

morphs exist, there may be as many as three or four illustrations per species. Both sexes are depicted when there is significant sexual dimorphism in plumage. The birds are presented in unadorned field-guide type plates, typically in perched poses. Swifts are depicted in flight, and small flight paintings accompany many of the nightjars as well. The plates vary somewhat in accuracy, but overall they are excellent.

In such a massive volume containing so much factual information, there must be a substantial number of errors and omissions. Experts on particular species and groups will no doubt delight in pointing these out. In general, extralimital records are very inconsistently presented. In North America, for example, Texas occurrences of Mottled Owl (*Ciccaba virgata*) and Stygian Owl (*Asio stygius*), many records of Plain-capped Starthroat (*Heliomaster constantii*) in Arizona and Bahama Woodstar (*Calliphlox evelynae*) in Florida, and Cinnamon Hummingbird (*Amazilia rutila*) occurrences in Arizona and New Mexico are not mentioned, whereas old and probably invalid Texas records of Rufous-tailed Hummingbird (*A. tzacatl*) are noted. The Green Violet-ear (*Colibri thalassinus*) is said to stray to the extreme southwestern United States, when in fact the records are from the central and eastern parts of North America. A bird reported (p. 413, 420) to be a Black Swift (*Cypseloides niger*) of Caribbean origin from Martha's Vineyard, Massachusetts, was never identified and may, in fact, have been an *Apus* (W. Petersen pers. comm.). These are quibbles; the book was not intended to deal with distribution in this detail. However, readers should be warned that this information should be taken with a grain of salt.

The most serious flaw in these volumes, and one that reduces their usefulness, is that references are not cited in the text. Reading the family accounts, one comes across many interesting and provocative statements and fascinating facts that merit further exploration. But the text provides no efficient way to find the source of the information. At the end of each family account appears an extensive list of references, but without titles. The only way to try to ferret out the source of a particular piece of information is to check each of these citations against the bibliography. All but the most persistent readers will throw up their hands in the face of this task. The usefulness of future volumes would be greatly enhanced by using small superscript numerals or some other space-efficient means of connecting information with its source. Approximately 8,000 references are cited, and it is a shame that this vast collection of data is not made more accessible.

This volume, along with its companions, represents a stunning achievement. Collectively, this set of volumes will be the indispensable primary source of information on the birds of the world for the next several decades.—KENNETH P. ABLE, *Department of*

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Bull's Birds of New York State.—Edited by Emanuel Levine. 1998. Cornell University Press, Ithaca, New York. xx + 622 pp., 7 maps, 6 figures, 8 tables, 30 black-and-white sketches. ISBN 0-8014-3404-1. Cloth, \$39.95.—State bird books serve many functions and assume many formats. Some works contain lavish illustrations and provide copious detail on the precise status of every species known to have occurred in a particular region; others are either so superficial or so provincial that they provide little of interest to anyone except a reader with a specific interest only in the bird life of a particular state. *Bull's Birds of New York State* provides a pleasing blend of regional information in a format that is both informative and reader friendly. A 50th anniversary project of the Federation of New York State Bird Clubs, this publication is the product of a collegial effort involving individuals, institutions, and organizations combining their talents to produce a valuable contribution to the ornithological literature of the Empire State. This reference substantially updates John Bull's 1974 treatise, *Birds of New York State*, by effectively integrating information published in Andrlé and Carroll's (1988) *The Atlas of Breeding Birds in New York State* and field reports gleaned since 1974 from the Federation's quarterly journal, *The Kingbird*. From the latter source, the majority of unusual reports and all of those representing new species or new breeding records for New York have been carefully screened by the New York State Avian Records Committee.

Besides the species accounts, which represent the main body of the volume, there is much useful information to recommend in the introductory sections of this book. In keeping with the tradition found in most state bird books, the physical environment of New York is described in considerable detail. In addition to including a revision of Bull's 1974 narrative of New York's physical environment, this book provides a 12-page description of the ecozones of the state, along with a colored ecozone boundary map and maps showing elevation contours and landcover types. Although it is nice to have this information between two covers, the fact that much of the material was previously published in *The Atlas of Breeding Birds in New York State* adds an element of redundancy. The inclusion of this material apparently is justified by the fact that many of the species accounts

make reference to the ecozones when describing the distribution of birds.

In a 13-page summary of bird habitats in the state, Charles R. Smith and Shari K. Gregory describe New York on a smaller landscape scale. More than a simple narrative description of New York's floral communities, the authors provide a thoughtful analysis of landscape changes over time and highlight the significance of succession in determining the future of bird populations, such as those of Golden-winged Warbler (*Vermivora chrysoptera*) and Eastern Towhee (*Pipilo erythrophthalmus*). They remind readers that "succession is a natural ecological process, not necessarily a threat, as some have asserted." They also emphasize that any attempt to interrupt or thwart succession means making "a long-term commitment to active management based on ecological, economic, political, and philosophical considerations." In this case, the question is "Are we prepared to cut mature forests in order to encourage regeneration that will maintain successional habitats required by shrub-land bird species?"

Smith and Gregory also cogently describe how developing technology (e.g. satellite remote sensing and standardized habitat taxonomy) may soon provide methodologies for describing landscape changes over large areas and long time periods, techniques that are already cornerstones in a number of landscape-scale conservation projects. At a more parochial level, detailed habitat descriptions and associated indicator plant and bird species lists should prove useful to anyone interested in obtaining basic information about northeastern bird assemblages.

Another introductory section authored by Smith describes the role played by the Federation of New York State Bird Clubs in integrating bird conservation projects in the state. More than simply stroking the sponsoring organization, this section gives succinct descriptions of the most important bird-based conservation programs in New York (e.g. Breeding Bird Survey, Breeding Bird Atlas, State Parks Checklists, Finger Lakes National Forest Study). In addition, it presents current, statistically significant trend analyses for increasing and declining breeding bird species. Figures accompanied by written summaries provide a convenient digest of population trends for many bird species in New York. This section effectively pulls together information that otherwise is scattered in a variety of data bases, thus making it an especially useful resource for conservation planners, legislators, and anyone else desiring a summary of population trends in New York's breeding birds.

A 15-page section by David W. Steadman on long-term changes in bird populations provides an interesting paleontological perspective on New York's bird life. Even though primarily an update of Steadman's avifaunal history that originally appeared in *The Atlas of Breeding Birds in New York State*, for many readers this section will provide an expanded con-

text in which to view changes in bird populations. For example, one of Steadman's most chilling projections pertains to avian extinction rates. At the current extrapolated rate of approximately 20 avian extinctions per millennium, in 10,000 years New York State could lose roughly half of its species of birds! How to curtail this phenomenon will be an increasing challenge for bird conservationists in the centuries ahead.

The final introductory section includes a discussion by Carole S. Griffiths about trends in avian taxonomy, as well as a statistical chronology that traces changes in the New York state bird list since the publication of John Bull's original *Birds of New York State* (1974) and its 1976 supplement. In 1998, the official New York State bird list comprised 451 species, 243 of which were breeding species or historically had bred in the state.

The main body of the text consists of 451 species accounts written by approximately 75 contributing authors. One of the greatest strengths of the book is the efficient, easy-to-follow organization of the species accounts. Starting with a generalized description of "Range," each account is followed by a brief (yet precise) statement describing the species "Status" in New York. Indicator terms for abundance, such as "Common" and "Rare," are quantified by definitions such as "20 to 50 individuals per day per locality," or "1 to 6 individuals per season." Although by no means perfect, such an approach offers a quantifiable way for describing species abundance that is sometimes lacking or is far more subjective in some other state bird books. Along with abundance, the status of each species is described as "Resident," "Migrant," "Visitant," or "Vagrant." For species that nest in New York, the accounts are broken into "Breeding" and "Nonbreeding" sections. For nonbreeding species, the term "Occurrence" is used to define each species' status within the state.

Within the "Occurrence" and "Nonbreeding" sections (for breeding species), migration data include high and low counts and early and late dates; winter occurrence also is described. In some accounts, a "Remarks" section includes information that does not specifically fall into the regular categories described above, yet nonetheless enriches the account in some way. For example, the Black-headed Gull (*Larus ridibundus*) account describes the only United States nesting of the species in neighboring Massachusetts, and the account for Red Crossbill (*Loxia curvirostra*) provides extensive details about the taxonomic complexities of this highly variable species.

Although it might seem desirable to analyze every species account for flaws or erroneous inclusions and omissions, suffice it to say that careful scrutiny of a number of randomly selected accounts produced no glaring errors and even fewer grammatical mistakes. Considering the variation in authors' styles and the vast amount of data included in the species accounts,

in my judgement the editors are to be congratulated for producing such a remarkably error-free work, especially where multiple authors wrote the species accounts and introductory sections.

It is a pleasure to read *Bull's Birds of New York State*, and I have no doubt that I will refer to it often in the future, just as I have done with its predecessor. It is a visual treat because of the artfully produced line drawings by Dale Dyer. It rightfully belongs on the shelf of any birder or field ornithologist who has an interest in avian distribution and species trends, whether specifically in New York State, or in general. Likewise, conservation planners in the Empire State should use this book to supplement data gathered by the National Audubon Society's New York State Important Bird Areas program.—WAYNE R. PETERSEN, *Massachusetts Audubon Society, Center for Biological Conservation, South Great Road, Lincoln, Massachusetts 01773, USA.*

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Fundamentals of Molecular Evolution, 2nd Edition.—Dan Graur and Wen-Hsiung Li. 1999. Sinauer Associates, Sunderland, Massachusetts. x + 443 pp. ISBN 0-87893-266-6. Paper, \$48.95.—There exists a tremendous range of data and theory regarding the patterns and processes of molecular evolution. In a concise manner, Graur and Li provide a synopsis on the basic and dynamic elements underlying the theories and practices necessary to understand and derive this knowledge. Like the first edition (1991), the second edition attempts to bridge the data (e.g. molecular biology) with the concepts and theories (e.g. population genetics and systematics) and does so in an exceptional manner, synthesizing much of the information gained over the last decade into a broad evolutionary context. The authors state in the preface that “We set out to write a book for ‘beginners’ in molecular evolution.” This volume certainly represents an excellent primer for beginners, but it also embodies a valuable reference for more-advanced students and scientists with an interest in the field. This is partly due to its comprehensive breadth regarding the rapidly enlarging theoretical and practical framework in molecular evolutionary studies. Using the scientific method and a straightforward writing style, Graur and Li use mathematical and in-

tuitive explanations to address problems in molecular evolution including subjects such as likelihood, mutation, transposons, genomic evolution, exon and intron change, duplication, RNA viruses, concerted evolution, and the C-value paradox.

The organization of the chapters is fairly consistent. In most cases, key concepts are introduced with brevity and clarity and the operating terms are defined. Many of the subjects are discussed within a scientific framework and are often provided with supporting evidence, alternate theories, and clear mathematical or biological examples. Most chapters contain good citations of the primary literature, and the end of each chapter includes a valuable list of papers and books suggested for further reading.

The first three chapters provide the foundation for the remainder of the book. These chapters are an excellent review of the genetics of the evolutionary process. They interweave some of the important concepts of population genetics in an outstanding manner, particularly at the level of understanding genic and nucleotide diversity. The third chapter is a commendable review of the tools and concepts necessary to use the comparative approach in the field of molecular evolution.

The fourth and fifth chapters cover a broad range of topics. In many ways, these chapters serve as a jumping-off point to the utility of molecular evolution in investigating basic questions of molecular and organismal diversity. Particularly impressive is the emphasis on the potential factors associated with rates of mutational change (e.g. adaptive radiations, loss of function, replication-dependent and replication-independent factors, gradualism vs. punctuated equilibrium, and synonymous vs. non-synonymous patterns). There is ample discussion regarding the various distance methods used, and the mathematical arguments are easily followed.

The final three chapters are a concise synthesis of some of the most recent discoveries within an evolutionary context. In these chapters, Graur and Li introduce theoretical and methodological elements involving genomic diversity and evolution as well as many of the problems being encountered in molecular evolution. These chapters illustrate the dynamic theories and mechanics of molecular evolution and are an excellent foundation for outside discussion and inquiry. The two appendices are also helpful. The first is a brief discussion of the spatial and temporal geological scales and their relevance to species diversity and the field of molecular evolution in general, and the second is a discussion on some of the basic elements of probability.

A key feature of the book, and one extremely relevant to avian biologists, is that it transcends any organismal bias for the more straightforward task of addressing contemporary and classical issues in evolutionary biology using molecular and theoretical techniques. In many cases, the examples are lucid