

REVIEWS

EDITED BY WALTER BOCK

The ecology and behavior of the Prairie Warbler *Dendroica discolor*.—Val Nolan Jr. 1978. Ornithological Monographs No. 26. xxii + 595 pp., color frontispiece, 42 text figures, 8 appendices. Cloth. \$29.50.—For the past three decades Margaret Nice's "Studies in the life history of the Song Sparrow" has been the benchmark for investigations of the breeding biology of passerine birds. It is appropriate that Val Nolan has dedicated his monograph on the Prairie Warbler to that remarkable woman, since it clearly follows in her tradition and is destined to be placed next to her works on the bookshelves of many ornithologists.

Nolan's book presents the results of 14 years (1952–65) of systematic field work near Bloomington, Indiana. The picture of the life cycle of the Prairie Warbler that emerges is more complete than that available for any other passerine bird. The 41 chapters, 186 tables, and 8 appendices almost overwhelm the reader with information, but include biological details that most studies have been unable to determine, or have only guessed at. It is indicative of Nolan's intimacy with his subject that not only has he observed females laying eggs in nests 11 times, but also that he holds the unique distinction of having had a female warbler lay her egg in his palm on no less than four separate occasions.

The book is organized chronologically, following the annual cycle of the Prairie Warbler from its wintering grounds in the Caribbean, through the breeding season in Indiana, and on to the postreproductive movements of the birds and their fall migration. Each phase of the cycle is the subject of one or more chapters containing analyses of the associated events and phenomena. Some topics that do not fit neatly into this sequence, such as descriptions of vocalizations, are introduced at an appropriate place, while others are not positioned as logically, such as the chapter on mating systems and sex ratio, inserted between the fledging of young and the discussion of the postreproductive period. Other topics that do not follow the chronology, such as survival and mortality, food habits, maintenance behavior, and a consideration of measurements, plumages and molts, are gathered in a series of chapters at the end of the book. Almost all aspects of the breeding ecology and behavior are documented in impressive detail. In particular, the treatments of nest-building (Chapters 15–17), the events between fledging and independence of young (Chapter 28), cowbird parasitism (Chapter 32), the behavior of birds during the postreproductive period (Chapter 35), and site fidelity (Chapter 37) are much more extensive than those of most comparable studies.

The great value of Nolan's work lies in its intensive nature. In an age in which both ecological and behavioral studies are becoming more and more quantitative, we risk losing track of the importance of studying organisms as unique individuals in our quest for adequate data bases and statistically significant differences. Nolan was able to study only 10–15 territories in detail each season, but the long duration of his investigation produced the sample sizes necessary for his analyses, without sacrificing familiarity with individual subjects. He followed the histories of 135 territories, involving 137 males and 176 females, of which 85 males and 119 females were individually color-banded. The book is full of insights resulting from this ability to deal with known individuals. For example, he documents that of 75 males that returned to his study area in seasons subsequent to banding, 55 (73%) reoccupied their former territory. Similar results are given in many life history studies. However, Nolan can provide additional behavioral details on the 20 males who bred on new territories. Almost all returned initially to their old territory, then left it and relocated after periods of 2–8 days, prior to female arrival, and without any evidence of pressure from other males. Nolan interprets this as a mechanism of behavioral flexibility in a species inhabiting a seral habitat, where inflexible site fidelity might be disadvantageous. Another example is found in his analysis of sexual chasing in Prairie Warblers. Shortly after arrival of a female on a territory, the male repeatedly chases her, often seizing her tail with his bill and hanging below her. Nolan was able to distinguish between pairs that eventually bred and temporary pairs that broke up after several days of association. Sexual chases were successful (the male caught the female) significantly more often in chases involving eventual pairs. This is an important finding in relation to our lack of understanding of pair-bonding mechanisms and the role of aggression in courtship behavior, and calls for more detailed study.

Perhaps the most significant finding resulting from the ability to recognize most individuals is the demonstration of the tendency of male Prairie Warblers to make routine "explorations" of areas surrounding their territories (Chapter 30). Nolan regularly encountered males at considerable distances (up to 1.2 km) from their territories, and he suggests that they may carry out such explorations as frequently as once per day, remaining absent from their territories for as long as 2 hours. Such "explorers" can be

distinguished from males making brief invasions of a neighbor's territory, and they seem to be especially interested in nests and nest-related activities on other territories. Nolan argues that exploration could play an important role in relocation of territories either before nesting or during midseason by allowing males to evaluate and compare sites, or even to carry out "trial-and-error" dispersal. This finding may have much wider significance. Nolan cites evidence for similar "exploration" in the work of Kendeigh and Mayfield on other parulids, and I have found similar cases in the Yellow-rumped Warbler (*Dendroica coronata*) and the Tennessee Warbler (*Vermivora peregrina*). Nolan argues rightly that if this phenomenon is widespread, the numerous studies that have purported to demonstrate large numbers of non-breeding males or "floaters" in passerine populations are suspect. Unless it can be established that "floaters" are not actually "explorers," arguments using the observation of floating males as evidence for limitation of breeding density by territoriality must be treated with caution.

One of the most intriguing sections of this work was, for me, the analysis of the surprisingly high degree of polygyny found in the Prairie Warbler. Polygamy is generally accepted to be an abnormal condition for most parulids, but 25 of the 137 males (18%) whose histories Nolan followed were involved in polygynous relationships. This usually involved two females breeding on one territory, but four males simultaneously defended two separate territories, each with a resident female. Nolan argues that polygyny results from the high rate of nest failure due to predation or cowbird parasitism, a feature not previously associated with polygamy in passerines. Pair bonds frequently dissolve when nests fail, resulting in the presence of unmated females throughout the breeding season. The probability that such females will be able to renest successfully declines rapidly as the breeding season advances. Therefore, Nolan argues that for "the sexually-competent female Prairie Warbler, unmated in midseason with time running out and the pool of potential mates dwindling, rejection of a courting male solely because he was mated might assure reproductive failure for the year" (p. 370). Current models for the evolution of polygyny suggest that females will choose to pair with a mated male when his qualities, or the qualities of his territory, are sufficiently better than those of available unmated males that they compensate for any loss in fitness to the female resulting from having to "share" her mate. Although the reasons why Prairie Warbler pairs break up upon nest failure are unclear, Nolan argues that the selection pressure upon females to remate rapidly will favor polygyny, even in the absence of the margin of individual or territorial superiority usually thought to be necessary for the evolution of such a mating system. However, Nolan's analysis suggests that the latter factors are not totally irrelevant. Territories of polygamous males were larger than those of monogamists, and the length of time required for a polygamist to obtain his first mate of the season was shorter than that for monogamous males. Both these observations are consistent with the hypothesis that either such males or their territories may be particularly attractive to females. In addition, the "cost" of polygyny for females may not be severe. The productivity of nests on the territories of monogamous males was no higher than that of nests of polygynists. This may be attributable to the fact that the nests of a polygynous male were rarely synchronized (most polygynists obtained their second mate while the first was incubating), and the males could contribute significantly to the feeding of the young of both females.

The extremely high rate of nest failure may be an important determinant of aspects of the breeding biology besides the mating system. Only 22.3% of a sample of 400 nests were successful (producing at least one fledgling warbler or cowbird) and Nolan argues convincingly that this low rate is not an artifact of his activities. The median active life of a nest (measured from the laying of the first egg) was only 10.1 days, compared to the 24–25 days required to successfully fledge young. Females renested repeatedly (one female built seven nests in a season). Calculation of mean values for various components of reproductive effort shows that the "average" female built 3.1 nests per season, laying 10.8 eggs, 2.2 of which produced fledglings (p. 419). The extent of renesting, along with the dissolution of pair bonds following failure, produces a situation in which hardly any two individuals follow the same course of events during a breeding season. This led Nolan to analyze many factors on a per territory basis, rather than per pair or per breeding attempt. Cowbirds were responsible for about 18% of nest failures and circumstantial evidence suggested that predation accounted for almost all the remainder. The probability of success increased from 15% to 36% as the season progressed, probably due to a reduction in both parasitism and predation. Nolan reasons that selection has not shifted breeding later into the summer because early nests have bigger clutches and larger broods. This, along with possibly higher survival of early fledglings, may offset the disadvantageous rate of nest failure in early breeding attempts. There is also an interesting interaction between nest height, time of the season, and success rate. The proportion of nests lower than 1 m from the ground declined during the season, while the proportion of high nests (above 2 m) increased. Paralleling this is a change in nest success. Early in the season 32% of low nests were successful, but only 13% of high nests. Late in the season less than 15% of low nests fledged young while about 35% of

high nests did so. Nolan interprets this as a response by females to the phenology of concealing vegetation. Early nests, built when the vegetation is least developed, probably were most likely to survive if placed in denser cover near the ground. Later in the season, when leafy vegetation is fully developed, high nests will also be concealed and their height may afford additional protection from ground-hunting predators.

Although Nolan's writing style is clear, the book is heavy reading in sections because of the amount of information presented. Figures and tables are generally well-organized and understandable and, in many cases, present the data in a form that would allow additional analyses and comparisons (if the reader were able to think of any that Nolan has missed!). However, I found two features of the writing to be somewhat frustrating. First, references to other literature frequently appear to be added as an afterthought and one is often uncertain whether the work cited supports or contradicts the statement Nolan has made. Second, Nolan continually refers the reader to other pages, chapters or tables within the book. While such cross-referencing is often useful, I found its occurrence eight or nine times in a single page distracting. The book has an excellent index that serves the same purpose as many of the cross-references.

Nolan has done an excellent job of drawing together the literature on the Prairie Warbler, including numerous old or little-known sources. However, the length of time required to write and edit this monograph is reflected in the bibliography. While 103 of the 646 citations are from before 1930, only 40 date from 1971 or later.

An overall evaluation of this work must be in comparison with Margaret Nice's classic study of Song Sparrows, since I feel that Nolan's book will fill much the same role. Nolan's study is more intensive than was Nice's, and he has analysed his results in much greater detail. However, it is not as "extensive" in the sense that while Nice was able to summarize and include a great proportion of the work on other passerines for comparison, Nolan has not attempted to do so. Most of his references to other breeding biology studies are to other warblers. While such a compilation is one of the most useful aspects of Nice's work, Nolan cannot be faulted for its omission. The literature on the breeding biology of passerine birds has expanded enormously since Nice completed her work in the early 1940's, and to attempt such a task today would tax the energy of any worker, and would have doubled the size of the present volume.

This book has much to offer any reader. The amateur ornithologist may find some parts of it heavy going, but should not be put off by the mass of analyses. The biological story that emerges is fascinating. Ornithology students (and many ex-students) will find a useful lesson in the importance of attention to accurate recording of details in field studies, and a timely warning of the dangers of assuming that they can easily extract "the" course of events from the highly-variable patterns that exist in nature. The study suggests numerous questions for additional research, either on the Prairie Warbler or other species. I have indicated several in this review; many others can be found in all sections of the book. The theoretically-inclined reader may be initially disappointed by what is an unreservedly descriptive study, but will receive new perspectives on various basic issues in modern avian behavioral ecology, such as the significance of "floaters" in populations or the evolution of polygyny. Nolan's findings will undoubtedly be used to estimate parameters for future models of behavior and ecology, in the manner that Nice's study has been used. For example, Nolan's elaborate simulation of reproductive success in hypothetical Prairie Warbler populations, with and without cowbird parasitism (pp. 528-538), invites computerization and the investigation of the influence of varying different parameters on reproductive output.

In summary, both Nolan and the American Ornithologists' Union are to be congratulated for producing this useful and monumental study. The cost of the book is not overly high in relation to current book prices, and it is not likely that Nolan's work will soon become outdated. This monograph will serve as a standard reference for many years, just as Margaret Nice's work has done till now.—M. ROSS LEIN.

Avian breeding cycles.—R. K. Murton and N. J. Westwood. 1977. Oxford, Clarendon Press. xiii + 594 pp., 193 figures, 19 tables. \$48.00.—This is the kind of book that nowadays is usually written by a committee, and probably should be reviewed by a committee as well. Its scope is vast, ranging from neural and gonadal histology through reproductive endocrinology and photoperiodism to the ecology and evolution of breeding seasons—with excursions into such subjects as reproductive energetics, sexual selection, and the regulation of population size. A review of such an ambitious treatise has to be either long-winded and detailed or brief and dogmatic. I have chosen the latter.

The authors' aim in this book is to stimulate research, and so they have slanted it toward the interests of postgraduate workers and senior undergraduates. "It would certainly have been easier [they explain in the preface] to have drawn general broad conclusions, which may as a result have been oversimplifications, than to summarize other worker's results accurately and we hope that we have adopted the

most useful course . . . In attempting to synthesize some of our physiological and ecological understanding of avian reproduction [they continue in chapter 1], one object of this book will be to illustrate some of the patterns of ecological adaptation that result from the restraints imposed by complex physiological mechanisms. Another aim is to persuade physiologists to relate their experiments to the natural environments under which their subjects live. We believe that future advances will involve a multi-disciplinary approach and we hope that our book will provide a starting-point and stimulus."

While this treatise is rather too late to be a "starting point" in this direction, there is little doubt that it will be a stimulus and source-book for the future. The treatment of subject matter is encyclopedic and empirical. The authors amply repeat and summarize data from original sources, at least tacitly inviting readers to form their own evaluations and interpretations. This is the greatest strength of the book. Although the authors say (p. v) that they have eschewed "broad general conclusions" lest they lapse into unreliable generalizations, they have succumbed overtly to at least a few aspects of synthesis or generalization in the summaries that precede each chapter and in the many original diagrams combining information from diverse sources. Generalizations, in fact, abound in this book.

Avian Breeding Cycles is organized according to a plan that seems logical enough as the authors explain it in the Introduction, but which in practice results in the frequent scattering of logically allied subjects through two or more chapters. Perhaps this is unavoidable in a treatise that attempts to meld such diverse topics, but it nevertheless detracts from conceptual coherence at numerous key points. The authors compensate partially for this fragmentation by a very thorough cross-referencing of subjects by page- and figure-number.

Following a brief "Introduction to Reproductive Strategies" (chapter 1), three chapters concern the processing of environmental information by the neurohypophysial system (chapter 2) and the effects of adenyhypophysial hormones on the gonads and accessory reproductive organs (chapters 3 and 4). Two chapters (5 and 6) are then devoted to the endocrine basis of behaviors leading to the coordination of gametogenesis and reproductive competence between the sexes. Chapters 7 and 8 concern the energetics of reproduction and other events of the annual cycle (e.g. molt, migration) that potentially affect the timing of the breeding season. The diversification of breeding cycles in response to organismic and environmental variables is surveyed with numerous examples in chapter 8 (north-temperate zone) and chapter 9 (tropical and additional temperate-zone cycles). At this point the text returns to the subject of physiological mechanisms with a series of four chapters, respectively, on the role of circadian rhythms in photoperiodism (chapter 11), the integration of photoperiod and endocrine reaction (chapter 12), examples of apparently non-photoperiodic breeding cycles (chapter 13), and the evolution and adaptive radiation of photoperiodism, with examples emphasizing anatids (chapter 14). The text concludes with chapters on sexual selection, pair bond, and mating systems (chapter 15) and population regulation (" . . . what happens to the surplus that results from reproduction . . ." chapter 16) that are connected only remotely with the main theme of the book but which enable the authors to take some favorite hobby horses out for a trot. The end materials comprise five appendices (at least three of which are pointless), a Postscript summarizing selected developments since the completion of earlier parts of the text, a thorough but not exhaustive "Bibliography" of about 1,600 titles (to 1976), very good species and author indexes, and a three-page subject index that seems sparse for a treatise of such length and complexity.

Avian Breeding Cycles is obviously the product of vast enthusiasm, an almost comprehensive command of the technical literature, and (not least) a super-efficient reference file. This results in what could be termed in the genre of the day as "all you ever wanted to know about avian breeding cycles—and more," which is a synopsis of both the strengths and weaknesses of this book. It is a hoard of information, and it is undoubtedly petty of me to complain that some of this information is irrelevant. However, this problem crops up in nearly every chapter, and soon becomes intrusive, distracting, and finally annoying. For instance, in a chapter on the energetics of reproduction the authors stray off into a discourse on the adaptive radiation of annual cycles in Old World warblers (pp. 158–163), and include a 6-page "List of Warbler Species" as Appendix 3. In this same chapter, while discussing migratory fat deposition, they digress into winter fattening, and the only text-figure on this subject concerns nonmigratory bulbuls. They conclude their introduction to circadian rhythms in avian photoperiodism (p. 285) with the revelation that ". . . the physiology of insect circadian rhythms has been comprehensively reviewed by Brady (1974)." In chapter 14 (Evolutionary Aspects of Photoperiodism) the reader is distracted by extensive intercalations on the food habits of ducks, geese, and their allies, but these digressions do not culminate (as one is expecting) in a discussion of the coevolution of food habits and breeding cycles. The information is a bonus, but produces (as in many other cases) a tedious prolixity. One detects in the background the shuffling of reference cards, very few of which seem to have been overlooked.

As is true of any compilation as monumental as *Avian Breeding Cycles*, there are factual errors and

some misprints, but these are infrequent and none that I detected merits a tantrum. I am sure, however, that Barbara Blanchard DeWolfe will be bemused to find herself identified (p. 234) as one of the pioneers of "photo-experimentation"—a technique that she forthrightly disdained. There are also some conceptual inconsistencies that suggest that the authors changed their opinions occasionally during the ontogeny of the manuscript. For instance, assertions about the general "stability" and "predictability" of tropical evergreen forests (p. 5) are continued to p. 164 as "climatologically stable conditions" and "virtually predictable . . . resource availability," but transmuted at the top of p. 261 to an observation that seasonal variations of food availability do occur in equatorial forests. As another example, the authors say (p. 352) that it is "inconceivable that changes in daily photoperiod could serve as a proximate signal . . ." for *Phylloscopus trochilus* overwintering near the equator, but suggest two pages later that variation in the intensity and duration of twilight could be a weak Zeitgeber for *Pycnonotus goiavier* at Singapore (1°20'N).

The most serious defects of this book—and perhaps the only serious defects—are the assumptions that all avian species rely on endogenous circannual rhythms in the genesis of annual physiological cycles (p. 365) and that the annual photocycle is a nearly universal or primordial environmental cue entraining such rhythms to keep them in adaptive phase with environmental variation. These assumptions, and in particular the tacit viewpoint that photoperiodism is a nearly universal and prepotent regulatory system, often seem to lead the authors far beyond the limits of established fact. Experimentally defined concepts such as photoperiodic threshold and photorefractoriness often become transformed into mere correlates of field observations. Threshold, according to the authors, is the natural daylength at which gonadal activity or breeding behavior is first detected, and the cessation of such activity or behavior signals the onset of photorefractoriness, regardless of whether a given species is known from experimentation to depend on photoperiodic stimuli or to undergo a photorefractory period. For instance, the authors say on p. 392 that ". . . all *Cygnus* species develop photorefractoriness . . ." but in fact no species of *Cygnus* has been examined for this experimentally. Similar extrapolations beyond existing data occur, for instance, for *Corvus frugilegus* (p. 251), *Falco peregrinus* (p. 266), and for anatids in general in chapter 14. In some cases, it is probably reasonable to extrapolate between closely related species (e.g. *C. frugilegus* and *C. brachyrhynchos*) in which one form is known to be photosensitive, but even this is hazardous. Several northern hemisphere forms of *Zonotrichia*, for instance, are known from experimentation to undergo a photorefractory period, but at least two southern hemisphere forms do not. Nevertheless, applying the criteria expressed most prominently in chapter 14, Murton and Westwood would attribute a photorefractory phase to the southern forms as well. Similar examples occur in the author's own extensive investigations of pigeons (p. 266). Such liberties with empirical rigor may serve an important heuristic purpose in large-scale comparative analyses (as in the discussion in chapter 14 of the evolution of photoperiodism in anatids) but risk also the promulgation of much that is false. It will require the services of a seer much more perspicacious than I to discern the optimal pathway in this, and each critic must choose his own way; but all should guard against enthusiastic speculations that so easily become enshrined as icons.

Finally, the authors introduce early in their book (p. 2) an idea that subsequently surfaces repeatedly—namely, that "complex physiological mechanisms" impose "restraints" on the adaptive radiation of breeding cycles. I suggest the alternative viewpoint that neuroendocrine complexity, far from being a "restraint," is a source of flexibility as a template for selection, and has led to a richly diversified hierarchy of controls (of which photoperiodism is but one) that may be far more plastic and sensitive, in both a temporal and a phylogenetic sense, than the authors of this treatise seem to believe.

After I had completed this review I learned that Ron Murton had died of heart failure at the age of 46 years, and I was sorrowed to realize that we would never again resume the debates that had illuminated our association through many years, over many pints of ale, and in many parts of the world. I hope that Dr. Westwood is already contemplating a streamlined second edition of this remarkable treatise—one in which it will be easier for readers untutored in its themes to separate the wheat from the chaff.—
JAMES R. KING.

Food webs and niche space.—Joel E. Cohen. 1978. Monographs in Population Biology No. 11, Princeton, N.J., Princeton Univ. Press. Pp. xv + 189, illus. Cloth \$14.00, paper \$6.95.—That organisms eat other organisms is a fundamental fact of life, the foundation of nearly all ecological processes. There are patterns to these "who eats whom" relationships that we call food webs, and while some ecologists have devoted their energies to describing the patterns, others have begun to cast about for theoretical

generalizations that can be drawn from the information at hand. Cohen's effort is one of the more innovative theoretical treatments to date.

Cohen proposes a basic empirical generalization, that "within habitats of a certain limited physical and temporal heterogeneity, the overlaps among niches along their trophic (feeding) dimensions can be represented in a one-dimensional space far more often than expected by chance alone." Natural food webs, in other words, fall into a small subset of the range of mathematically possible food web relationships among organisms. Cohen bases his approach on the application of interval graph theory to food web data. Basically, the problem is to connect by lines all kinds of organisms that share a common prey in their diets; these lines define niche overlaps. We then ask whether all these lines joining predators that share prey in a food web can be represented as overlapping intervals along a single line, i.e., can they be ordered linearly in one dimension. Cohen finds that, with few exceptions, most published food webs do in fact permit one-dimensional ordering; they are "interval" food webs. The exceptions are chiefly webs from complex or composite habitats, and the theory leads us not to expect interval food webs in heterogeneous habitats. Cohen suggests that this may reflect the fact that the organisms may be physiologically capable of existing under more varied habitat circumstances than their trophic interactions allow.

Having demonstrated that many of the food webs he considers are in fact interval, Cohen then undertakes a rather lengthy statistical and modeling exploration of the possible universe of food webs from which the observed food webs might be drawn, in order to determine if the apparent one-dimensionality of niche overlaps should in fact surprise us (mathematically, it should). He then goes on to propose a correlational approach to determine what the one dimension ordering trophic niche overlaps in a community might be, recognizing that this dimension may well vary between different communities, and that different niche dimensions are rarely totally independent of one another. This search for dimensions yields varying results, with few new insights. In the end, Cohen admits that there are no clear reasons why trophic niches in single habitats should be one-dimensional, but he feels comfortable that this is not a mathematical triviality.

It is, frankly, a bit difficult to tell whether the results are trivial or not. Because a good deal of the book is concerned with statistical and simulation analyses of the food webs, it is not always the most exciting reading, especially to those whose primary interests are biology rather than modeling or statistics. (A condensed version of the basic approach may be found in Cohen, J. E. 1977, Proc. Natl. Acad. Sci. USA 74: 4533-4536, for those who would rather sample the ideas before plunging into the book.) More fundamental, however, are the definitional problems that beset the treatment. The food webs are defined in terms of predators or prey as "kinds of organisms," which are "equivalent classes with respect to trophic relations." These may be species populations or groups of related or unrelated species, and this lumping of populations must obscure a good deal of the basic populational niche relationships. This, however, is not Cohen's fault. He employs published food web information gathered by other investigators, and is thus at the mercy of the sorts of lumpings of prey and predator taxa that they employed in their analysis. In Bird's food web graph of Canadian willow forests, for example, one "kind of organism" is "snails," another "*Rana pipiens*," and another "Red-winged Blackbird, Bronzed Grackle, and Song Sparrow." Are the latter birds really "equivalent" consumers, and are the three groups really similar in the amount of trophic diversity they encompass? Unfortunately, Cohen's entire treatment rests upon the reality of the trophic units whose niche overlap dimensionality is being assessed. Further, the food web information is collapsed into an "eats/does not eat" matrix linking kinds of organisms, and thus the quantitative detail of how much is eaten, when, is lost.

Another key definition is that of "habitat." Cohen finds that food web graphs are interval within single habitats, but his definition of a single habitat is that it must possess uniformity with respect to an important quantity, such as physical conditions or characteristic biota. This is scarcely a succinct, quantitative definition, and it poses problems when one attempts to associate defined factors with the single dimension ordering trophic niche relationships.

Cohen is not unaware of these problems, and devotes a chapter to addressing how they might influence the generality of his finding. Missing from the entire treatment, however, is any evidence of natural history intuitions. These, presumably, might guide us in determining what a "kind of organism" in a food web really is, whether a given area is one habitat or several, or what good candidates for important correlates of the single niche dimensions might be. Cohen's mathematics do none of this, and in the end his analysis may say more about the incompleteness with which ecologists have characterized food webs than the reality of his model. It remains to be seen, then, whether Cohen's demonstration of one-dimensionality is an artifact of the data sets available to him or a basic pattern in the way nature is put together. As Cohen stresses, only further field studies of feeding relationships, detailing precisely the

statistics of predator and prey populations, the time changes in feeding relationships, and individual variability in food habits, coupled with well-designed perturbation experiments, will really resolve the issue.—JOHN A. WIENS.

Bird diseases.—L. Arnall and I. F. Keymer. 1975. Neptune City, N.J., T. F. H. Publications. 528 pp., numerous plates (mostly in color) and figures. \$30.00.—This book consists of two parts; the shorter first part deals with the normal bird and covers its anatomy and physiology in 50 pages, whereas "Heredity and Health," "Nutrition and Metabolism," "Hygiene," and "Clinical Examination" are compressed in two to 10 pages, respectively. The second part deals extensively with the diseases of birds, which are assembled under specific headings like "Bacterial Infections," "The Digestive System," "Poisoning," "General Breeding and Rearing Problems," etc. For every disease, the clinical signs, the diagnostic criteria, and the treatment and prevention are given. The sources of information are not quoted within the text, but there are some few references at the end of each chapter. A wealth of some 75 pages in lists and tables conclude this thick book: a classification of birds with a listing of the most frequent diseases for each order; a list of the scientific names of the birds mentioned in the text; a glossary; a table with the weight, heart and respiration rate, and body temperature for 33 selected species; and 30 pages of tables indicating the names, usage, dosage, and side effects of various drugs, pesticides, disinfectants, and toxic substances.

For a long time, there has been a need for a book on the diseases of birds in English. There is not only an ever growing number of amateurs who keep and breed birds as pets, but birds are also kept in substantial numbers in zoos and in laboratories for research in ethology, physiology, and functional morphology. As it becomes increasingly more difficult to replace the captive birds from the wild stock, the prevention of diseases and the medical care of birds other than domestic ones gains more and more in importance. Because veterinarians with interest and experience in treating captive birds are not always readily available, the keeper of birds should have some knowledge of the prophylaxis and, for the cases of emergency, of the diagnosis of diseases and of the treatment of sick birds. Chapters on bird diseases are often included in books on cage and aviary birds, but these are written by laypersons and are never complete and detailed enough. But most books on bird diseases written by professional veterinarians are restricted to the economically more important domestic birds. The "Merck Veterinary Manual" (3rd ed., 1967, Merck & Co., Rahway, N.J.) concentrates on poultry and deals with cage and aviary birds only marginally. "Infectious and Parasitic Diseases of Wild Birds" (J. W. Davies et al., 1971, Ames, Iowa State Univ. Press) covers the subject of the title extensively, but does not treat the specific problems connected with wild birds kept in captivity. "Laboratory Animal Management: Wild Birds" (National Research Council, 1977, Washington, D.C., National Academy of Sciences) provides excellent guidelines for the procurement, housing, feeding, and breeding of wild birds in captivity, but the diseases are treated only briefly; however, a wealth of references on all these topics are given. "Diseases of Cage and Aviary Birds" (M. L. Petrak, ed., 1969, Philadelphia, Lea & Febiger) is a thorough and authoritative approach to the subject, in which the different topics are covered by contributions of specialists. This book, however, is directed especially to veterinarians and students of veterinary medicine, and some parts need to be updated and expanded; it is not suitable for the needs of most bird keepers. Unfortunately, the book I find to be the most useful one for laypersons and veterinarians, "Haltung von Vögeln—Krankheiten der Vögel" (H. Kronberger, 1974, 2nd ed., Jena, VEB Gustav Fischer Verlag—the revised and expanded 3rd edition, 1978, has not yet been available to me), is available only in German; its translation would be of great value for English-speaking bird keepers.

The authors of the latest book, L. Arnall and I. F. Keymer, have a vast experience in their field. They have been publishing articles on various aspects of bird diseases for some 20 years and have both contributed to the volume of M. L. Petrak. Their book is directed to a broad audience as it is expressed in the "Introduction": "This book is a practical guide . . . useful both to the layman and professional veterinarian." I have, however, some serious reservations with the book being a practical guide to the treatment of avian diseases.

The text is kept in an almost non-technical and simple language, clearly a concession to the laypersons among the readers, but resulting in a loss of detailed and accurate information for the professionals. On one hand some chapters (e.g. "Surgery" or "Necropsy") are of no practical use for laypersons and of no great help for professionals because they are too superficial. On the other hand, the chapter "Anatomy and Physiology" is of no interest for the professional veterinarian and is difficult to read for the laypersons, especially because of the lack of adequate illustrations. These chapters could be omitted in favor of a more in-depth treatment of the prevention of diseases and of the feeding and housing of birds. Further-

more, the book is not always easy to use as a source of information, for several reasons. The illustrations (some are excellent, others are badly out of focus) are almost never placed within the related text. The text is very often repetitious; for example, for almost every disease, overcrowded housing, lack of hygiene, and stress are mentioned as a cause. For the sake of clarity, this information should have been better dealt with once and for all in the chapter "Health" or "Hygiene" because it is valid for any disease. The organization of the chapters is not always clear: Leucosis, for example, is treated under "Tumors, Cysts, and Similar Structures" and not under "Viral Infections" as one might expect.

My main reservations, however, concern the information given in the second part of the book, especially with respect to the treatment of the diseases. For instance, to eradicate ectoparasite insects and arachnids, sprays containing DDT are still suggested (p. 156, etc.). As a treatment of avian malaria, it is suggested to put a thin film of oil or oily insecticide over stagnant water to prevent the development of eggs of gnats and mosquitoes (p. 158). Tapeworm infestations are still regarded by the authors as being incurable (p. 173), although some drugs (e.g. Yomesan) have been available in recent years. To slim down obese birds, it is suggested to feed them a "high-protein" diet (p. 342) consisting of more than 50% seeds that contain large amounts of fat in addition to proteins, whereas it has been the experience of bird keepers that just these seeds should be given only in small amounts or during the breeding season to prevent the fattening of captive birds. Streptomycin is indicated as an antibiotic (p. 484), but it is not mentioned that it is absolutely toxic for parrots. In the same table, Griseofulvin is suggested for the treatment of *Candida* infections, although it is effective only against Dermatofycoses.

An explanation for these deficiencies may be that the knowledge in this particular field of veterinary medicine has made tremendous advances during the last few years. This volume, however, was published in 1975, and—as one remark in the "Acknowledgments" suggests—its writing took some years. Therefore, the book can be used as a general source of wide-ranging information only by a discriminating reader already knowledgeable and experienced in keeping and treating diseased birds.—DOMINIQUE G. HOMBERGER.

Canada's threatened species and habitats.—Theodore Mosquin and Cecile Suchal (Eds.). 1977. Canadian Nature Federation (75 Albert Street, Ottawa, Canada K1P 6G1). x + 185 pp. Paperback. \$8.00.—In May 1976 a conference was held, under the sponsorship of the Canadian Nature Federation and the World Wildlife Fund (Canada), to review the status of Canada's threatened species and habitats, consider current management programs and government policies, and offer proposals for necessary action. This publication contains most of the papers presented at that symposium. Collectively they point up the major gaps in our knowledge of the biology of most of the species, and the general lack of concern by the public for them. The recommendations that emerged from the conference basically urged greater governmental support for investigations of threatened species and areas, and called for specific governmental actions needed to prevent further deterioration of these elements of Canada's biota.

The proceedings are grouped into eight sections, dealing with the nature of endangered species problems in Canada; the major large land mammals that are threatened; marine problems (primarily marine mammals); birds; amphibians and reptiles; a small sampling of plants, insects, molluscs, and freshwater fishes; the protection of natural habitats in ecological reserves or parks; and, finally, what must be done to meet future needs. Many of the contributions are quite short, but they are generally succinct in summarizing the status and problems faced by some (by no means all) of Canada's threatened species.

Five papers in the volume deal with birds (a sixth, on peregrines, was published elsewhere). Goodwin provides a short but thoughtful overview of the major species facing problems in Canada, the sources of the problems, and the programs that are necessary to meet the rather awesome challenges of true wildlife management. Vermeer and Peakall deal with environmental contaminants with special reference to fish-eating birds. They note that such problems are quite obviously more severe in some regions in Canada than others, in accordance with the patterns of agriculture or industrial pollution in these areas. They suggest that colonial fish-eaters may be excellent indicators of food-chain pollution because of their spatial localization and their trophic position, and they call for more thorough development of baseline information on these species. The most obvious of Canada's threatened bird species, the Whooping Crane, is given attention in a brief updating of management programs (Kuyt), while a review of the status of the major waterfowl species indicates that, despite the emphasis of management (and thus research) on this group, we still know alarmingly little of their real population dynamics (Alison). The most thorough treatment is that of Nettleship's on Eastern Canadian seabirds. Despite their vast numbers, seabirds may be especially threatened because of accelerating human activities in marine and coastal areas, because of their highly aggregated distributions, and because their reproductive rates are especially

low. Populations of many species have changed dramatically in recent years, including especially disturbing declines in populations of diving species such as murres, dovies, razorbills, puffins, gannets, and cormorants. For these species, pollution of the seas by oil poses the greatest threat, through both its direct effects on the birds and its indirect effects on their prey resource base. But it would be a mistake to attribute seabird population problems exclusively to petroleum development. Increasing exploitation of fish stocks by commercial fisheries also poses a major threat to these species. [Two independent model analyses (Wiens and Scott 1975, *Condor* 77: 439–452; Furness 1978, *J. Anim. Ecol.* 47: 39–53) indicate that the populations of the major seabird species breeding in coastal areas may consume 22–29% of the annual fish production in nearby waters.] As Nettleship notes, this direct competition between seabirds and man “has only one likely outcome—extinction or severe reduction in numbers of the avian competitor.” Seabirds also face other problems: drowning in fish-nets, toxic chemical pollution, mineral development, human disturbance (including bird tours to previously remote breeding colonies), and disturbance by gulls (whose populations have benefited, often dramatically, from human development in coastal areas). The picture is not bright, but Nettleship offers a series of general and specific recommendations for further management and study of seabird resources. A broader statement of the situation is provided by Goodwin: “Look at the rest of this afternoon’s program and you might conclude that the *real* problems are confined to whooping cranes and peregrine falcons, with fish-eating birds and waterfowl possible runners-up. Look at the programs of many government agencies in this field and you might even conclude that waterfowl are *the* problem. But many species seem to be experiencing declines, and all of them present baffling problems: is the decline natural or man-induced; can it be arrested and how; should it be arrested; what population should be considered normal; at what point does the species become endangered; and on and on. These may seem to be problems in biology, but the real problems are sociological, because the resources likely will never exist to do a proper job of finding the answers to the riddles unless we can convince society they are important, and society is unlikely to conclude they are important unless it can be convinced there is some urgency.”

These proceedings provide some valuable Canadian perspectives on wildlife problems, but many of the problems are really North American in scope. A parallel conference addressing the problems of threatened species in an international context would further these contributions.—JOHN A. WIENS.

Evolutionary ecology.—Bernard Stonehouse and Christopher Perrins (Eds.). 1977. Baltimore, University Park Press. viii + 310 pp. \$39.50.—The research of David Lack spanned a period of nearly 50 years and can best be characterized by the rubric “Evolutionary Ecology,” the title of his 1965 presidential address to the British Ecological Society (*J. Anim. Ecol.* 34: 223–231). From 1930 to 1976 Lack authored over 200 papers and 13 books with the central theme that all life is shaped through the influence of natural selection and that natural selection operates exclusively at the individual level. (A complete list of Lack’s publications is included in this volume.) That theme dominates the 21 papers in this book by students, colleagues, and others not directly associated with Lack but who were influenced by his concepts and approach.

The four major sections of the book focus on special concerns of David Lack: Population Regulation and the Function of Territory (5 papers), Feeding Adaptations and Ecological Segregation (4), Breeding Adaptations and Reproductive Rates (8), and Behaviour, Adaptation, and Taxonomic Relationships (4). Fifteen papers in this volume deal with Lack’s major interest, birds. Two each are concerned with mammals, plants, and the more general subject of population regulation. Predictably, the contributions vary in form and content. Some present original and stimulating field studies (Gibb, Krebs) while others are original syntheses from literature or museum material (Levin and Turner, Newton). Still others review published material (Wynne-Edwards, Watson, Chitty) in an effort to highlight controversies to which Lack was a major contributor. Others are more appropriately termed theoretical in their approach and analysis (Ricklefs).

Among papers in Section 1 on regulation of populations, three are mostly reviews of past work. Wynne-Edwards covers a familiar subject by introducing the biblical ten commandments and suggesting their relevance to the ability of animals to take the initiative in controlling their own numbers. Watson reviews his work on the importance of territory in population limitation in red grouse, and Chitty, who disagreed with Lack on the interpretation of cyclical phenomena in microtine rodents, provides an historical sketch of these differing opinions. Gibb presents a synopsis of a long-term study of rabbit populations in New Zealand. He shows the complex interaction of food shortage, predation, and behavior in regulating populations and thereby illustrates the folly of seeking single-factor causes. This paper and a more detailed monographic treatment of the study deserve considerable attention. Gibb suggests that social

behavior seems to determine which rabbits survive and breed, rather than how many. Food shortage seems to affect the habits of rabbits, predisposing them to predation at high densities.

In another original contribution, Krebs asks if song acts as a signal to keep intruders out of a territory. This question is addressed with an elegant experimental program of removal of territorial males and playbacks of songs. Krebs shows that song playback after removal of birds significantly slows occupation of territories by "floaters" or holders of nearby marginal territories relative to controls without playbacks.

Three of the four papers on feeding adaptations and ecological segregation deal with birds of marine environments. Harris documents the ecological differences among 19 species of seabirds in the Galapagos Islands. The emphasis in this paper, as in the next on Pelecaniformes by Nelson, is on the relationships between breeding ecology and feeding ecology (food type, feeding methods, time and location of feeding). Nisbet outlines a study of courtship feeding in the Common Tern. He concludes that feeding by males plays a major role in providing nutritional requirements to the laying female. The amount of food brought by the males seems to be important in determining clutch size. Nisbet anticipated the obvious and asks why females do not continue to feed themselves. He suggests that females might become too heavy and thus unable to fly. Another explanation might involve the mechanical difficulties of diving with considerable extra weight. In the fourth paper in this section, Rosenzweig demonstrates the importance of habitat selection in the coexistence of desert rodents. A reanalysis of data presented by Brown and Lieberman (1973, *Ecology* 54: 788-797) on seed size selection shows no correlation between seed size and rodent size.

Section 3 on reproductive rates and breeding adaptations is the largest, with 8 papers and over 100 pages. Newton reviews the literature on timing and success of breeding in tundra geese and concludes that breeding depends largely on fat reserves from winter and migration periods. Timing and success of breeding are influenced by snow melt and availability of nest sites. He also notes that hatching success is lower in birds with limited fat reserves. These birds must leave the nest to feed, exposing the nest to predation. In a rather general review Fry examines the ecological correlates of cooperative breeding in birds, concluding that most cooperative breeders are tropical, sedentary, and long-lived. This paper is followed by an Oriens' contribution showing that helpers are common in a number of South American icterids (blackbirds). In addition to presenting intriguing new data, they emphasize the need to examine the evolutionary consequences of both offering and accepting help. Kluver, van Balen, and Cave discuss the patterns and evolutionary pressures associated with the length of the interval between first and second broods in the Great Tit. They suggest, for example, that decreased survival of adults in pine woods relative to that in oak should result in selection for a second brood in pine habitats.

Three papers consider the evolution of clutch size. Two (Perrins, Ricklefs) develop theoretical models while one (Owen) attempts, with unsatisfactory results, to account for latitudinal gradients in clutch size on the basis of food resource diversity. Perrins concludes that clutch sizes observed in nature have not evolved solely as a result of predation. Nutrition is clearly important in nidicolous species but high predation rates may be important in reducing clutch sizes. Ricklefs develops a detailed and very intriguing model to account for the relative significance of clutch size-dependent starvation and clutch size-dependent predation. He concludes that predation, in general, does not play the primary role even in tropical regions.

Clutch size in the plant family Compositae is the subject of a paper by Levin and Turner. Their study, based on an examination of museum collections, shows that clutch size varies geographically (increasing as one moves away from the equator or as elevation increases) and with plant life form. No satisfactory explanation is provided for the variation with life form or geographic region. The latter pattern parallels that known for most birds.

In the final section communication systems are involved in three papers. Medway and Pye describe the use of echolocation in the systematics of swiftlets and Snow discusses duetting and courtship displays in the blue-backed manakins (*Chiroxiphia*). Zahavi reviews earlier work on communication and the evolution of altruism. The last paper (Schaefer and Schaefer) describes a study of the Agavaceae in southwest North America. Variation in reproductive expenditures in yuccas and agaves are related to pollinator preference, inflorescence size, and post-flowering half-life. This paper seems more appropriate to Section 3.

As is so often the case in multi-authored volumes, the quality of the papers varies considerably. Despite that problem the diversity of approaches and phenomena discussed is a tribute to the continuing impact of David Lack on ornithology, ecology, and evolution. I doubt that most ornithologists will be able to justify purchasing this volume considering the variation in the quality and originality of the papers and its high cost (12.7¢/page).—JAMES R. KARR.

A field guide to the birds of West Africa.—W. Serle and G. J. Morel. 1977. London, Collins. 351 pp., 28 color plates, 20 black-and-white plates, 1 map. £ sterling 5.95.—This is the best available single small field guide to West African birds. The size and binding are ideal for field use. Introductory sections define the area and the habitats. The scientific names generally follow C. M. N. White's checklist and are up to date, with distributional records included up to 1971. Species accounts include descriptions of the birds, voice, distribution and habitat within West Africa, and nest and eggs. These accounts include many original observations of behavior, food, and habitat by the authors, who have had many years of field experience with the birds.

As the West Africa list has 1,097 species of birds, birders will have to identify some species from the larger standard works for the area, either Bannerman's volumes or those of Mackworth-Praed and Grant. The present field guide describes 726 species and simply lists the others in a regional checklist occupying 32 pages. Of the birds described, 555 are illustrated, 335 in color, all by W. Hartwig. Thus only about a third of the bird species are illustrated in color in the field guide. Most of the color plates are helpful for identification, though colors are too greenish for the crakes and thick-knees, and sizes sometimes are misleading (male and female Didric Cuckoo are in fact about the same size, and the three small kingfishers on plate 23 should be also). The black-and-white illustrations are of some help for identification, but less so for the francolins, shorebirds, larks, *Cisticola* species, flycatchers, and many weavers and bishops. Verbal descriptions for birds not illustrated may be found under "allied species," but sometimes not close allies; for example, Hottentot Teal appears under African Black Duck. I find some verbal descriptions wordy or uninformative ("no outstanding plumage characters," "no distinctive plumage characters"). The choice of species to be described by color plate, black-and-white, just words, or not at all is not obvious: seabirds are slighted, as are endemics of the Gulf of Guinea islands, but so are larks (10 species are not described at all and none of the other nine species get better than black-and-white). Treatment of Palearctic migrants usually excludes color plates but often includes detailed verbal descriptions. I wish the authors had illustrated in color all the breeding species of West Africa, and if they must have a field guide that lacks some species, then leave out the seabirds and the migrants, as these are in other available field guides. More local species could be included if plumage descriptions were shorter (often these repeat what is obvious on the plates) and if the 32-page checklist and the 41-page scientific-English-Spanish-French-German name lists were not included. Although the field guide is helpful and the most convenient guide to West African birds, it is not comprehensive, and I shall continue to tote my Mackworth-Praed and Grant as long as the airlines don't weigh my book bag.—ROBERT B. PAYNE.

The California Quail.—A. Starker Leopold. 1977. Berkeley, University of California Press. Appendices by K. M. Nissen, B. M. Browning, and M. J. Erwin. xx + 281 pp., 95 figs., 40 tables. \$14.95.—Certain animals have achieved what Aldo Leopold considered to be the status of a "numenon" in a particular habitat. Like loons on a boreal forest lake, these animals are such a typical component of their environment that it is almost impossible to imagine the habitat without them. So it is with the California Quail and the arid coastal vegetation of western North America.

The combination of such an evocative species and an experienced wildlife biologist, like Starker Leopold, holds much promise, and the reader is not likely to be disappointed. This book is an outstanding example of a readable, yet scholarly and factual, life history account that will be of interest to not only professional ornithologists and wildlife managers, but also to amateur naturalists.

After giving due credit to his graduate students, who over the years accumulated most of the scientific data that form the basis of the book, and to fellow quail enthusiast Ian McMillan, who shared with the author his unique flare for quail management, Leopold introduces the bird in opening chapters on the species, its distribution, and its basic habitat requirements. For native Californians, their state bird needs little introduction, but for those unfamiliar with this quail, Leopold's introduction captures much of its charm.

The real substance in this volume appears in the sections dealing with quail ecology and management. Leopold first describes the quail's social biology and then provides a detailed analysis of the species' reproductive biology. His chapter on rainfall as a factor affecting reproductive success is well-argued and demonstrates the type of predictive information that can result from long-term studies that span many years. In the same chapter, Leopold's account of his research on the possible role of phyto-estrogens in regulating quail reproduction leads to some intriguing hypotheses, which he prudently keeps in proper perspective relative to other environmental factors. The chapter on quail mortality follows a classic

approach, concluding with a discussion of density-dependent and density-independent mortality that introduces the final section on quail management.

The management of California Quail is treated in chapters on cover, food, water, and hunting. Leopold also does a good job of placing these in proper perspective, and concludes that the future of the California Quail depends heavily on the land management practices of private land-owners. The highly touted use of "guzzlers" and other watering devices for quail in marginal areas cannot compensate for the loss of prime habitat to development.

The closing chapter on "Backyard Quail" provides a challenge for suburban Californians. It remains to be seen whether Leopold's ideas will ever catch on the way winter bird-feeding has in northern states, but the possibility of managing suburban quail is exciting.

I found only a few minor production flaws (e.g. Fig. 50 is quarter-turned), and these in no way detract from an otherwise attractive and amply illustrated (135 figures and tables) text. On the technical side, the book's rather large bibliography is lacking several key references that relate directly to subjects treated in the book (e.g. Bartholomew's papers on quail water economy and William's paper on quail vocalizations).

One distressing error perpetrated by the publishers involves the advertisements on the book that have appeared in the major ornithological journals. They feature a drawing of a Montezuma Quail rather than a California Quail. One might have hoped the editor of at least one of our professional journals would have noticed and notified the publishers before publishing the ads!

Despite this *faux-pas*, Starker Leopold clearly "knows his quail" and has demonstrated an ability to share this knowledge effectively in this very worthwhile book.—STANLEY A. TEMPLE.

Birds of man's world.—Derek Goodwin. 1978. Ithaca and London, British Museum (Natural History)/Cornell University Press. 183 pp., illustrated with photographs and line drawings. \$10.95.—Almost every American bird-watching visitor to Great Britain or Europe is struck by the far greater number and diversity of birds that breed within the cities in both large and small parks than are found in comparably situated parks at home. In this popularly-written book aimed primarily at a British audience Derek Goodwin reviews some of the changes man has brought to the environment around him that have increased the populations of those birds that can adapt to the human landscape. He discusses the clearing of forests that has created new habitat for birds of woodland edges and open country, agriculture's provision of water where it was previously unavailable to birds, the greater exposure of food items on paths and roads, increased availability of nest sites on structures built by man, effects of domestic animals, deliberate or incidental feeding by man, and introduced species. Goodwin draws on his recollections of visits to cities like New York, Cairo, and Colombo, Sri Lanka, as well as his long experience with the birds of London.

In a popular book no less than a "professional" one, analysis and numerical data are useful and persuasive; too often this is lacking in *Birds of man's world*. Goodwin's treatment of New York, for example, is devoted to three common native breeders in Central Park. Wouldn't it be interesting for both his British and American readers to know that 259 species have been recorded there, that approximately 18 breed each year, and that the number of breeding species has increased significantly since Goodwin's visit in 1962? All this information is readily available, and an analysis of what caused more species to find Central Park more attractive in the 1970's than any time since the 1930's (no deliberate actions on the part of its administrators) would have been illuminating. A similar phenomenon is occurring in the London parks, but Goodwin makes no mention of the excellent annual reports of the Department of the Environment's Committee on Bird Sanctuaries in the Royal Parks. Likewise, some consideration beyond the anecdotal of the differences between the ecology of birds of a northern temperate city like London, a hot dry one (Cairo), and a hot wet one (Colombo) would have been thought provoking. The information on North America is essentially limited to the discussion of Central Park and reviews of introduced species in Hawaii and on the mainland; Goodwin's research must have been somewhat spotty, as he says the House Finch "maintains a rather precarious population [on Long Island]. . . and is also said to occur, in places, from Connecticut to Maryland" (p. 109).

Since the majority of bird watchers live in urban or suburban areas, a book devoted to their neighborhood birds could have important benefits for education and conservation. It is too bad Goodwin provides no suggestions to the amateur of interesting and useful studies he could carry out in his own back yard or local park, or any urging that bird watchers census and document the changes in urban and suburban birdlife so that they may be aware of what man's present and future effects are on the

birds that can and cannot adapt to this ever-spreading habitat. This important subject remains in need of a book that will be useful to town planners, teachers, conservationists, and bird watchers.—ROGER F. PASQUIER.

Field Guide to the Birds of the Eastern Himalayas.—Sálim Ali. 1977. New York, Oxford Univ. Press. xvi + 265 pp., 37 color plates, 1 map, 1 figure. \$15.50.—This is a very useful, well-written and well-illustrated guide to the montane birds from eastern Nepal through the Indian state of Arunachal Pradesh (formerly North East Frontier Agency of Assam). The book is a field-guide-style rewrite (with expanded geographical coverage) of Sálim Ali's "Birds of Sikkim" (1962, out of print). The 16 color plates from the Sikkim book are incorporated, and the text rewritten, leaving out those things that do not pertain to field identification. The Sikkim book was longer (414 pp.) and larger (10 × 6½ inches compared to 7½ × 5 inches), with larger print. A total of 536 species are covered, of which 366 are illustrated in color. Lowland species and some rare or sporadic visitors are not included.

The text is generally excellent, each species account divided into three headings: size; field characters; and status, habitat, etc. "Size" consists of length in centimeters and inches and reference to a common species such as myna, pigeon, or kite. "Field Characters" contains descriptive material as well as techniques for differentiating similar species. Useful pointers such as flight shape and characteristics are given for many species. "Status, Habitat, etc." includes abundance, range, elevation, seasonality, habitat preferences, habits that assist identification, food, and voice. The material given is more than adequate to identify most species. However, in difficult groups such as diurnal raptors and warblers, many species could not be identified using this book. The distinctive immature plumage of the Crested Serpent Eagle is not described, for example. Similarly, other immature plumages are either not mentioned or too briefly described (e.g. Feathertoed Hawk-Eagle, immature accipiters, and Shaheen Falcon) and some adult plumages are described inadequately for identification (e.g. Crested Honey Buzzard). A few mistakes were made, e.g. the white patch at the base of neck of the King Vulture usually does not show in flight; the name Greyheaded Fishing Eagle is herein used for *Ichthyophaga nana*, but for *I. ichthyaetus* in both the "Handbook of the Birds of India and Pakistan" (Ali and Ripley 1968) and "A Synopsis of the Birds of India and Pakistan" (Ripley 1961). Field identification techniques in India have not yet reached the sophisticated levels of North America and Europe but are steadily improving as the number of bird-watchers increases. As with Sálim Ali's other books, the section on natural history (Status, etc.) is superb, containing a great deal of pertinent information, succinctly and well-written.

The 16 plates by Paul Barruel, D. M. Henry, and Robert Scholz, taken over from the Sikkim book, are excellent and the birds depicted can be mostly readily identified. The 21 new plates by Winston Creado, J. P. Irani, and K. P. Jadav are generally good but not up to the standard of the Sikkim plates, and a few species (e.g. *Muscicapa sibirica* on plate 24) could not be recognized from the plates. Use of the earlier plates saved money but means that similar birds are often on different plates. No flight drawings are included. Peterson-style "arrows" are used on the new plates.

Inevitably, comparison of these plates with those of "Birds of Nepal" (Fleming et al., 1976—reviewed in Auk 94: 617) will be made. The same species in the two books often look quite different, e.g. Streaked Laughing Thrush. In some cases, there are subspecific differences, but often they should be the same. When in doubt it is best to rely on Sálim Ali's book as the plates are mostly quite reliable and were better reproduced than those in the Nepal book. On the other hand, the field identification material in the Nepal book is often better, while the natural history data are excellent in both books. With these two books, most birds encountered in the entire Himalayan Range can be identified.

There is a short preface describing the evolution of this book from a Bhutan field guide to its expanded form. An introduction gives a brief description of the political and geographical area covered, and altitudinal zonation is described in terms of the dominant plants and habitat. A few paragraphs on how to use the book are included.

It is discouraging to look over the wonderful birds contained in this book since most of the Eastern Himalayas are difficult or impossible to visit. Entry into the whole of Arunachal Pradesh is prohibited to foreigners. A special permit is required to visit Bhutan and then visits may normally be made only by groups of more than six people for a stay of six to eight nights at a cost of US \$130.00/person/day. Sikkim is cheaper but a special permit is required and much of the state is off-limits to foreigners. However, one or two areas are opening up for trekking. The Himalayas of Eastern Nepal can be visited by foreigners with a special permit but there are no roads and all travel must be by foot. The only bright spot in this sad picture is the northern part of India's West Bengal state, in the Darjeeling District. A permit is required but easily obtained, and there are roads up to 3,600 m (12,000 ft), allowing access to some marvellous birding. The Eastern Himalayas are among the richest areas for birds in the entire world, rising

from just above sea level in the Brahmaputra and Ganges River Valleys to over 8,500 m (28,000 ft) in just a few kilometers (the entire area covered by the book from north to south is less than 200 km wide)—shifting from lowland tropical rain forest to subtropical rain forest, through the temperate zone and on up to vast ice fields. The heavy monsoonal rainfall provides luxuriant vegetation for an extraordinarily rich montane avifauna (much richer than the dryer Western Himalayas). Much remains to be learned about the birds of these mountains. It is hoped that the Indian government will allow easier entry into some more of these marvellous areas before long.

The Eastern Himalayas are the radiation center of distribution of SE Asia's montane avifauna, and Sálím Ali has done an excellent job of enabling the identification of most of its diverse forms. This is the first field guide produced in southern Asia to which Western standards for field guides can be directly and favorably applied. Several years ago, when working on this book, Sálím Ali said this was going to be his last one—let's hope he has changed his mind. Congratulations on a book well done.—BEN KING.

Bird Guide of Thailand.—Boonsong Lekagul and Edward W. Cronin, Jr. 1974. Second (revised) ed. Bangkok, Association for the Conservation of Wildlife (4 Old Custom House Lane, Bangrak, Bangkok, Thailand). xv + 316 pp., 104 color plates, 8 black-and-white plates, 1 line drawing, 2 maps, and distribution map for each species. \$12.50.—Revised, enlarged, and greatly improved, this second edition provides color pictures and brief textual identification material for all of the 850 species of birds known to occur in Thailand. The 112 color plates are spaced throughout the book, never more than a few pages from the accompanying text. Each species is numbered on plate and text, making it easy to work from plate to text. Flight drawings are included for those species whose identification would be aided by them. The plates are rustic by western field guide standards, but are mostly adequate for identification. Some caution is advised though, as the reproduction is not very good and many colors have been severely altered, e.g. orange-rufous of the Stonechat came out pink. While many plates are new, quite a few were carried over from the first edition. The new ones are improvements, while some of the plates from the first edition appear faded. Some errors were also made, e.g. the black ear-patch of female Black-eared Shrike-Babbler is missing; the flight drawing of the Crested Serpent Eagle is a subadult rather than adult; the male Marsh Harrier is the west Eurasian race rather than the east Asian *spilonotus*; the Large Grass Warbler is unrecognizable. Complicated groups such as diurnal raptors, terns, some groups of warblers (*Phylloscopus*, *Bradypterus*, and *Cettia*), and many of the flycatchers couldn't be certainly identified using either plates or text. It is recommended that plates and text from other books of the region be checked on difficult species. The brief, succinct, and generally well-written text contains: size (in centimeters), identification material, habits, voice, habitat, status, and geographical, seasonal and altitudinal distributions. A useful distribution map is included for each species. For species that are readily identified in the field, the text is quite adequate, but it is sometimes too short for identification of difficult species, e.g. color of legs of Little Egret is not mentioned, and the description of the immature Brahminy Kite is inadequate for identification. The problems with the plates and text are often due to a lack of specimens in Thailand. The introductory material is well presented, including a little zoogeography, a short history of Thailand's ornithology, some birding areas, and directions for using the book. A useful vegetational map is included as well as a map showing various cities and birding areas mentioned in the text. The front endpapers contain small color paintings of over 100 species of Thai birds representative of different families, along with a page reference for each bird shown. This is a very helpful innovation that will greatly assist the beginner and visitor to find the appropriate family. A short bibliography and glossary are included at the end of the book. Appendix I contains a list, with range, of all the subspecies of birds in Thailand. A list of English-name synonyms is in Appendix II. Finally, a list of English name changes (from the first edition) made in the second edition is given.

With 850 species, this small tropical country has a longer list than the whole of North America and is a marvellous place for birding. However, the awesome scale of forest destruction is changing that rapidly. It is estimated that if the current rate of logging (both legal and illegal) continues, every bit of forest in the entire country will be destroyed in 8 or 9 years. Dr. Boonsong has been one of the strongest and, until just a few years ago, practically the only voice opposing this carnage. He has miraculously managed to get several fine areas set aside as national parks, but only constant vigilance and struggle prevent poachers and loggers from ruining those areas as well. The situation is so serious that unless some strong outside support is given Dr. Boonsong's efforts, there will be literally no birds left in just a few short years. In 1961, when I first visited Bangkok, birds were everywhere in Bangkok itself and abundant in the surrounding rice paddies. But now there are few birds in Bangkok and the rice paddies

in the Bangkok area are mostly devoid of birds and vegetation other than rice. Vultures have been virtually exterminated in the entire country. There are very few raptors or swifts (or small cats) to be seen today in Khao Yai National Park, possibly the result of widespread pesticide use in areas peripheral to the park. Thailand is an ecological disaster area and, hopefully, Dr. Boonsong's book will stir up some local as well as international interest in the wildlife of this delightful country before it's all gone.

I have pointed out the shortcomings of this guide to encourage caution among its users. There is a large number of species to deal with, and when you add the fact that over 50 of those species have been added to the list in the last 15 years alone, you have got to be careful with identification. All in all, this is an excellent book that will not only be adequate but essential for most people interested in the birds of Thailand. It is one of the best books to be produced in southern Asia and is a significant milestone in Thai ornithology. Now that a wonderful book is available for Thai birds, ornithologists and conservationists must join efforts to insure that Thai birds are available in the future for users of this book.—
BEN KING.

ALSO RECEIVED

Guide to the study of animal populations.—James T. Tanner. 1978. Knoxville, University of Tennessee Press. xiv + 186 pp. \$8.95.—There is a critical need in ornithological studies to adopt a more thoroughly demographic view of populations, and to couple this with concise and appropriate measurement and analysis of population characteristics. This book presents the basic techniques for dealing with such attributes of populations as density and dispersion patterns, sex and age composition, mortality and survival rates, reproduction, dispersal, population growth rates, and stability. The emphasis is squarely on description and analysis of population features, not the development of mathematical models of populations or the theories of population or evolutionary biology. Assuming that his readers have a knowledge of basic calculus and statistics, Tanner develops the ways to sample and analyze populations clearly and concisely, with frequent literature citations providing avenues for those who wish to pursue topics more intensively. He touches on a broad array of topics, but goes deeply into few; his description of methods of marking animals is quite superficial, for example, despite the reliance of mark-recapture techniques upon proper marking of individuals. There are other shortcomings, but in all it's a nice introduction to population measurement and analysis. Caughley's recent book (1977, *Analysis of Vertebrate Populations*, New York, John Wiley and Sons) also covers many of these same topics at much the same level; those working with bird populations should certainly have one or both of these books available, and would do well to study it carefully *prior* to gathering field observations.—J.A.W.

Birds of my Kalam country.—Ian Saem Majnep and Ralph Bulmer. 1977. Auckland University Press. \$29.50.—The senior author is a native of the village of Gobnem in the Upper Kaironk River Valley and a naturalist well-versed in the ways of local birds. He has for many years been associated with anthropologists and linguists working in his area of New Guinea, and more recently has been with the Department of Anthropology and Sociology at the University of Papua New Guinea. The junior author is an anthropologist who first visited the Kaironk area in 1960 and has spent much time there in the intervening years. He has a long interest in the birds of New Guinea and in the relationships between New Guineans and their animals. Together these authors have produced a novel and fascinating bird book.

Part One of this book traces the history and ecology of the Kaironk area. Part Two deals with the birds, and chapter headings and ordering of chapters are as the senior author suggests they should be. Thus we have such intriguing chapters as, "Birds which men's souls can turn into: the lories and other local parrots," "Those birds that perch high in the lopped trees," "Those kinds of birds which vomit up the food that they have eaten: the bats," "The Cassowary," and 12 others, all of which are full of information despite their unorthodox titles. The unusual juxtapositions are thought-provoking. The information on nesting and food is particularly welcome.

Part Three is composed of six Kalam bird stories, and an epilogue explains how the senior author learned about the animals of his area. There is a useful index to animal and plant names, and the drawings by Christopher Healey are a decorative addition.

I can highly recommend this book not only from an ornithological viewpoint but also from an anthropological, ecological, and historical viewpoint. It is a successful amalgamation of culture and science; and I hope it will serve as a prototype for many more such books, so that we may take advantage of the wealth of knowledge painstakingly acquired by naturalists all over the world.—MARY LECROY.