Avian Ecology and Conservation in an Urbanizing World

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Avian Ecology and Conservation in an Urbanizing World.—John M. Marzluff, Reed Bowman, and Roarke Donnelly, Eds. 2001. Kluwer Academic Publishers. xiii + 585 pp. ISBN 0-7923-7458-4. Cloth, $159.95.—As the introduction of virtually every chapter in this book reminds us, the footprint of human activity lies over most of Earth's surface, in some places more deeply imprinted than others. Some of the deepest imprints are in urban areas, which continue to expand as human populations grow, and it is those areas and their environs where the contributors to this book focus their research.

This work arose from a symposium on birds and urbanization held at the 1999 Cooper Ornithological Society meeting, augmented by invited chapters in an effort to fill a few gaps. The aim of the book is to document and to discuss effects of human settlement on birds. Surprisingly, in a search of ''Biosis,'' ''Wildlife Worldwide,'' and ''Current Contents'' databases, the editors found only 101 articles reporting new empirical research on birds and urbanization. Given the global increase of urban areas, a volume on this topic was clearly overdue.

The chapters in the book reflect the variety of approaches for handling contemporary problems in urban avian ecology, mixing new perspectives with traditional ecology. The first section focuses on building a theoretical framework. Of the later chapters, some describe avian populations and communities within urban borders (true ''urban birds'' chapters), others sample along an urban–rural gradient. These employ typical avian ecological methods (mainly relating to quantifying habitat selection, diets, physiology, and reproductive success via nest monitoring, and population censusing and survey methods), only focusing these efforts on one or more specific habitat components of the urban gradient. There is little described in the way of unique methodology (which is good—this allows us directly to compare data from urban environments to those collected in more natural ones). Virtually all chapters conclude with policy and management recommendations or implications; most are accompanied by aerial photographs or satellite images of the general study area (although those are often poorly labeled). Although the chapters are grouped into distinct sections, there are unfortunately no section introductions or summaries. Cross-referencing among chapters is excellent, yielding a product that appears more integrated than such symposium-product volumes often are.

Space does not permit a description of each of the 27 chapters; however, several contributions bear additional comment.

A section containing introductory chapters sets a conceptual tone for the investigation of birds in urban environments. J. Marzluff and coeditors R. Bowman and R. Donnelly begin with a useful service—the provision of a list of standard terms and definitions, a common lexicon for both this book and future work. An ''urban gradient'' theme begins here, and is identified as ranging from urban to suburban, to rural (agricultural landscape elements) and exurban (scattered houses and cabins), to wildland. Marzluff then follows with a bibliography of empirical studies of urbanization and birds (the aforementioned 101 articles), with which he attempts to support or identify generalizations from those efforts. The few consistent effects observed were increases in non-native, edifice-nesting, nest predator, or nest parasite species of birds. Ecological and be-

havioral mechanisms that produced those effects were inconsistent, varying primarily with the type of habitat being urbanized.

Three chapters in this section are the most conceptually oriented of the book, each emphasizing some aspect of the multiscale, gradient nature of urbanization, and the need to study it on those terms. M. Alberti and colleagues, all urban planners, provide an analysis quantifying the ''new'' urban gradient, putting lie to the old ''core area'' model (degree of urbanization decreasing in concentric circles around a downtown area), which is replaced with a polycentric view. Thus, the categories defined in Chapter 1, although perhaps forming an ecological gradient, clearly do not form a smooth spatial gradient. The new pattern metrics they develop and the approach they advise are interesting, but would benefit from a more multivariate-oriented analysis using the standard statistical tools most avian ecologists are already familiar with (e.g. principal-components analysis, detrended or canonical correspondence analysis). Hopefully, this chapter will stimulate further development of biologically meaningful urbanization metrics. J. Miller and coauthors also advocate a gradient approach, but from a multiscale landscape ecological perspective. Gradient analysis has long been used to study variation in ecological systems, and it has proven to be a powerful tool in a variety of studies. Miller et al. note that one important advantage is its potential for identifying thresholds, where human effects may cause marked changes in biotic responses. Both they and M. Hostetler emphasize the need for sampling directed at more than one spatial scale, and Hostetler uses this multiscale approach to develop the ''best prediction area,'' the primary spatial extent over which environmental variables seem to best predict species occurrences. He proposes that the scale at which a species relates to habitat variation is related to body size and diet. Although none of those chapters says it outright, we infer that gradient-based studies might do well to adopt a pixel-based rather than a polygon-based approach when using maps to describe underlying environmental variation, thus avoiding the sometimes false homogeneity implied by polygons.

A section on ecological processes affecting birds contains seven chapters, two of which are not confined to a single species or city. D. Bolger presents a conceptual framework for the study of urban effects that begins with a consideration of patterns of bird abundance across an urbanizing landscape in southern California. We liked this chapter because much of what it reports is an extension of our earlier collaborations with Bolger. Still, it is worth reading as an operationalization of a good multiscale approach. To truly understand what is occurring in urban-affected systems, one needs to study thoroughly both demographic (e.g. adult survival, nest success, dispersal) and ecological (e.g. top down vs. bottom up regulatory mechanisms) processes. His comments are especially valid because most studies (including others in this book) only look at a small portion of these, and infer ''urbanization effects'' from results that may be only loosely linked to actual processes.

S. Reichard and colleagues, all urban horticulturalists, provide an extensive review of bird interactions with non-native plants in human-altered environments. Their review suggests that the conventional wisdom of birds as major dispersers of non-native plants is probably not as widespread as casual observations of foraging birds would suggest, although it remains clear that numerous effects of urbanization on birds are mediated by exotic plants. They observe that quantitative relations between the two groups need to be greatly strengthened. A potentially useful appendix of literature surveyed is not well organized nor is it synthesized; nevertheless this chapter contains the seeds of several possible dissertation projects.

A section containing seven chapters on individual species populations in urban environments well illustrates the understanding to be gained from long-term or wide-area studies. R. Pierotti and C. Annett provide an excellent review of their 22 years of work on breeding Western Gulls (*Larus occidentalis*) in areas of heavy versus relatively little urban influence. Gulls that are refuse specialists typically show very low lifetime fitness due to reduced longevity and low reproductive productivity. A captive-rearing experiment showed that refuse (represented by chicken scraps) was nutritionally inadequate for normal chick development. Overall, despite their ability to capitalize on anthropogenic resources, more urban-associated gulls generally fared much worse in terms of reproductive success. Marzluff and Donnelly combine with K. McGowan and R. Knight to synthesize results of demographic studies on American Crows (*Corvus brachyrhynchos*) conducted in Washington, California, Wisconsin, and New York. One result is a ''source-sponge'' model of population dynamics: over-productive suburban areas export nonbreeder crows to urban areas, which can absorb them. That can occur because anthropogenic resources for prebreeders are good, but less so for breeders (fecundity in urban areas is lower than suburban ones). The model differs from the traditional source-sink model in that the urban areas always maintain a successful breeding population. It also depends on continued urban sprawl (conversion of native habitat to suburbia), giving the abundant nonbreeders a place to eventually breed; otherwise, the urban habitat is just another sink.

Four of the five chapters on community-level studies are confined to a particular city, or even a region within that city. As the fifth points out, however, that may not be such a bad thing from a replication perspective, because there is considerable expectation that the avifaunas within disparate urban areas are

likely to be quite similar. R. Blair examines the homogenization of urban avifaunas, comparing species distributions along structurally similar urban gradients in California and Ohio. He finds that sites from the urban end of each gradient are 3× more similar to one another in bird-species composition than sites from the more natural area end. Thus, city birds (starlings, pigeons, and house sparrows) are city birds in both places, but the native community in California generally differs from that in Ohio. He notes, as have we all, that humans have created a certain surreal (but often comforting) homogeneity among urban areas: in his words, ''you could drop a blindfolded person outside a fast-food restaurant in Portland, Oregon; Portland, Maine; or Portland, Ohio; remove the blindfold and they would be hard pressed to identify the state in which they had been dropped.'' This conversion of the landscape has had a not-surprising effect on the avifauna.

Bowman and Marzluff conclude with a brief discussion of general issues emerging from the book, which is mainly a summarization of salient features from individual chapters: the need for a rigorous methodology, a set of appropriate metrics, explicit incorporation of spatial heterogeneity, development of mechanistic links between individuals and populations based on demography, and defining links between populations and communities based on species interactions and trophic relations. Put that way, those recommendations sound like a prescription for improvement of ecology in general, not just studies of urbanization effects.

There are questions that remain unanswered. Are urban areas population sources, sinks, or traps? That seems to be completely species-specific. In southern California, Bolger posits that urban areas serve as a source for the presence of urban birds in wildland areas. M. North observes that the density of waterfowl young in urban Anchorage exceeds that of most major waterfowl rearing areas in the wildlands of Alaska, and L. Jerzak shows that urban Magpies (*Pica pica*) are increasing in numbers and are more productive in urban Eurasia. Florida Scrub-jays (*Aphelocoma coerulescens*), on the other hand, have lower productivity in suburban versus wildland areas, as noted by S. Schoech, G. Woolfenden, and Bowman. Perhaps most surprisingly, G. Mennechez and P. Clergeau document that although European Starlings (*Sturnus vulgaris*) capitalize on human refuse in feeding young, attaining higher nest densities in urban areas with trees and lawns, broods do not do as well as those in rural habitats, and thus urban habitats could be a suboptimal habitat for breeding starlings. And then there is the source–sponge model. Also left largely unanswered is the fate of migrant birds in an urbanizing landscape. The issue is briefly addressed by J. Brawn and D. Stotz. In examining the importance of parks in urban areas (Chicago specifically), they postulate that whereas parks are perhaps not suitable areas for supporting populations of breeding birds, they may be quite significant for migrants during passage—an ''oasis'' effect. Given the accumulating evidence of human effects on migrants, especially Nearctic–Neotropical species, that issue bears considerable scrutiny.

We are also left with less than perfect understanding of the role of predation in influencing population dynamics. In a brief review of nest predator abundance and urbanization, D. Haskell and his coauthors point out that our knowledge of the process is patchy. Most studies (including their own) use methods (e.g. quail eggs in artificial nests) that cannot detect the full range of predators attracted to nests, and thus few document changes in predation rates with housing density (although Blair's studies detected a decline in nest predation rates with urbanization). Marzluff et al. observed that crow abundance was uncorrelated with nest predation, in part because they are only one of a suite of nest predators that have complex interactions among themselves and with their prey. It thus seems difficult to generalize ''urbanization effect on nest predation,'' because predator communities vary greatly by region, and behavioral changes in predators may mean that their abundance is not related to predation pressure.

Clearly, this is a book about landscape ecology and geographical ecology (though perhaps on a smaller scale than R. MacArthur envisioned when he coined the latter term). Thus, the successful scientist practicing in this arena must be able to create and manipulate maps. But success will require more. Bowman and Marzluff note that a new paradigm of urban ecology is arising that seeks to disentangle the effects of biophysical phenomena on ecosystem processes from those produced by socioeconomic phenomena. In most cases, our training as ecologists, whether avian or otherwise, has left us unprepared to undertake this transition on our own; to be effective, we must develop collaborations with urban planners, sociologists, economists, and even political scientists. Likewise, although we definitely need a landscape approach to understand the effects of urbanization, we may also need a new set of landscape metrics; patch size, shape, and isolation, corridors, and habitat ''matrices'' need to be rethought. Abiotic effects have been mostly overlooked, despite the fact that understanding those has formed the foundation of most ecosystem studies.

Ecologists often seek out the most ''pristine'' (more accurately, less disturbed by humans) sites for studies, as if behavior, ecology, and ecosystem processes are somehow held in abeyance in areas influenced by humans. This book is clear evidence that this is not so. Even in downtown Los Angeles, bird populations are affected by predators and parasites, availability of nesting sites, and suitable habitat; individuals are faced with the need to find mates and places to forage. Natural selection and evolution are

not on holiday in urban environments. Urban studies are obviously useful for conservation purposes, but we would have appreciated more emphasis on using urban systems to deal with more typical theoretical (that is, less applied) problems. It would be nice to use urban areas in ecological studies (if nothing else they are such common and accessible habitats for research), but sometimes it seems that research in urban areas will ultimately be used only to answer ''urban ecology'' questions, that is, for policy and management.

What is missing? We would have liked to see more on the ecological mechanisms by which effects of urban development are propagated into the surrounding wildlands—that is, what actually produces the ''edge effects'' that are so frequently documented in landscape ecological studies relating to birds. Although the urban-gradient approach may be a productive way to search for ecological relationships, the fact that this urban gradient does not follow a smooth geographical gradient means that extremes will be spatially adjacent (e.g. high-density housing abutting relatively undisturbed wildlands, as is common in our own region). Other lacunae are not the fault of the editors, but represent the fact that apparently little research has been done in certain areas. For example, Miller et al. note that only 5 of 41 studies they reviewed covered the entire length of the urban-wildland gradient, being especially light at the exurban portion. Also, there appears to be a paucity of work relating to urbanization in grassland or desert biomes; given the rapid human population growth in the arid regions of the American Southwest, we hope that area receives attention soon.

To the extent this book is an unbiased survey of urban bird ecology (now newly defined), it points out a clear scarcity of long-term studies (22 years by Pierotti and Annett notwithstanding). Of those that do exist, most rely on Christmas Bird Count data, which often sample a highly heterogeneous landscape over a scale inappropriate to answer questions relating to the urban gradient. It is also surprising that there are not more long term ''experimental'' (i.e. pre- and postdevelopment) studies, especially given that the pace of urbanization, at least in many countries, shows no indication of slackening.

A volume reviewing and synthesizing the new urban ecology from the perspective of birds has been required for some time. Is this the book we have been waiting for? Despite a number of really excellent contributions (not all of which we mention above), we judge that about a third of the chapters are just not very good; some are limited in scope and duration, and a few are simply poorly written. These shortfalls are compounded by weak copyediting, yielding a product with a truly annoying number of typographical errors. The layout of tables and appendices is not very well done, with many lacking suitably descriptive titles. One appendix even includes for its extensive literature citations a column of numbers keyed to ''numbered entries in the references section''; the reference section is not numbered. Although the provision of aerial and satellite imagery is thoughtful, the images are of relatively low contrast, hence often muddy and indistinct. There is extensive use of place names without accompanying maps throughout the book, and many of the maps provided lack keys and scales. Finally, this poor production is coupled with a price ($160!) that is stunningly high, virtually guaranteeing that this book will appear only in institutional libraries, not on the shelves of working avian ecologists.

This book is not the definitive work, but rather a representative of the status of the field. It is difficult to understand the complex effects of urbanization on birds, but attempts are being made to isolate the important factors. Rather than a culmination, it is better to think of this book as a beginning. We are glad to have it, and we expect to refer to it frequently in designing our own research in urbanizing landscapes.—JOHN T. ROTENBERRY and THOMAS M. UNFRIED, *Department of Biology, University of California, Riverside, California 92521, USA. E-mail: rote@citrus.ucr.edu*