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RECENT LITERATURE

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BOOK REVIEWS

Flight Ways: Life and Loss at the Edge of Extinction

Thom van Dooren. 2014. Columbia University Press, New York, NY. 193 pages, 13 B&W photos and 1 map. ISBN 9780231166188. $30.00 (Hardcover)

In less than 200 pages, Thom van Dooren aims in his ambitious book, *Flight Ways,* to reconnect humans empathetically with the rest of the planet's inhabitants, but especially vanishing species. This is asking a lot, but he succeeds—or at least makes great strides—using evocative storytelling and compelling discourse. A number of themes are carefully woven together with the goal of awakening sensitivities, building understanding, and motivating commitment to stopping the decline of populations and species. As one who works in the field of endangered Hawaiian bird research, I found this book illuminating, thought-provoking, and insightful. It probes deeply into the evolution, ecology, and ethics of our interactions with other species and offers useful lessons for thinking about endangered species and extinction in more meaningful ways. It will likely spur self-examination and further inquiry by readers, which can open new lines of communication with the general public about conservation.

The book features five stories of imperiled bird species belonging to families recognizable to anyone: albatross, vulture, penguin, crane, and crow. These are relatively large and long-lived species that reproduce slowly, sometimes with what seems like agonizing effort. They also are social in ways that we can all appreciate. These life history traits are bound to elicit an empathetic response from most readers as they learn about the ways of life and threats to the existence of these birds. Nevertheless, vultures and crows are not necessarily endearing to everyone (excluding ornithologists, of course), giving van Dooren the opportunity to stretch our capacity for empathy and understanding beyond the easy attraction of the more charismatic species.

The five stories featured in the book are not species accounts in the usual sense, although there is ample evolutionary, ecological, and ethological information and context. Instead, we are pulled into the lives and troubles of these birds at a more personal, intimate level. At the same time, we are provided with a robust philosophical framework, backed up with frequent literature citations, for understanding how our relationships and perceptions of birds and nature generally have developed. The arrangement of the five chapters, each featuring a different species or group of species, is important because the stories build on one another, leading us through different themes, lessons, and levels of comprehension.

Chapter 1 gets us off to a good start by explaining that species, in this case Black-footed (*Phoebastria nigripes*) and Laysan (*Phoebastria immutabilis*) albatrosses, are the result of arduous daily work performed by countless generations of birds to perpetuate individuals and populations over immense periods of time. Thoughtful attention is paid to the painstaking efforts of individuals that roam vast tracts of ocean to gain and retain mates and raise offspring on the tiny, sandy islands of Midway Atoll. These and other seabirds are threatened because they mistake plastic debris and other waste circulating in the oceans as food, exposing the tragic dissociation of modern society from species and ecosystems that are distant, seldom experienced, and therefore forgotten. The narrative very effectively underscores our responsibility to become aware of other species, even those we might never see, and become attentive to how we impact their way of life.

Chapter 2 explains the fascinating relationship between the vultures and people of India, where until recently the bodies of dead farm animals and offal from dumps and other sources were efficiently disposed of by the birds. Although scavenging by vultures has a long history in Indian society, this essential sanitizing and health-promoting service is diminishing because vultures are poisoned when they consume the carcasses of cattle tainted with diclofenac, an anti-inflammatory drug for treating a variety of conditions in both cattle and humans. In this illustration of how humans can sometimes benefit directly from other species, we gain a deeper appreciation of how associations can be inadvertently unraveled to the detriment of non-humans and humans alike. Moreover, the reduced role of vultures as scavengers has opened the door for rats and dogs, which pose additional public health challenges as their populations increase in response to the availability of carcasses. At the same time, economic opportunities for the rural poor are diminishing because bones collected for processing into fertilizer now need to be cleaned more thoroughly than when vultures did the job. With vultures commonly viewed as harbingers of death, van Dooren philosophizes on the complicated role of death in the maintenance of interspecies connections that are essential to life.

Moving from rural India to urban Sydney Harbor, Chapter 3 chronicles the struggle of a tiny population of Little Penguins (*Eudyptula minor*) to persist and nest despite formidable obstacles and threats imposed by humans. The main theme examined here is the tenacious and ancient attachment of some species to their breeding sites. A strong ethical case is made for protecting these "storied-places" by exploring the evolutionary significance of strong site attachments and the consequences of altering or destroying them for individuals and populations. The author fosters empathy by considering how places become imbued with special meaning for colonial birds from experiences shared from one generation to the next. How a bird might change and be changed by the environment they inhabit is also discussed. The subtle characterization of the penguins as "guests" that periodically come ashore to breed in burgeoning residential areas provides poignant insight into the critical and growing problem of how humans intrude into the special places of other species without due consideration of their needs or prior claim.

Cranes capture the imagination of everyone and the story of Whooping Crane (*Grus americana*) conservation is well known in North America, not least because of some of the unusual ways in which humans interact with them. The "hands-on" nature of Whooping Crane conservation history brings it fully into the human experience. In Chapter 4, van Dooren analyzes how the intensive captive breeding program coaxes cranes into reproducing, and how humans have become functionally surrogate parents that must instill lost or deficient migratory and reproductive behavior in individuals. This chapter will deliver a shock to anyone who is unfamiliar with the costs of endangered species recovery in terms of effort, time, and personal commitment. Just as the human costs are examined, so are the sacrifices of individual birds maintained in captivity and used in various ways to increase the chances of establishing wild populations. By this point in the book, we have been introduced to a range of ethical perspectives concerning our interactions and relationships with other species, but here the issue confronts us head-on. No easy answers are offered and the usual justifications ("for the good of the species") are not espoused. Rather, a discussion of the ethics of how individual birds are used in species recovery is respectfully opened, even while acknowledging the encouraging conservation progress made with existing methods and programs.

Having started with albatrosses nesting on specks of land in the middle of the Pacific Ocean, the final chapter concludes the book with an account of the Hawaiian Crow (*Corvus hawaiiensis*) in the montane forests of Hawai'i Island. The species has existed only in captivity since 2002, when the last individuals disappeared from the wild. Even so, the issue of captive propagation is not the focus of the chapter; rather, van Dooren explores the idea of grief by reviewing how individuals of some social species can be affected by the loss of their mates. The theme of grieving crows resonates with the strong attachment of penguins to their breeding grounds, but the crows take us further philosophically. The ethological investigation of grief is set in the context of human exceptionalism, which asserts that only humans can truly mourn because they alone are able to

recognize the connection between life and death. As discussed here and elsewhere in the book, philosophical constructs that aim to set humans apart from nature are at the core of the global extinction epidemic. Understanding deeply the interconnections and dependencies we share with other species is offered as a critical element in preventing the extinction of more species. It is because we have not achieved this understanding that van Dooren believes we do not sufficiently mourn the loss of species. Indeed, he offers the account of Hawaiian Crows as a narrative form of mourning, which is intended to help us understand that the deaths of individuals and species have grave consequences for our own well-being.

In the Epilogue, the author calls for more "extinction stories" that can arouse a greater sense of responsibility to halt the extinction of more species. I think this book will inspire many readers to do just that. I look forward to reading more from him and others who take up his challenge.

Thom van Dooren is an environmental philosopher and anthropologist in the Environmental Humanities program at the University of New South Wales, Australia. His current research examines the interactions and relationships of humans and crows around the world in the context of rapid environmental change.

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HBW and BirdLife International Illustrated Checklist of the Birds of the World Volume 1: Non-passerines

Josep del Hoyo and Nigel J. Collar. 2014. Lynx Edicions, Barcelona. 903 pages, hundreds of color plates. ISBN 9788496553941. $209 (Hardcover)

Reviews, including my own, of the previously published individual volumes of the *Handbook of the Birds of the World* have been universally positive and typically proclaimed the series as a monumental achievement. Thus, condensed and updated summary volumes are the logical and much-anticipated final chapter for the series. This is the first of two and covers only the non-passerines. So, given all the fantastic features of the first seven non-passerine volumes, what had to be sacrificed to condense them into a "mere" 700 pages of text that constitutes the "Checklist?" The 4471 species accounts were necessarily reduced to: (1) listing of names in French, German, and Spanish, (2) "Other common names" (with "common" meaning English names), (3) "Taxonomic Notes," which consist of an abbreviated citation of the type designation, the type locality, and a summary of taxonomic problems within and among species, typically greatly updated from the original seven volumes, with literature citations, and for those species for which species rank is controversial, the scores from the system used to assess the rank, and (4) a list of subspecies treated as valid by the authors. Color codes indicate IUCN conservation status (17% of all non-passerine species are officially considered threatened with extinction!). Clearly, the authors put a lot of thought into how to pack the most essential information into minimum space.

But this volume is by no means a collation of pruned text from the previous volumes. The classification itself has been updated at all levels, from major reorganizations of higher-level classification (e.g., transfer of seriemas, falcons, and parrots to the end of the sequence) to re-evaluations of subspecies limits. The work that went into this is remarkable. The authors have done an amazing job at keeping up with all the latest literature.

The controversial part of the volume is the novel assessments of species limits, and thus this is the focus of my review. As announced on the first page of the Introduction, the authors regard this as perhaps the major goal of this volume, and then use nearly 25 pages, profusely illustrated, to outline and justify their criteria for species limits. A full review of this section would require more space than allotted here. Needless to say, any reassessment that elevates to species rank some 462 taxa traditionally ranked as subspecies (and 30 species re-ranked as subspecies) demands scrutiny because this represents an increase in non-passerine species diversity of nearly 12%. Those 25 pages are highly recommended reading for anyone interested in a review of problems with species concepts, from theoretical to

applied aspects, with a nice review of historical thinking. In fact, I suggest that HBW make these pages available as a separate pdf. The graphics, which beautifully illustrate many important points in avian taxonomy, would make great teaching materials. This section contains many conceptual insights, excellent real-world examples of the problems faced, and a good overview of the recent crisis in species delimitation. An omission is a discussion of the "gene tree/species tree" problem and incomplete lineage-sorting. A clear explanation of these critical concepts would have made it easier for general readers to understand the problem of letting results from a single gene dictate taxonomy, as in the ongoing epidemic of "mtDNA myopia." The Introduction outlines why use of genetic distance to determine species/subspecies ranks is flawed. The Introduction also includes an explanation of the terms used in the International Code of Zoological Nomenclature that the non-taxonomist will find especially valuable.

The core of the chapter and thus the heart of the controversy is the application of the Tobias et al. (2010) criteria for assigning taxonomic rank at the species/subspecies level. The catalyst for this approach is clearly stated: overapplication of Biological Species Concept (BSC) criteria by many taxonomists in the mid-20th century, often without explicit rationale, demoted by mere pen strokes hundreds of taxa from the rank of species to subspecies, before the importance of vocal differences was recognized. Virtually all current systematists, regardless of species concepts, recognize that current species limits in many bird groups are far too broad, incorrect, or weakly justified. In the mid-20th century, when much of current classification was codified, any hint of hybridization was formerly misinterpreted as free interbreeding. The pace with which taxa are restored to species rank through the traditional approach of new, peer-reviewed research is painfully slow, especially in regions where fieldwork is difficult or expensive, particularly the Old World tropics. The authors are also clearly uncomfortable with many of the studies that have been published, which are increasingly produced by and passed on by those whose worldview of bird classification is through the painfully narrow laboratory window of a few genetic loci, and who have minimal hands-on experience with geographic variation, contact zones, playback trials, and other perspectives on population-level variation in birds. Given the importance of the species rank in assigning conservation priorities, BirdLife International and others can no longer afford to wait for individual formal studies to re-evaluate species limits. Thus, the table is set for a comprehensive new approach.

For all the above reasons, I sympathize with the need for a major overhaul. The basic concept of the Tobias et al. (2010) methodology (modified in some ways by del Hoyo and Collar) is to quantify differences in plumage, voice, and shape among taxa known to be good species (because they are sympatric or parapatric without any gene flow) and to then extrapolate these differences in a comparative framework, yardstick-style, to the unknowns, namely all those allopatric populations that are the painful problems of BSC classification. The goal is to assign ranks (species, subspecies, or no rank) to these allopatric populations (and even parapatric populations) based on quantitative, explicit, repeatable criteria. The essence of the system is that two taxa shall be treated as separate species if the sum of the scores from their assessment of biometrics, acoustics, plumage and bare parts, ecology and behavior, and "geographical relationship" (contact zones) reaches a threshold of 7 points, with the important caveat that the number of characters that can be used is capped from 1 (for ecology and behavior) to 3 (for plumage and bare parts), because of potential autocorrelation of characters within a category. The 7-point threshold was reached by calibrating the scoring system with 58 pairs of sympatric or parapatric taxa ranked indisputably as species (95% of which scored at least 7 points), and further tested on a set of 23 European taxa ranked as subspecies, of which all but two failed to reach 7 points. My concern here is that the "knowns" might represent a biased sample in terms of latitude (temperate and higher latitudes) and phylogeny, and that extrapolations from them could thus be perilous. Also, why not boost the threshold from 7 to whatever it takes to eliminate the outliers in their calibrations to produce a more conservative approach? The authors restricted their analyses to a subset of the world's avifauna chosen by their own expertise as potentially controversial, with over 9000 papers gleaned for relevant information. Under the auspices of an international

conservation organization, BirdLife International, one might suspect that such an overhaul would be biased towards raising taxa to species rank if under conservation threat (clearly the agenda of some conservation biologists, and a tactic that could undermine conservation biology in the long-run), but the authors state that this has not biased their rankings. Eventually, all results will be made available online to allow anyone to examine the criteria and the scoring, with the explicit goal of making the current volume the first step in a dynamic process, not the endpoint. Currently, all we have is the scores in the Taxonomic Notes sections.

To try to understand the mechanics of the HBW-BirdLife International system, I picked three examples of splits involving familiar North American taxa:

(1) *Larus smithsonianus* (Arctic Herring Gull) is treated as a separate species from *L. argentatus* (European Herring Gull). From the Taxonomic Notes, this split is *not* based on the scoring system, but on published phylogenies of the group based on mtDNA sequence data. Given that use of genetic data was downplayed in the Introduction, and not formally discussed, this immediately raises concerns. Certainly this pair of species would not come close to the 7 point phenotypic threshold because *smithsonianus* "adults are 'near indistinguishable' from *argentatus*." Directly quoted from one of the mtDNA papers is that "acceptance of the splits or lumps based *solely* on mtDNA cannot be regarded as robust." Indeed, can anyone think of a worse group than the hybridizing large gulls for use of gene trees for assigning species limits? Evidently, the reason for the split is because other papers cited have treated them as separate species. Given that the goal of the HBW-BirdLife International scheme was to conduct fresh, objective evaluation, basing such a decision on the controversial if not flawed treatments of others is perplexing.

(2) *Patagioenas albilinea* (Southern Band-tailed Pigeon) is treated as a separate species from allopatric *P. fasciata* (Northern Band-tailed Pigeon). From the Taxonomic Notes, the differences in bill color warrant 2 points, differences in color shade of underparts scores 3 points, differences in wing-covert color scores 2 points, and a difference in the color of the nape adds 1 point for a sum of 8 points, thus surpassing the 7 point threshold. However, these are all plumage and bare parts characters, which are stated to be capped at 3 character sets; so, I assume the score should be only 7, thus only marginally hitting the threshold. However, species limits in New World Columbidae are typically associated with vocal differences, and plumage differences among non-interbreeding sympatric species (e.g., Ruddy, *P. subvinacea*, and Plumbeous, *P. plumbea*, pigeons) would not come close to 7 points. So, why not use vocal characters? Xeno-canto and Macaulay Library currently contain roughly 75 examples labeled as "song" (although some are obviously call notes, not songs) through most the ranges of the two subspecies groups. Songs of the northern birds are typically double-noted, whereas those of the southern birds are typically single-noted, so there is a hint that species rank might be warranted pending fuller analysis. However, a recording by T. A. Parker III from Belize (Macaulay Library 70842), which is in the range of the northern group, is clearly single-noted, as in the southern group, thus illustrating the importance of a more thorough analysis. Given the authors' use elsewhere of voice recordings available on Xeno-canto, the absence of their use here is confusing.

(3) *Colaptes cafer* (Red-shafted Flicker) is treated as a separate species from *C. auratus* (Yellow-shafted Flicker). The contact zone between these two taxa in the Great Plains is among the most thoroughly studied in the world, and the signal from that contact zone is clear, i.e., mating is typically non-assortative (but see Wiebe 2000), the resultant hybrid swarm occupies a broad zone in the Great Plains, and introgression beyond the hybrid zone is extensive. Thus, the dramatic and numerous plumage differences between them are inconsequential when it comes to mate selection, resulting in free interbreeding and extensive gene flow. Because the two taxa do not treat each other as separate

"species", then why should we? Because this is a showcase example of application of the BSC, why did the HBW-BirdLife International system re-split them? The Taxonomic Notes enumerate the many familiar plumage differences between them, which sum, unsurprisingly, to a score much higher than the 7-point threshold. An additional point is gained *because of* the broad hybrid zone because the scoring system treats hybridization as a positive point under the demonstrably flawed rationale (see below) that hybrids are less fit (for which there is evidence to the contrary from the flicker hybrid zone, e.g., Moore and Koenig 1986). Unlike sympatric and parapatric pairs of woodpecker taxa between which gene flow is restricted or non-existent, differences in vocalizations between the flickers are unknown. The Tobias et al. (2010) scheme requires making decisions based on comparisons to close relatives, but I see no evidence of that here or elsewhere.

From these three examples and from general concerns about the HBW-BirdLife International system, I find the following general problems:

(1) *Parapatry is not treated as sufficient evidence of species rank*. When two populations are parapatric with little or no interbreeding, all species concepts treat the two populations in question as separate species, and for good reason. Other than broad sympatry, what better evidence could one want that two populations should be treated as separate species if despite direct contact, evidence for free gene flow between them does not exist? Yet the authors treat parapatry as just another character, adding 3 points to their overall scoring scheme in favor of treating two populations as separate species. Frankly, after seeing this, I had a difficult time taking the rest of the scheme seriously because parapatry without free gene flow is *prima facie* evidence for species rank – no further information is needed. The scoring process is backwards – it is the results from the contact zones that should determine species/subspecies rank and then also feed into the scoring system of related taxa for assessment of rank in allotaxa, which segues to the next problem:

(2) *The signal from contact zones is ignored*. The undeniable intuitive appeal of the BSC is that in cases where two taxa are in direct contact, the behavior of the organisms themselves determines the ranks of the taxa. Thus, the BSC species/subspecies category for taxa in contact is the only rank in Linnaean classification that is defined biologically, hence the name BSC. Therefore, the results of secondary contact in terms of degree of interbreeding send a strong signal in terms of which phenotypic differences between the populations are important or not in terms of determining patterns of gene flow in related groups. However, as far as I can tell, the authors seem to ignore all such valuable biological information in their assessment scheme. For example, the two freely interbreeding toucans in their fig. 5b, as well as the flicker example above, are each treated as consisting of two species. Thus, the cart is driving the horse. The logical approach is to use the information from the contact zones in terms of relative importance of phenotypic characters as the "knowns" and then extrapolate those results to the differences among the "unknowns," the allotaxa in the same genus or family, to arrive at a defensible assignment of taxon rank. For example, non-assortative mating at the flicker contact zones tells us that multiple, conspicuous differences in plumage color and pattern that cover extensive regions of the body are not, *in themselves alone*, sufficient evidence for treating two populations in that genus or related genera as separate species. Likewise, the absence of differences in vocalizations between the two flicker populations also provides critical information on assigning ranks in related allotaxa because there are no sympatric or parapatric woodpecker species known to be vocally indistinguishable.

(3) *Non-assortative and assortative mating are not distinguished*. The authors correctly note that the modern BSC allows for extensive hybridization, but seem to misinterpret one of the papers they cite in support. Specifically, Johnson et al. (1999) emphasized that the BSC classifies

two populations as conspecific only if mating is non-assortative, and proposed that anything short of that is equivalent to "essential" reproductive isolation. Yet the authors seem to treat all cases of non-assortative mating as representing two species if the two populations meet the threshold for treatment as separate species under their phenotypic assessment scheme. In fact, they treat hybridization as a "positive" character in terms of the score in favor of the populations being ranked as species. Acknowledging that this would seem counterintuitive, they provide the broad rationale that "hybrids are less fit" and that hybridization is thus a form of isolation. To support this, they cite a single case, the *Ficedula* flycatchers of Europe, where hybrid inferiority is indeed well documented. However, mating in these taxa is strongly assortative, with only a 10% level of hybridization, and so this differs fundamentally from the hybrid zones that produce hybrid swarms as a consequence of free interbreeding. In fact, we have no information on hybrid fitness in the vast majority of avian hybrid zones. Overall, my impression is that within the broad category of hybridization, the authors do not understand the critical difference between assortative and non-assortative mating, which is at the core of understanding BSC rationale.

(4) *Variation in important characters as isolating mechanisms is not calibrated for phylogenetic differences*. The Tobias et al. (2010) scheme emphasizes the importance of adjusting their scheme for the group involved. Clearly, using the same thresholds for plumage differentiation in, say, *Scytalopus* tapaculos or *Elaenia* flycatchers must differ from those in groups with complex patterns and colors. As far as I can tell, the scale in this volume is not phylogenetically calibrated. The threshold score of 7 is applied universally, from *Empidonax* flycatchers to birds-of-paradise. Although not specifically stated, apparently the idea is that whatever *Empidonax* lack in plumage characters is counterbalanced by diversity in vocal characters. The problem with the HBW-BirdLife International scheme is best illustrated in their Figure 13, which is intended to demonstrate inconsistency among regions and studies in assigning species ranks by showing dramatic differences in degree of plumage difference in two groups. The extreme similarity in the plumages of six pairs of *Thamnophilus* antshrikes recently split on the basis of vocal differences contrasts vividly with the dramatic plumage differences in both sexes of seven pairs of Asian *Chrysocolaptes* taxa treated as conspecific. However, rather than demonstrate inconsistency as intended, this actually dramatizes real biological differences among families. The Thamnophilidae show minimal plumage differences within a limited palette of color and pattern variation among taxa that clearly should be treated as separate species, whereas the Picidae often show dramatic plumage and pattern differences among freely interbreeding taxa (e.g., the *Colaptes* example above, although the *Chrysocolaptes* complex itself indeed likely represents a misapplication of the BSC). And this segues into perhaps the worst problem:

(5) *Phenetic taxonomy has risen from the dead*. The Tobias et al. (2010) scheme has an eerie spiritual connection to the long-abandoned "phenetic taxonomy" approach to classification in which character similarity was quantified and used as an estimate of relationships among taxa. The rationale was that degree of similarity mirrors degree of relationship. Although the Tobias et al. (2010) scheme is directed at assigning ranks rather than relationships among taxa, the rationale is painfully similar, i.e., a tally of the number of character differences, often with arbitrary delimitation of what a character is, determines taxon rank. This is conceptually flawed for similar reasons, in my opinion. Just as all characters should not be treated equally in assessing relationships, likewise they should not tossed into a pot and summed to assign species rank, despite the appeal of quantification. Instead, what counts under the BSC are characters known to be important obstacles to free gene flow in the group of birds under review, whereas other differences are essentially ignored. Characters typically demonstrated

empirically to be associated with, if not the cause of, barriers to free gene flow in birds are differences in vocalizations and displays. Differences in bare part coloration may be more important in some groups, such as gulls. Differences in plumage and especially morphometrics are often irrelevant or typically less relevant, and to use them to assess taxon rank requires special pleading on a case-by-case basis. The focus of the BSC is on the biologically critical process of gene flow, not similarities and differences in phenotypic characters as assessed by human perception. The authors claim to follow the BSC, but they do not. Instead, they have employed a novel species concept that is highly unlikely to gain a foothold.

In addition, the scoring system itself has many minor problems, some of which are acknowledged, e.g., subjectivity and repeatability. Others are not, such as use of unpublished theses or cherry-picked results from publications using DNA sequencing without providing any rationale for how and when they are used. To elaborate on just one example, hybrid zones are scored as either "broad" or "narrow." However, variation in width of hybrid zone and degree of introgression is largely continuous among the many cases of non-assortative mating and consequent hybrid swarms at contact zones. The authors, nonetheless, assign all hybrid zones to one of two categories, either "narrow" (defined as less than 200 km wide) or "broad" (defined as more than 200 km wide), without any justification, much less biological rationale, for such an utterly arbitrary scheme, nor any discussion of whether a definition based on *relative* width of hybrid zone rather than absolute width might not be better, given variation in range sizes by 2–3 orders of magnitude. Yes, all of us tend to use "broad" and "narrow" when characterizing hybrid zones, at least the extremes, but no one can provide a meaningful definition.

For all these reasons, I recommend blanket dismissal of the novel rank assignments in this volume. The authors observed that "the Tobias criteria have not been rapidly adopted in published species-level taxonomic revisions." This lack of adoption should send a strong signal regarding independent evaluation of their scheme. The underlying conceptual and practical problems with the assessments require re-evaluation by HBW and BirdLife International before implementation in guiding conservation priorities. Nonetheless, the volume itself is an outstanding contribution, a great value for the price, and should be owned by every ornithologist interested in global bird diversity, even if the individual volumes are already owned—just do not take the species-level taxonomy seriously.

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Flying Dinosaurs: How Fearsome Reptiles Became Birds

John Pickrell. 2014. Columbia University Press, New York, NY. 240 pages. ISBN 9780231171786. $29.95 (Hardcover). Also available as an e-book.

Flying Dinosaurs is a timely popular work, focusing especially on the latest research related to the dinosaur-bird link. This short and enjoyable book provides an updated summary of discoveries such as dinosaurs preserved with their feathers (including evidence of feather color), evidence of bird-like behavior (such as dinosaurs found in bird-like sleep positions, or brooding above a nest of eggs), bird-like diseases in dinosaurs, and other exciting advances involving a parade of new species of dino-birds from all over

the world, especially China. The author conveys information accurately while at the same time using a colloquial and even humorous style, and entertains with diverse anecdotes that surround scientific research, such as the discovery of the first feathered dinosaur, *Sinosauropteryx*, and the infamous fake fossil of "*Archaeoraptor*" (a "piltdown" of bird origins, born out of the illegal commerce of fossils).

Researchers specializing on the dinosaur-bird transition are likely to know most of these stories and may thus focus on scientific disagreements they have with the book's content. Nevertheless, this being an academic journal, it may be of interest to raise a few controversial points. The author's perceived importance of *Limusaurus* is heavily influenced by a single study (Xu et al. 2009) that stands almost alone in the belief that this fossil species has proven the fingers in the hand of birds and dinosaurs are 2, 3, and 4 (index, middle and ring fingers). Most paleontologists consider these fingers to be 1, 2, and 3 (thumb, index and middle finger). Perhaps because of this, the author failed to mention some beautiful corroborating data from modern birds, i.e., the molecular genetics of embryonic wings suggest a hand with digits 1, 2, and 3, as most paleontologists expect for a dinosaur (Vargas and Fallon 2005, Tamura et al. 2011). I also feel that the author did not place sufficient relevance on the recovery of collagen proteins from dinosaur fossils. Unlike DNA, collagen proteins are tough and actually have a chance of deep-time preservation. Different labs have independently performed extractions, replicated results, and discarded results with evidence of contamination (Service 2009). The unique sequence of dinosaur collagen obtained from these studies has allowed unprecedented molecular testing of dinosaur affinities, and has shown that dinosaurs align with birds; paleontologists can now say "we told you so." It seems that the author did not perceive the full measure of the quality and importance of this work. Then again, a few specific controversial points are not overly significant, and they do not take away from the great educational value that this book offers to the general public.

A special chapter is devoted to a very interesting new topic. As very well put by the author, "Philosophical and ethical issues abound, but reawakening—in a living animal—dinosaur traits that have been asleep for 66 million years would surely be the ultimate tool for stirring the human imagination." Atavisms (the development of traits once present in remote ancestors) certainly happen spontaneously in birds, such as the "toothed" talpid chicken mutant, and the hoatzin, which re-evolved claws on the wings of their chicks. Experimental atavisms are also possible and can provide remarkable insight on the developmental mechanisms involved in the dinosaur-bird transition. However, a little discussed fact is that the best available experiments continue to be single-trait transformations published decades ago, such as the experimental induction in chickens of partial teeth (Lemus et al. 1983), or dinosaur-like fibulas reaching the ankle (Hampé 1958). Much hard work in the lab is yet to be done before anyone may speak of producing a "Chickensaurus," an experimentally modified bird with several primitive, dinosaur-like traits. Caution is timely because talk about "dinosaur re-awakening" is always stirred up with each new *Jurassic Park* movie. It is worth noting that trailers of the upcoming *Jurassic World*, the latest in the series, still portray some of the most bird-like dinosaurs in outdated fashion, that is, as creatures covered all over in scaly reptilian skin. "Raptors" (technically, basal paraves) were certainly feathered, as documented by feather and quill-knob preservation in fossils. *Jurassic World* may go down in history as one of the greatest setbacks ever in the flow of information from science to the public, overshadowing the noble efforts of books such as *Flying Dinosaurs.*

I cannot help comparing *Flying Dinosaurs* with another excellent short book written in 1999 by paleontologist José Luis Sanz, that bears the exact same title, but in Spanish (*Los Dinosaurios Voladores*). Although *Flying Dinosaurs* has a beautiful set of pages with color images, mostly recreations of dinosaurs, *Los Dinosaurios Voladores* has many more schematic drawings and illustrative pictures. These images allow readers to better grasp things they can only strive to imagine from text alone, and the great introduction to dinosaur and bird anatomy in Sanz's book allows a better discussion of the facts and provides the reader with a more legitimate sense of understanding.

Solving the origin of birds has not been easy. It is an event buried in deep time (the oldest known birds date from about 150 million years ago), which is precisely why establishing their descent from dinosaurs is one of the greatest scientific triumphs of modern natural history.

A long history of neatly overcome objections and an ever-growing body of evidence have supported the consistency of this conclusion. This growth of knowledge has been especially large since the late 1990s, including compelling evidence such as feathered dinosaurs, which leaves little room for reasonable doubt. *Flying Dinosaurs* is a book written in a new age where the idea has become firmly established, and nicely illustrates the ongoing boom on dinosaur-bird research. Although I continue to hand out *Los Dinosaurios Voladores* as the #1 starter for students approaching my lab, I will gladly recommend *Flying Dinosaurs* as a great follow-up and update on this fascinating topic.

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Birds of New Guinea, Second Edition

Thane K. Pratt and Bruce M. Beehler. 2014. Princeton University Press, Princeton, NJ. 528 pp. ISBN: 9780691095639. $49.50 (Paperback). Also available as an e-book.

The first edition of the Birds of New Guinea by Beehler, Pratt, and Zimmerman (1986) catalyzed field ornithology in New Guinea—a major bioregion with high avian diversity and endemism. The second "revised" edition was published in late 2014. Revised is in quotes because the new edition is a total rewrite rather than a revision. The new edition is much more than a field guide, it contains a wealth of new information.

The revised edition by Pratt and Beehler has 109 all new plates by John C. Anderton and Szabolcs Kókay and one plate (parrots in flight by Dale Zimmerman) from the first edition. The new plates are a vast improvement, reflecting the overall trend in field guide illustrations in the roughly 30 years since publication of the first edition. The plates depict a greater number of plumage variations, sexual differences, and geographic variation, with about 630 more images of birds than in the original, plus a plate of bowerbird bowers. The plates depict postures, birds in flight, and displays that not only aid identification, but inform about natural history.

A major addition is the inclusion of range maps. Given the complex geography of New Guinea and the convoluted distributions of many species, range maps add a huge amount of information. The written range descriptions are able to clarify and add detail lacking in the first edition, particularly of subspecies distributions. Maps are often scaled to add detail for species with restricted distributions, such as maps showing just the Vogelkop for the Bird's Head endemics. The maps appear opposite the plates along with a short description of the key field characters for every species, making field identification easy without the need to refer to the text. Species are generally grouped by relationship, but there are cases where confusing unrelated taxa are either shown together or there is a reference to see another plate. A single plate of diverse open-country songbirds is useful. The overall layout is well designed to facilitate field identification. Students in my field ornithology course are reaching correct identifications faster and more often than students from previous years who used the first edition.

The new information in the text makes the book a doubly good investment. Taxonomy has been completely revised to reflect many

advances since the first edition and to be more consistent with regional systematics. Synonyms are listed with many species, particularly those altered from the first edition. Every species has good descriptions of plumage describing major geographical, sex, or age variations, and descriptions of how to distinguish from similar species. Information about behavior, nests, eggs, habitat preferences, and elevational distributions increases the value over field identification.

The first 25 pages give excellent background on the natural history, biogeography, and ecology of the avifauna. There is valuable advice for visitors to New Guinea where birding presents different challenges and requirements from many other countries where experienced birders travel. These introductory pages provide some references and a window to the primary literature. A detailed checklist and synopsis is in preparation by the authors and will greatly add value to the Field Guide and further transform and facilitate ornithological research in the region when coupled with this handbook. The forthcoming checklist will provide justification and citations for many of the taxonomic decisions in this revision.

In a tome of this size, there are bound to be a few errors, like the apparent transposition of the plates for *Ptilinopus rivoli* and *P. bellus*, but, overall, there are very few apparent errors; the text has been well-edited and proof-read. I have heard people lament that the guide does not cover the political region of Papua New Guinea (PNG), leaving out the rich avifauna of many islands and archipelagoes like the Bismarcks and Admiralties, but endeavoring to include all PNG's avifauna would have made the tome cumbersome or have required diminishing the content for New Guinea's complex and challenging avifauna.

There is a Kindle version of the book that I purchased as soon as it was out. An advantage of the electronic version is that I can conveniently carry it with me for study. People not familiar with the avifauna and planning trips to New Guinea might want to purchase the electronic version for study prior to their trip. It is handy to have on hand to browse when not wanting to carry the hard copy. However, the electronic version cannot replace the hard copy when identifying birds in the field or wanting to quickly look up information for reference.

Overall, the book represents a landmark upgrade to regional ornithological references and should be added to everyone's ornithological collection, not just those who are planning field trips to New Guinea. It is clear that the authors have a profound knowledge of the avifauna gathered from extensive firsthand experience in the region. They manage to pack so much information between the covers that I and any future ornithologists and ecologists in the region will be deeply indebted to them. This will be a valuable reference for a long time and, hopefully, will inspire more ornithologists to tackle the fascinating avifauna of New Guinea.

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