group selection as a possible selective benefit of group-selected behaviors. In addition, it would have been nice to have re-drawn graphs to a consistent legible style. However, these minor (and idiosyncratic) issues do not detract from the greater synthetic impact this book will have. The next time a student comes to me and wants to work with antipredator behavior, I will point them to this book. And, the book has helped me identify a variety of comparative studies that need to be conducted. I cannot think of a stronger endorsement for this excellent work.

Literature Cited

- Cott, H. B. 1940: Adaptive Coloration in Animals. Methuen, London.
 Cott, H. B. & Benson C. W. 1970: The palatability of birds, mainly based on observations of a tasting panel in Zambia. *Ostrich* **8**(Suppl.), 375—384.
 Edmunds, M. 1974: Defense in Animals. Longman, New York.

The Rise and Fall of Ethology

Burkhardt, R. W. 2005: Patterns of Behavior: Konrad Lorenz, Niko Tinbergen, and the Founding of Ethology. University of Chicago Press, Chicago, IL, USA. 636 pp., Paperback: \$29.00 or £20.50, ISBN 0-226-08090-0.

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The author of this book, Richard Burkhardt, is a professor of history at the University of Illinois. He received a Ph.D. from Harvard in 1972. Ernst Mayr was the codirector of his dissertation on Lamarck. Burkhardt began research on this book in 1978. He has interviewed both Lorenz and Tinbergen, has had access to their correspondence, and has himself corresponded with most of the major figures in the field of ethology. This background and material has allowed him to write what surely must be the most authoritative history of the field of ethology.

The first four chapters of the book cover the early history of studies of animal behavior from the end of the 19th century until the beginning of the Second World War. The first two of these chapters are devoted to detailed portraits of Whitman and Craig in America, and of the British field biologists Selous, Howard, Kirkman, and Huxley. All of these men were acknowledged by Lorenz and/or Tinbergen to have been influential in the development of their ideas. Most professional animal behaviorists will find fascinating the descriptions of the work of these men and of the milieu in which they developed, but the less specialized reader may be a bit overwhelmed by the sheer quantity of material. The chapters on Lorenz and on the early collaborations of Lorenz and Tinbergen give considerable insight into the formation of the basic ethological concepts, such as fixed action patterns, innate releasing mechanisms, and the psychohydraulic model. Lorenz was the intuitive genius and Tinbergen the enthusiastic experimentalist. Together, they formed a team that both codified and promulgated ethology as a separate field of inquiry. Considerable attention is paid to the early interactions of both men with the American and British scientists interested in animal behavior, which were more extensive than I had realized. Somewhat less attention, however, is devoted to the continental European influences on their development, especially on that of Tinbergen. For the interested reader, a more complete exposition of such early influences on Tinbergen can be found in Rell (2000; see also Hogan 2001).

Chapter 5 is devoted to an inquiry into Lorenz and National Socialism. As Burkhardt says (p. 232): 'Seeking to understand this part of Lorenz's career is a complicated project, and interpretations of the question are bound to differ'. Many of the facts are quite clear, both from Lorenz's own publications and his correspondence. Lorenz was certainly sympathetic to many of National Socialism's tenets. Burkhardt's discussion of these facts implies that Lorenz was probably an active supporter of the