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BOOK REVIEW

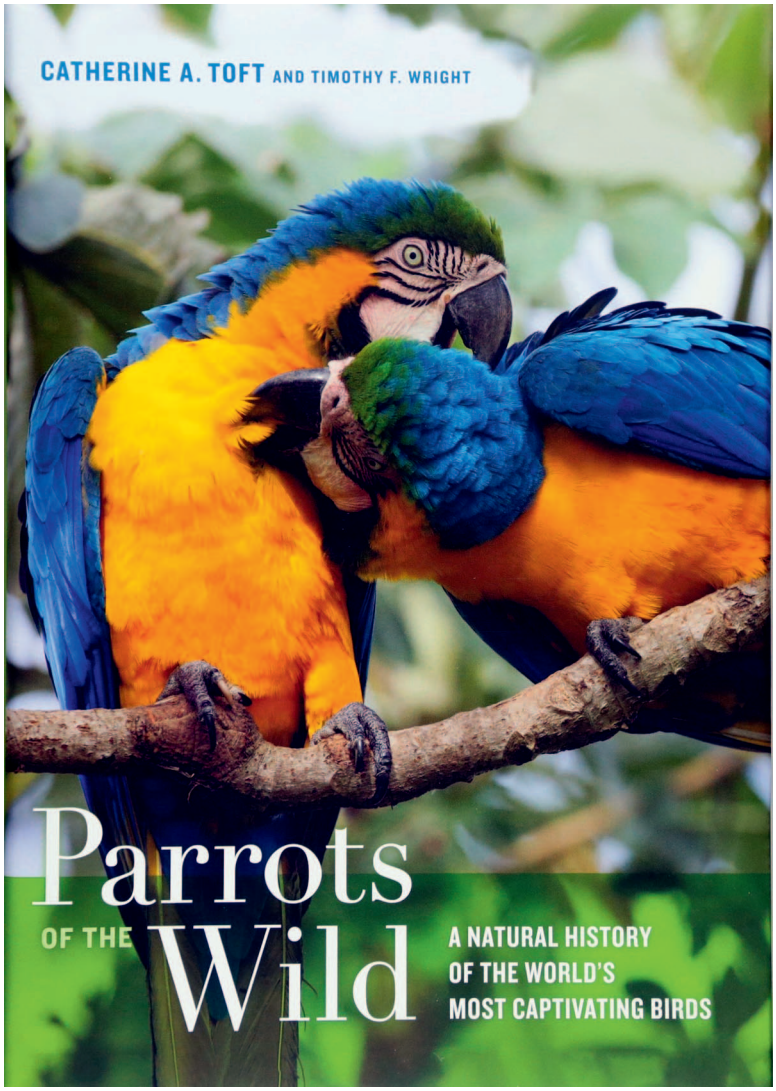
Parrots of the Wild: A Natural History of the World's Most Captivating Birds

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Parrots of the Wild: A Natural History of the World's Most Captivating Birds by Catherine A. Toft and Timothy F. Wright. 2015. University of California Press, Berkeley, CA, USA. 346 pp., ~1,000 references, 90 color photo plates, 15 graphs and tables. $39.95 (hardcover and ebook). ISBN 9780520239258.



Most readers of *The Condor* need little convincing of the importance of birds in a broader understanding of vertebrate ecology and evolutionary biology. There are more than 10,000 species that inhabit most parts of the world, and they exhibit a broad range of mating systems. Birds dominate terrestrial vertebrate communities and, as a result, are often the vertebrate barometer of choice for assessing ecosystem processes and health. Fewer readers may appreciate the fact that one group, the parrots, represents a microcosm of many important aspects of avian biology. The 371 recognized species of extant parrots are or were found in most parts of the planet and exhibit a diversity of mating strategies. They are famous for their extraordinary intelligence and show an order-of-magnitude range in brain sizes that rivals all other modern birds. The remarkable plasticity of parrot brains is also reflected in their size in relation to overall body size, among the highest in birds and a trait often found in animals with sophisticated cognitive ecologies. Their bizarre communicative abilities, well known in captivity and by millions of pet owners, represent an emerging model for comparisons with songbird neuroethology. Clearly, parrots are poised to provide information on an important dimension of avian biology. However, as Catherine Toft and Timothy Wright argue in *Parrots of the Wild*, parrot populations and species are disappearing at a truly alarming rate around the world, threatening to curtail an impor-

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tant chapter in ornithology before it can be written.

In *Parrots of the Wild*, we unfortunately learn that the chapter has already been closed on an inordinate number of parrot species. The authors walk us through the basic examples of parrot extinction: Carolina Parakeets (*Conuropsis carolinensis*) in North America, *all* the Caribbean macaws (*Ara* spp.), and most Caribbean parrots (*Amazona* spp.). Continental populations are often more resilient, but even here at least two of the more spectacular parrots, the highly prized "blue" macaws of continental South America (where parrots reach their greatest diversity), are already gone. Many more perch precariously on death row. This is a real crisis in ornithology and behavioral ecology, because there are good reasons to think that avian behavioral complexity might reach new heights among the large macaws, which have the largest brains of all birds, yet are arguably some of the most formidable and poorly known study subjects. For a variety of reasons, some of the more interesting species are being targeted for extinction.

While parrots' braininess and sociality have captivated scientists since Aristotle, the same social intelligence has made them formidable study subjects. It is especially difficult to follow known individuals over significant spatial and temporal scales. Nevertheless, Toft and Wright make a convincing case that many important discoveries and advances in parrot biology have taken place since Forshaw's (1978, 2010) classic *Parrots of the World*, including a new pigment unique to parrots, a unique cup-and-shell vocal learning circuit in the forebrain, and molecular phylogenies that have painted a much clearer picture of parrot evolutionary history. Chapter insets offer a more detailed examination of some of the major contributions: DNA and phylogenetic analysis of the extinct Carolina Parakeet; herbivores, nitrogen, and nutritional ecology; jaw architecture and foraging ecology; plumage coloration and psittacofulvin; nutritional physiology and extremely altricial development; and an uplifting account of a conservation success story, the Kakapo (*Strigops habroptilus*).

The book weaves together information from a large number of laboratory and field studies of parrots, macaws, parakeets, parrotlets, lorikeets, cockatiels, cockatoos, and lovebirds, to name a few. *Parrots of the Wild* is a hybrid coffee-table book, with 90 stunning, full-color photographs of wild parrots yet small and light enough to easily slip into a briefcase or backpack. The prose is enjoyable—sometimes as much about the researchers who tackle parrot biology as it is about the birds—as we trot with the authors around the globe to treat various taxa that are particularly well known: the flightless Kakapo in New Zealand; cockatoos, rosellas, and the Eclectus Parrot (*Eclectus roratus*) in Australia; the Burrowing Parrot (*Cyanoliseus patagonus*) in Argentina; and the Green-rumped Parrotlet (*Forpus passerinus*) in Venezuela. While the authors attempt to synthesize aspects of parrot biology, a recurring theme is the dire conservation situation of this group; all proceeds go to conserve wild parrots, as explained in the Foreword by Jamie Gilardi, president of the World Parrot Trust. As such, the book will appeal to a broad audience, including university libraries, students and researchers of birds in general and parrots in particular, aviculturists, pet owners, zookeepers, veterinarians, and conservation biologists around the world.

The book begins with a timely and helpful synthesis of parrot systematics and phylogeography. A flurry of molecular phylogenies has been published over the past decade, beginning with Hackett et al. (2008), that place parrots as a sister branch to the songbirds and New Zealand wrens and a sister group to falcons—a major reordering affecting the phylogenetic placement of more than half of extant bird species and one that places parrots at a pivotal point in avian evolutionary biology. The results have been replicated a number of times, and a newly erected avian order, the Psittacopasserae (Suh et al. 2011), is now the largest taxonomic grouping of extant birds.

Subsequent chapters tackle several thorny issues in avian evolutionary biology and try to build on evolutionary hypotheses where possible. Neurobiologists and cognitive scientists studying the biology of social learning will likely find interest in Chapter 4, regarding sensory perception, and Chapter 5, which deals more directly with parrot brains. Here the authors attempt to build upon a set of hypotheses developed by neurobiologist Erich Jarvis (2006) and others to explain the evolutionary origins of avian vocal learning. This is taken up again in the Epilogue, where the authors attempt to articulate a hypothesis that human spoken language evolved from music and argue that parrots converged with humans in this regard. While this is an interesting hypothesis for the evolutionary origins of human spoken language and avian vocal learning, it is not the only one, and I found this section not particularly well developed. I would refer readers to other works and alternative hypotheses regarding human language evolution (Falk 2004, Konner 2010) and vocal learning in birds and mammals (Colbert-White et al. 2014, Nowicki and Searcy 2014). Nearly all the explanations in the case of parrots lack demonstration of adaptive benefits in the field, so there is much work to be done and great opportunity.

Several chapters, despite the emphasis on wild parrots implied in the title, reveal that there are still broad areas of parrot biology that lack a field complement; thus, details and testable hypotheses about adaptive function remain fertile ground for developing new research questions. The authors include extensive discussions, especially of Budgerigars (*Melopsittacus undulatus*) and African Grey Parrots (*Psittacus erithacus*), in order to fill certain voids in the neurobiology of auditory perception and vocal

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imitation, plumage reflectance, and complex cognition. Catherine Toft's sad and untimely passing in 2011 may have resulted in the exclusion of growing bodies of research on wild populations; readers interested in vocal learning and development in wild parrots can consider Berg et al. (2012, 2013) and a review by Bradbury and Balsby (2016).

Population ecology is one area where there is no realistic lab dimension, but it is crucial to understanding how natural selection shapes the genetic structure of populations. The chapter regarding population ecology unfortunately ignores important work on parrot population modeling (e.g., Veran and Beissinger 2009, Tarwater and Beissinger 2012, 2013) and is focused instead on population size, body size, and the vulnerability of the remaining wild populations. While the questions raised are important, the analysis of unpublished data unfortunately ignores the hierarchical nature of species relatedness (Felsenstein 1985), despite an entire chapter covering psittacine taxonomy and phylogenetics.

In conclusion, I came away inspired that there is still much to learn about parrots in the wild, and I would want to read this book before attempting to expand on our knowledge of this remarkable group of birds. The title will lure many readers to buy the book, and each purchase will help save wild parrots.

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