

BOOK REVIEWS

The foraging behavior of Mountain Bluebirds, with emphasis on sexual foraging differences.—Harry W. Power. 1980. Washington, D.C., The American Ornithologists' Union. Ornithological Monographs No. 28. ix + 72 pp. \$8.50.—In this monograph, Harry Power gives us a detailed account of field experiments designed to test various hypotheses on the adaptive significance of sexual foraging differences in birds. The general approach is excellent and should be carefully considered by anyone interested in social behavior. For the most part, Power is logical and perceptive, and his discussion contains many interesting observations. Unfortunately, the mechanics and reporting of the study leave much to be desired, so that I must temper my enthusiasm with a note of caution.

Chapter 1 is an outline of the possible evolutionary bases of sexual foraging differences: Darwinian sexual selection, intersexual competition, the division of labor between mates, sexual differences in foraging efficiency, and intersexual exploitation. Each possibility is represented by a brief statement of the evolutionary forces presumed to be involved, and a catalog of the operational criteria required for accepting it as a true hypothesis. An enormous number of ideas are abbreviated in this six-page section; some are placed on solid ground but many are not. Throughout, hypothetical statements on the adaptive value of behaviors are prefaced by the phrase "selection can produce . . ." as if the presumption alone constitutes a robust evolutionary model. The tone becomes redundant and pedantic. More importantly, the usage of "selection" camouflages hunches and vague relationships in need of firm underpinnings. One should not take for granted statements like ". . . selection should always minimize the cost of collective harvest to a group of males and females (e.g. a pair), but not the cost to individuals . . ." (p. 4) or "Selection for parental care by both males and females opposes the development of sexual foraging differences by opposing structural sexual dimorphism . . ." (p. 6). The real problem here is not due to Power so much as to our lack of an adequate theoretical framework for behavioral and ecological interactions between mates, including the possibilities of exploitation and teamwork. I hope the bluebird monograph will spark more interest in this fascinating area.

Chapter 2 consists of a brief description of the study area in Montana and definitions of the relevant behavioral categories, while Chapter 3 is a summary of nonexperimental observations on the foraging patterns of the Mountain Bluebird (*Sialia currucoides*). The frequencies of occurrence of six different foraging modes (perch, hover, etc.) and eight different foraging sites (tree, fence, etc.) are compared for

males and females at each stage of the nesting cycle. Power argues that most sexual differences were restricted to the nestling stages, and that the differences observed during some of the other stages were caused by variations in prey densities and idiosyncracies of peculiar individuals. Some readers will be distressed here (and in subsequent chapters) at the extent to which *ad hoc* arguments are invoked to explain away unwanted results. Also, some of the conclusions on the effects of nesting condition may simply be due to differences in the sample sizes. Several important patterns nonetheless emerge, and Power discusses the implications in rich detail. The sexes spatially separated their foraging effort: females tended to use aerial staging points and to hover in areas far from large perches, whereas males more often perched on trees and fences, feeding in areas near large perches. Hence, females apparently expended more energy when foraging, and may have exposed themselves to greater risks of predation.

Because sexual foraging differences were most pronounced during the nestling stages, Power hypothesizes that the increased work load of feeding young is what drives the sexes to separate their use of resources. Chapters 4–8 are devoted to observations and experiments designed to sort out the relationships between work load and foraging behaviors. The key experiments involve removing young and/or adults so as to change the brood size, number of adults, number of nestlings per adult, and total number of birds per territory; meanwhile, foraging is monitored as before. The presentation of results is tortuous: some 14 two-way contingency tables and 150 χ^2 tests (not log-linear models) are presented and described in sometimes tedious detail. Also, many important results are couched in terms of a "high cost score," an unnecessarily loose statistic based on combining ranks for the use of aerial staging points and tall vegetation. The treatment of this statistic is puzzling: some of the graphs of central results (Fig. 7, p. 44) bear little or no resemblance to their interpretation. The general conclusion to be drawn from all this is that both sexes respond to the number of young per adult by adjusting their foraging efforts.

Chapter 9 contains miscellaneous hypotheses and foraging experiments. I found the most interesting part of the chapter, and perhaps of the monograph, to be the consolidated ordering of foraging behaviors and locations into three levels corresponding to increasing work effort. Additional foraging tactics are combined with existing ones to go from one level up to the next when a bird's work load is increased (e.g. when the number of young per adult is increased). The parallels with optimal diet theory should be obvious, but that body of work is largely ignored. A token reference to foraging theory is included, but

only as a straw man to say that energy intake rate is the only popular currency in foraging models. An experiment is presented to demonstrate the importance of vegetation height (rather than energy) as a currency, but it is not convincing. Although search times and capture rates were not measured, Power supposes that bluebirds achieve higher capture rates in short vegetation due to shorter search times. Because the bluebirds preferred short vegetation even when it was farther from the nest than tall vegetation, he concludes that vegetation height constrains foraging more than caloric cost. The presumed relationships between search time, foraging cost, and energy intake rate are never made explicit, but are clearly misconstrued.

Chapter 10 is a concise and adequate summary. I leave it to the discerning reader to judge which conclusions are particularly well supported and which are not. One conclusion I simply could not comprehend is why the carrying capacity should be less for nestlings than adults.

In closing, I must mention that most of the bluebird work was done from 1970 through 1972, as part of Harry Power's Ph.D. project (1974, University of Michigan). With this in mind, I am inclined to applaud its creativity and audacity. But some readers may be left with the feeling that what made a good 1974 dissertation does not necessarily make a good 1980 Ornithological Monograph.—STEVEN MARTINDALE.

Annual variation of daily energy expenditure by the Black-billed Magpie: a study of thermal and behavioral energetics.—John N. Mugaas and James R. King. 1981. *Studies in Avian Biology*, No. 5. Cooper Ornithological Society. vii + 78 pp., 14 text figures, 20 tables. \$8.00.—Confidence that knowledge of time and energy budgets can help to explain avian life-history patterns provided the impetus for numerous studies in the 1970s. Because most studies focused on the breeding season, however, "it is still impossible to discern what part of the annual cycle constitutes a bottleneck of energy or time that limits an animal's distribution or abundance, or jeopardizes its survival." Moreover, few previous studies distinguished between obligatory energy expenditure (basal and thermoregulatory requirements), over which an animal has only limited voluntary control, and expenditures in voluntary or facultative activities. Mugaas and King's study addresses these problems by coupling environmental thermal analysis with time-activity budgets. It describes the magpie's microclimate in southeastern Washington, estimates thermoregulatory demands by an energy budget model, and calculates daily energy expenditure (H_{TD}). The results are interesting and, in some cases, unanticipated.

The monograph is divided into five sections. The

first gives an abbreviated introduction (5 pages) to thermal analysis based on the equivalent blackbody temperature (T_e)—an index of the thermal environment. The second develops the methods of time-activity and energy budget analysis specific to the Black-billed Magpie, and culminates with a 14-term equation for calculating H_{TD} . The third section, which describes the magpie's thermal environment from a micrometeorological perspective, quantifies how T_e changes with season, position in the environment, and postural adjustments. The fourth chronicles events of the magpie's annual cycle, and documents seasonal changes in time-activity and energy budgets. The fifth section, the longest of the monograph (26 pages), discusses the data, emphasizing activity and required foraging efficiency (η_{RF}). The volume concludes with a 6+ page review of previous avian H_{TD} studies.

Magpie time-activity budgets are based on field observations of behavior made from March through December. The time that birds were in visual contact was fairly brief (averaging 13.8 h/month), and only three pairs were observed during the reproductive period—one pair during egg laying, one pair during incubation, and one pair during the late nestling stage.

Unlike other time-activity studies, behavioral categories are described in units called bouts, which define the bird's position in the environment. This is a necessary constraint of the energy budget analyses. Within each bout, the basic energy-requiring movements (called activities) are quantified. For example, Ground Bouts (bird on the ground) are subdivided into four activities—stand, walk, hop, and run—each of which is assigned an assumed energy cost. The time-activity budgets are used to estimate H_{TD} . The procedure entails summing activity costs for each of four different bout categories, and calculating thermoregulatory requirements from T_e . The H_{TD} estimates, although meticulously developed, are clearly limited since they rest upon necessarily tenuous assumptions about the energy cost of thermoregulation and activity. Because the accuracy of the H_{TD} estimates is unknown, and errors might be substantial (see Weathers and Nagy 1980, *Auk* 97: 861), the prudent course would be to regard the H_{TD} estimates as first-order approximations until further data become available.

Magpie H_{TD} varied with season and stage of the reproductive cycle. It was lowest ($1.20 \times$ basal) in incubating females, and highest (about $2 \times$ basal) in both sexes from October through December. The high fall and winter values resulted from increased flight-time, rather than an increased thermoregulatory requirement. Indeed, thermoregulatory demands never exceeded 5% of any day's H_{TD} . This surprising finding derives partly from assuming the magpie's lower critical temperature (T_{lc}) to be 5°C

(a value taken from Stevenson's unpublished Ph.D. dissertation), and assuming all flight heat production substitutes for thermostatic requirements. Other T_{lc} values could have been used, however, and different conclusions reached. Stevenson found that T_{lc} varied seasonally from -10 to $+10^{\circ}\text{C}$, leaving the origin of the assumed 5°C value uncertain, while Hayworth (unpubl. obs.) determined the magpie's T_{lc} to be 21°C . The magpie's actual T_{lc} in the wild is, of course, a moot point. Consequently, the true thermoregulatory demand is unknown.

The micrometeorological data reveal that the ground has a high potential as a source of heat stress. From late April through September, ground level T_e 's in the sun exceed the magpie's upper critical temperature for several hours during midday (up to as high as 56°C). Accordingly, this primarily ground-foraging species partitions productive events adaptively, such that the period of reproductive stress (late January to mid-June) precedes the months of potential heat stress, when food gathering for nestlings might be limited.

The discussion section emphasizes foraging. The magpie's required foraging efficiency (η_{rf}) is approximated by assuming that Ground Bouts primarily represent time and energy spent foraging. Setting Ground Bout energy costs equal to foraging costs shows that η_{rf} 's occur at two distinct levels during the year. For incubation stage males, or both sexes during molt, η_{rf} 's are low. At these times, the birds are not behaving like either *time minimizers*, or *energy maximizers*, implying that they are not maximizing foraging efficiency. After analyzing the foraging behavior of incubation stage males and molting birds, the authors suggest that, in these cases, behavior is favoring long-term fitness rather than maximizing short-term foraging efficiency.

Overall, I found this monograph stimulating. It touches many aspects of the magpie's life-history pattern, and its holistic approach is a genuine *tour de force*. The study's strengths are primarily ones of approach, and anyone interested in avian energetics or foraging ecology will find it invaluable. Its shortcomings are the small sample sizes underlying the time-activity budgets, and the uncertainty surrounding the estimates of T_e , H_{TD} , and η_{rf} . The latter problem, however, simply reflects our limited knowledge of ecological energetics. The authors have pushed energy budget analyses far into the future, and it will be some time before the empirical data base catches up.—WESLEY W. WEATHERS.

Rare birds of the west coast of North America.—Don Roberson. 1980. Pacific Grove, California, Woodcock Publications. xxxii + 496 pp., 10 color plates by 5 artists, 5 color and 271 black-and-white photographs, 8 line drawings, numerous maps,

graphs and tables. \$24.95.—The quest for rare birds along the West Coast has taken on phenomenal proportions in recent years. Many eastern passerines have become routine in California and shorebirds are now receiving considerable attention, with impressive results all along the coast. In western Alaska, American field guides are virtually worthless, as numerous Asian species (many with names most of us had barely heard 10 or even 5 years ago) are now seen regularly. "Rare birds of the west coast" is a welcome attempt to update the field guides and summarize what is known (or was through 1979) of out-of-range species along the West Coast.

Roberson defines the "West Coast" as Alaska, British Columbia, Washington, Oregon, California, and their offshore waters to 200 miles. Rare birds or "rarities" are species that have been found an average of four times or less annually over the period 1975–1979 in any West Coast state or province. The main text covers 288 such species, including a number of exceptions from California and especially Asian species found "too frequently" in Alaska. To make room for these less-known Asian birds, 24 American species qualifying as rarities in Alaska only are relegated to a short appendix. Species accounts include a brief description of world range; an introductory paragraph covering general status on the West Coast, theories explaining that status, taxonomic comments, etc.; detailed state or provincial accounts for those areas where the species meets the "rarity" definition (including numerous exceptions, especially for warblers in California); maps (usually including the northeast Asian range of pertinent species), often graphs, and occasionally tables detailing West Coast records; an identification section for many species, especially Asiatics; and representative documentary photographs for most species.

"Rare birds" was published by the author with apparently little or no professional editing. Many of the book's shortcomings could have been avoided had the manuscript received serious proofreading. Wrong dates, wrong county designations, missing and misplaced dots on maps, spelling errors, and typographical errors are all fairly prevalent. Statistical errors, graphing errors, incorrect compass directions and photo captions, and problems with syntax also exist. Several references are missing in the Literature Cited section, as are a number of species in the index. A few maps appear rather crude, as does the line consistently dividing the Soviet Union from the U.S. Many of the photographs are not documentary as they appear in this book—indeed, the popular game on page 332 is "find the bird." Some photographs are reproduced on too small a scale and others taken in color are meaningless in black-and-white. The photographs of specimens are poor and add nothing to the value of the book. There is occasionally undue overlap in information between

general introductory comments and state/provincial accounts. Rarely the seasonal or geographical status of a bird within a detailed state or province is left unclear in the text. A five-page Errata and Addenda (presumably available from the publisher and accompanying new sales) corrects many specific errors under the categories discussed above, but others remain. Perhaps a second list of errata would be in order.

Roberson made a noble effort to include the latest information in "Rare birds," but not without sacrifices. The reader is warned of this in the introduction, as text accounts occasionally contradict and supercede annotations facing the color plates. The text involved usually points out the problem, but not always. Contradictions occasionally occur within the text, but it is generally clear which information to follow.

Additional inadequacies are unrelated to editing and last-minute updating of the text. In evaluating the validity of over 10,000 individual records (as Roberson has done), perhaps no two reviewers would come up with identical sets of "good" records. Nevertheless, the book does not "comprehensively compile all acceptable records of Rarities through 1979" as claimed on page vi. Certain missing records (granted often obscure) were simply overlooked. This tendency seems greatest away from the author's "home range" in central and southern California. Fortunately these missing records rarely affect a species' overall pattern of occurrence. Certain of the book's "acceptable records" are controversial. Few would agree that sightings of apparent white-vented Manx Shearwaters in the northeast Pacific are sufficient to document the occurrence of the nominate race. The most significant of additional controversial records are the 1978 California Rufous-necked Sandpiper and two unique Oregon records: Black-headed Gull and Alder Flycatcher (recently rejected by the Oregon Bird Records Committee).

Considerable space is devoted to theories and speculation attempting to explain the presence of rare birds. Some of this is in order, such as that concerning the well-studied misorientation of eastern warblers, but elsewhere it is unnecessary or detracting. Attempts to describe precise migratory movements occasionally result in questionable analyses (see especially Stilt Sandpiper).

The color plates primarily concern Asian species, many never before shown in an American guide and many others only in Pough's long out-of-print "Audubon western bird guide." One plate covers unrecorded Asian species the author chose as among those most likely to occur in Alaska (at least one of them has since been found there). The plates vary considerably in quality, with Manolis' pipits, etc. on plate 8 clearly standing out as the best. The coloration of the peeps, or stints, on plate 4 seems particularly confusing.

There are, of course, praises to be made of the

book. A long list of acknowledgments, such as Roberson's, is always a good sign, and he has done an exceptional job of utilizing the opinions of many authorities. In the introduction, a sensible explanation of the method used to compile and judge records is recommended reading for anyone considering a similar evaluation of records. Considerable space is saved in the text as references are cited only for more obscure records. A number of records are published here for the first time. Common names used are generally well selected, but Dotterel lacks a needed modifier and the strictly American name (based on only two records!) "European Jacksnipe" (as opposed to simply Jack Snipe—there are no others) is unfortunately perpetuated. The summary of warbler records in California is especially enlightening.

Although there are a few errors, the identification sections may be the best in the book. Standard "field guide coverage" has been updated by use of the technical literature and many of today's top field observers in a way probably unmatched by any work of so broad a scope. Out of necessity, the emphasis is again on Asiatics, but the sections on *Empidonax* flycatchers and *Catharus* thrushes include even common West Coast species and are very well done. Certain accounts seem oversimplified, however, and for some of the Alaskan specialties more space is devoted to separation from American forms than to more confusing and equally likely Asian ones. On this same subject though, unrecorded but possible species are often mentioned in the text under similar species, and an appendix briefly discusses 35 such Asian forms.

Although the general design of the book is very good, certain improvements could have been made. Almost nothing is included on habitat use of specific species. The sex and age of birds constituting unusual records is rarely given (often no fault of the author's) but can add greatly to our understanding of these birds. Earliest and latest seasonal dates of occurrence would have been an easy and substantial addition. More discussion in photo captions could have pointed out specific features to note on the photographs.

Despite the problems noted above, "Rare birds of the west coast" should be valuable to professionals and amateurs alike; it certainly has received much use from this reviewer. Much of the information in it would be very difficult to gather elsewhere. Those doing research on specific species or groups, however, are warned to go beyond (and behind) the information presented to draw their own conclusions.—RICHARD A. ERICKSON.

Hawaiian birdlife.—A. J. Berger. 1981. Second Edition. University Press of Hawaii. ix + 260 pp., numerous illustrations. \$29.95.—Much has happened in the 10 years since Berger's first edition of

this compilation of the knowledge of the birds of this unique, diverse, and subtropical island chain, as amateur and professional interest, research, and publication have proliferated. Dr. Berger's effort in revising and updating his work is certainly timely.

At first glance the new book seems little different; the pagination is about the same (260 pages vs. 1972's version with 270). Several new color plates were added, although some from the previous edition were retained that perhaps could have been deleted. These represent early (verging on amateurish) efforts of a now much-improved artist. Most species accounts have received at least some updating; a few have had extensive updates. In fact, by my rough estimate, the book contains about 20–30% newly written material. In general, these accounts are very complete and show Berger's persistence in perusing the literature. Also updated, mostly from the pages of *'Elepaio*, is the list of migrants and the rapidly changing status of introduced birds. Thus the major strength of the book is that it is virtually a complete compendium of Hawaiian birds.

Despite these welcome and needed additions, I was disappointed in a few aspects of the book. Throughout there is a frustrating lack of consistency in Berger's style of references. Many statements that are apparently not Berger's own observations are made without attribution. More commonly, an observer of a particular bird or behavior is given, or the date (in the case of a record of a migrant), the place, or the publication source, but rarely all four. The lack of the latter is especially frustrating for someone interested in just what island has been graced by which unusual sandpiper or who estimated, for example, Bulwer's Petrel to number 250,000 on Nihoa Island (making this tiny island one of the most densely populated bird islands in the world). Some curious references also creep in. For instance, the work of a 1968 Master's Thesis by "S. C. Frings" (née Sheila Conant) is amply quoted, but not the same work more elegantly treated in her excellent publication (Conant, S. 1977. *Wilson Bull.* 89: 193). Inexplicable "oversights" such as this are not uncommon in the book. I should add hurriedly, however, that there was little I could find, even in the so-called "grey literature" of environmental impact statements, etc., that was not at least peripherally mentioned.

Berger's taxonomy is another puzzle. I consider it inadvisable at best, in such an important source of future references, to introduce a taxonomy that has been proposed only in an unpublished Ph.D. thesis. It is a taxonomy that will, I think, be largely accepted, but a state bird book is not the place for the ground to be broken, especially without much more justification. Berger has also chosen to give the migrants a rather cursory treatment. Although the ubiquitous Golden Plover rates almost half a page, the Sanderling, Ruddy Turnstone, and tattler rate only

4–8 lines each. I would have preferred a fuller treatment, but Berger chose to concentrate on Hawaii's more unique species. Probably the biggest failing in the old version was a lack of a decent map of localities. Unfortunately, in this new edition there is no improvement on the outline map that gives only the names of the islands.

In an otherwise excellent section on causes of extinction, Berger virtually omits the tremendous role the ancient Hawaiians undoubtedly played. The pre-contact Hawaiian population has been estimated to exceed 200,000, a level not reached again until the 1920s. Supporting this population took extensive agriculture and undoubtedly resulted in great destruction of the native biota through direct exploitation or habitat alteration. As Berger points out, however, this does not relieve us of an obligation to try to retain the remnant. Other causes of extinction are well documented in this book.

My greatest complaint, however, is the lack of consistent format in each of the species accounts. If you wish to find what island a species occurs on, or what is known about its food habits, for instance, you must carefully read, and occasionally interpret, the whole account. It would have been very helpful, although perhaps more constrained, to have separate sections.

In summary, it is a very well-done book, albeit slightly flawed here and there. It is clearly the best compilation of the birds of Hawaii and is likely to remain so for many years. Hawaii's birds, birders, and ornithologists all owe a debt to Dr. Berger for his effort in updating the work. At about \$30, it is well worth while for anyone's shelf who is interested in island ecosystems, and certainly those interested in Hawaii and the Pacific.—C. JOHN RALPH.

The integrated study of bird populations. Proceedings of a symposium held in Wageningen, The Netherlands, 17–21 September 1979. H. Klomp and J. W. Woldendorp (Eds.). 1981. Amsterdam/Oxford/New York, North-Holland Publishing Company. 255 pp. Paper. \$41.50.—The purpose of this symposium, held on the occasion of the 25th anniversary of the Institute for Ecological Research of the Royal Netherlands Academy of Arts and Sciences, was to bring together current knowledge on the population dynamics, physiology, ethology, and population genetics of birds. The occasion of the symposium also marked the 25th anniversary of the publication of David Lack's important book "The natural regulation of animal numbers." In that book, drawing heavily on evidence from birds, Lack argued that populations were usually regulated by their food supply. The papers read at the symposium are, in part, a progress report on advances in our understanding of the roles of food and other factors in the regulation of bird populations. Participants were primarily

Dutch and British ornithologists and, as might be expected, the Great Tit (*Parus major*) played a prominent role, as it did in Lack's book. Only one paper is based on work in Belgium and one on work in the United States.

The symposium has two major parts. The first seven papers (excluding the introductory remarks by J. Lever, Chairman of the Science Division of the Royal Netherlands Academy of Arts and Sciences) plus the last one are oriented toward topics or techniques, even though two of them deal strictly with data from a single species. They are followed by two papers by A. Watson and R. Moss summarizing their continuing work on Red Grouse in Scotland. Seven papers are devoted entirely to studies of the Great Tit.

Several of the papers deal with strategies of food acquisition and territory defense. J. D. Goss-Custard looks in detail at competition for food and interference among wintering waders, presenting original information on the Redshank and synthesizing much of previous work on foraging ecology of waders in Europe. N. B. Davies examines the economics of territorial defense in birds, measuring costs and benefits to individual birds from defending territories of differing sizes under varying circumstances. H. R. Pulliam discusses how wintering Chipping Sparrows in Arizona change their choices of seeds as seed abundance is depressed during the winter. J. R. Krebs examines trade-offs between foraging, watching out for predators, and territory defense in the allocation of time. D. M. Bryant and K. R. Westerterp provide new data on the use of doubly-labelled water to measure energy budgets of House Martins in the field during the breeding season.

Three of the general papers are focussed at a different level—the significance of behavioral ecology to population dynamics. I. Newton examines existing evidence for the role of food in regulating the sizes of avian populations. He reviews data according to several criteria of thoroughness and the paper is an excellent analysis of the literature. I did grow weary, however, of being constantly reminded that there might be some unknown, unmeasured factor that might be responsible for the patterns. All of science is vulnerable to the same problem and care and caution are the appropriate guidelines. I. J. Patterson, in a companion paper to that of Davies, discusses the role of territorial behavior on population densities and habitat distributions of birds. The final paper, by R. H. Drent and S. Daan, is the most comprehensive in scope, dealing with energetic thresholds for breeding, the determination of laying date and clutch size, energetic implications of variations in nestling growth rates, and rates of expenditure of energy by parent birds. It contains data from a number of species and a reanalysis of previous models of the energetic costs of changes in nestling growth rates.

The papers on the Great Tit cover a variety of top-

ics. A. A. Dhondt and R. Eijckerman report on experiments designed to demonstrate competition between Great and Blue tits. They show that Blue Tit numbers are more strongly affected by Great Tit numbers than *vice versa*. C. M. Perrins and T. A. Geer assess the role of Sparrow Hawks on Great Tit populations in Wytham Woods near Oxford, taking advantage of the fact that Sparrow Hawks were common prior to the late 1950s, became very rare in most of southern England during the 1960s as a result of high rates of pesticide use, but then recovered during the late 1960s when pesticide usage dropped. J. H. van Balen reports on experiments designed to explore the importance of winter feeding on population dynamics. R. J. O'Connor analyzes the vast quantities of information on Great Tits gathered by amateurs under the auspices of the British Trust for Ornithology. The study is of interest primarily as an exploration of the utility of the BTO data. If those data yield the same conclusions as the intensive field studies, then data in the files on other species for which no comprehensive field studies exist will be more useful than they would be if BTO and intensive data are at odds in the case of the Great Tit.

J. A. L. Mertens reports on new efforts to measure costs of incubation. These estimates are of general interest because all models of breeding season energetics include assumptions about the costs of incubation and the significance of delays in initiation of egg laying on energetic reserves of birds. Current estimates range from the view that incubation is less costly than nonincubation to the view that it is substantially more expensive. Mertens, by employing techniques that measure heat flux through nest box walls, shows that incubation is probably quite expensive, but more data are needed on both hole- and open-nesting species under varying weather conditions. Given that Yom-Tov and Hilborn (1981, *Oecologia* 48: 234) have argued that delays of just a day or two and small changes in clutch size can greatly affect the energy budgets of breeding birds, incubation may be a much bigger energetic bottleneck than previously supposed. The value of better estimates of incubation costs is high, and hopefully Mertens' paper will stimulate additional work.

A. J. van Noordwijk, J. H. van Balen, and W. Scharloo use data from the long-term, intensive studies of Great Tits in Holland to estimate the heritability of ecological traits. They conclude, by thorough and convincing analyses, that the heritability of such ecological traits as clutch size, laying date, egg characteristics, and body weight is remarkably high and that the influence of the female greatly outweighs that of the male on female-related traits. The extensive data base with marked birds allows separation of hereditary from environmental effects, one of the most important results of the Great Tit studies. Analyses now being carried out of data from other populations of Great Tits and Pied Flycatchers

should greatly enhance our knowledge of this interesting aspect of avian population dynamics.

The behavioral ecology papers are all of high quality. Davies gives a scholarly review of concepts and data on economics of territoriality, some of it drawn from his own work with Pied Wagtails. He clearly demonstrates what can be learned from careful field measurements of territorial behavior of individual birds when insightful questions are posed. Problems of trade-offs and matching variable evolutionary currencies, difficult issues in the next major phase in the development of optimality models of animal behavior, are insightfully discussed by Krebs, who shows the power of clever experiments as means of letting the animals tell us how important conflicting demands on their time are. An important prediction from fine-grained foraging models, namely that diets should expand as the abundance of high-ranked prey decreases, is verified by Pulliam. He also demonstrates that measuring the percentage of total food eaten by a population is of little value in predicting the influence of food depression on foraging economics or the problems that individuals have in finding enough to eat. Unfortunately, he titles his paper in a way that suggests that it is possible to test whether an organism "forages optimally." We are limited to testing, as Pulliam does very well, whether an organism appears to obey the decision rules postulated by a particular foraging model with specific constraints.

Bryant and Westerterp's work on House Martins is of value primarily as an exploration of the potential of the doubly-labelled water technique. Their data are not yet complete enough to provide clear relationships between parental energy expenditure and nestling growth rates and overall breeding success, but such goals seem to be within the reach of the technique. Goss-Custard's paper is a model of careful analysis, sensible attitudes toward definitional problems, and the creative use of simple models. Like Pulliam, he also shows the limited utility of knowing the fraction of resources consumed by a population.

Unfortunately, although the Scottish work on Red Grouse is one of the most extensive population studies yet undertaken, the grouse populations seem more puzzling today than they did a decade ago. The pattern of population responses to changes in quality and quantity of heather that seemed to characterize previous population fluctuations were not duplicated in the most recent decline. New experiments have estimated heritable aggressiveness among wild-hatched birds and its role in population fluctuations, but the paper in this symposium provides only a brief summary of that work. A full evaluation will have to await publication of the details. Among birds, as among mammals, populations of herbivores are more difficult to understand than those of species that eat higher quality food. Unfortunately,

the Red Grouse study has not yet addressed aspects of food quality other than nitrogen levels. The roles of defensive compounds have not been explored. Perhaps changes in plant responses to browsing and the physical environment are responsible for some of the changes not explicable by appeal to the factors so far investigated. It is not evident to me, from reading the collected papers on the Great Tit, that we are much closer to an understanding of the causes of population fluctuations in this species than we were when Lack wrote. From experiments like those of Dhondt and Eijckerman, clear evidence of competition among species of tits is available. The fall and subsequent rise in populations of Sparrow Hawks, which produced no noticeable change in population densities at Oxford, enables us to say with greater confidence that the effect of a major predator is primarily on turnovers rather than densities. Experiments not discussed in this volume have shown that territorial behavior is more important in the Great Tit than Lack believed. Nonetheless the current models are not decisive even though they are reasonable. Populations of Great Tits in western Europe exist in a very heterogeneous environment. The scale of patchiness is such that virtually every individual is within easy cruising radius of a town where people feed birds, especially in bad weather. Movement patterns in Britain are different from those on the continent. It is not evident, even if the key regulating factors were thoroughly understood for one population, that we would have the ability to predict causes of regulation in other populations. In fact, these studies were not designed in a way to yield generalizations, and it is unlikely that any will emerge from them even if they are continued for many more years. The strategy approach, illustrated by some of the earlier papers in the symposium, has been much more productive of testable generations at much less cost. Moreover, none of the Great Tit models has been subjected to the key test of predicting future population fluctuations.

I come away from a careful reading of the papers with an uneasy feeling that we are still a long way from being able to integrate results from "micro-ecological" studies of strategies of individuals and how they change with environmental conditions with data gathered on population dynamics. Understanding causes of population densities, an intuitively appealing topic and one of the most obvious ecological traits we wish to explain, has proven far more intractable than anyone expected. Enough options are open to individuals and enough factors influence birth, death, and immigration and emigration rates, especially in heterogeneous environments (which is most of nature), that simple relationships between environmental variables and population performance do not emerge. We can only hope that a better understanding of microprocesses will lead to population models with more predictive power

than those we presently employ. No other approach is currently on the immediate horizon, but time must be the judge. Meanwhile, we can thank the organizers of the symposium, the editors, and the participants for providing us with such a readable and stimulating summary of current work on avian populations in western Europe.—GORDON H. ORIANS.

Bird songs in the Dominican Republic/Cantos de Aves en la Republica Dominicana.—George B. Reynard. 1981. Two 12-in, 33 $\frac{1}{3}$ rpm phonodiscs in a double album. Laboratory of Ornithology, Cornell University, Ithaca, New York. \$10.00 (plus \$1.25 postage and handling)—This handsomely produced album contains examples of the vocalizations of an even 100 of the over 200 bird species known from the West Indian Island of Hispaniola. Nor is this collection padded with migrant and ubiquitous species; indeed, most if not all of the island's endemics are among the forms presented. These include the Least Pauraque (*Siphonorhis brewsteri*), the newly resurrected Ashy-faced Barn Owl (*Tyto glaucops*), the Ground Warbler (*Microlegia palustris*), the White-winged Warbler (*Xenolegia montana*), the La Selle Thrush (*Turdus swalesi*), and the Palm Chat (*Dulus dominicus*).

George Reynard, the recordist, has long been a research associate of the Laboratory of Ornithology at Cornell University, and has produced a previous recording devoted to Caribbean birds. He is one of the pioneer sound recordists among amateurs who got started by association with P. P. Kellogg and A. A. Allen. Such men have made the huge and excellent Library of Natural Sounds at Cornell what it is—the leading archives of bird sounds in this country. As one might expect, the recordings are of high average quality and none is below good quality.

The liner notes in English and Spanish are inside the folding album cover, and the list of species is on the back, each form being listed by English, Spanish, and scientific names. The stated purpose of the publication is to help residents and visitors to the Dominican Republic identify and enjoy bird sounds and to promote the new programs of conservation being undertaken in that country. The recordings making up the discs were painstakingly collected in 31 expeditions from 1959 to 1979, including trips in each month of the year. Most of the recordings are from the Dominican Republic, but a few are from other areas of the Caribbean, replacing inferior ones made in the Dominican Republic, although unfortunately it is not stated which ones these are. I trust they are not of species whose voices differ among islands so much that this would pose a problem.

I should note a few lapses pointed out to me in a letter from Mr. Reynard. The announcements of each species given in both English and Spanish by four different people are of uneven and mediocre sound

quality, which is a bit annoying although none is difficult to understand. Errata are: on the front cover, read trogon, not trogan; in the Spanish commentary on the inside cover, paragraph 2, in the third line add "Cara" after "Lechusa"; paragraph 3 on the same page is duplicated at the end of this Spanish section at the bottom of this and in the next column. In the back list of species, number 5 should be genus *Temnotrogon*, not *Trogon*; in entry 17 read Colorada for Colorado.

And here are a few additional critical observations of my own: the sequence of species is somewhat haphazard. Although member species of a family are usually grouped, the families are in no order. The presentation begins with thrushes, and these are followed by a trogon, three tanagers, a mimic thrush, an oriole, the Palm Chat, several finches, two parrots, and . . . like that. No locality or other data are given for any of the recordings, nor are localities of recording anywhere discussed. It was not for want of space either, as three needless (and expensive) color photos of palm, lake, and desert vegetation occupy almost half of one inner page. Those same photos are not referred to in the text or on the records. Also, there are 2.5-in margins and intercolumn spaces on text pages. I think anyone seriously interested in this album would be curious about where the birds were found. Of course some species are probably countrywide, but many others are local, and thus the places of recording would be very helpful to a visitor looking for those species. Finally, I am surprised that the author indicates a preference for maintaining the Hispaniolian potoo (*Nyctibius abbotti*) as a separate species when its voice is virtually indistinguishable by ear or by sonogram from *Nyctibius j. jamaicensis* of Jamaica or *N. j. mexicanus* of Middle America.

In summary, this is a major addition to the published sound recordings of bird voices. It is flawed in largely minor ways, the only serious one being in the lack of specimen data. May I suggest that any one of several journals might be willing to publish these data for the author, or barring that perhaps he could prepare a mimeographed list available on request.—J. W. HARDY.

The Peterson field guide to the bird songs of Britain and Europe (No. 15).—Sture Palmér and Jeffery Boswall. 1980. Stockholm, Sveriges Radio RFLP 5015. 12-in, 33 $\frac{1}{3}$ rpm monaural phonodisc. No price given.—This is the first of several projected supplements to the 14-record set (RFLP 5001-5014) already published by the authors to accompany Peterson, Mountfort, and Hollom's "A field guide to the birds of Britain and Europe." The original set was intended to present principal or characteristic vocalizations of every species in the book, but upon completion of the fourteenth disc many species were yet to be

included, either because recordings of their voices were not available or, presumably, because there was simply no room for them. A few of the more recently available recordings have been inserted in their appropriate taxonomic positions in later pressings of the original set, but now all of the remaining unpublished vocalizations will be collected in supplementary albums. The contents and intricate history of the whole 15-record production are described in more detail in the brochure accompanying RFLP 5015, and by P. Sellar in *British Birds* (66: 304, 70: 533).

This disc contains recordings of 13 "main" species (found 20 or more times in Europe) and 41 accidentals (anything less common than a "main" species). The species cuts are in the Peterson-series mode: about 30 s to 1 min long, usually featuring the primary song if the bird has one, and often another vocalization, such as an alarm call.

Because it is an accumulation of previously unavailable recordings, and because many of the accidentals are Asian, this disc contains a large proportion of vocalizations that are seldom recorded or published, or at least not readily available to western listeners. The "main" species appearing here whose voices were not available for publication in the original series include the Levant Sparrow Hawk (*Accipiter brevipes*), Ross' Gull (*Rhodostethia rosea*), Pallas' Sandgrouse (*Syrrhaptes paradoxus*), Eye-browed Thrush (*Turdus obscurus*), and the Rose-colored Starling (*Sturnus roseus*). The Asian accidentals include the White-tailed Lapwing (*Vanellus leucurus*; Turkmenia), Great Black-headed Gull (*Larus ichthyæetus*; Kazakhstan), Siberian Accentor (*Prunella montanella*; NE Siberia), and the Chestnut Bunting (*Emberiza rutila*; Amurland). The quality of the recordings would be hard to improve upon under field conditions, especially considering that many must have been made on windy steppes and tundra.

Some of the most arresting vocalizations are those of Jeffery Boswall himself. The album is worth listening to just to hear his alarmingly crisp voice and the brittle rectitude of his pronunciations as he introduces each species by its scientific name.

A sheet of explanatory notes gives the length of each cut, the scientific and English name of the calling bird, the name of the vocalization, whether recorded mono or stereo, wild or captive, and the locality, date, and recordist. Most recording localities are identified only by state or province, some only by country ("Canada"), and dates are given only by month ("March 1967"). This vagueness is surprising, for the authors have otherwise gone to a great deal of trouble to produce a well-documented record, and have themselves compared the documentation of a sound specimen to that of a study skin. (I'm assuming that the omission is the authors' rather than that of the various recordists.) The authors' placement of

the Wood Thrush in the genus *Catharus* is not explained. Typos are few and minor.

With the exceptions just mentioned, everything about this record is identified, quantified, attributed (a little two-line note on adjusting the bass and treble is signed "Sveriges Radio"), listed, organized, summarized, or explicated, sometimes more than once. The exceptional amount of thought and care that the authors have devoted to their work has resulted in a well-made and valuable record.—THOMAS A. WEBER.

Birds of Venezuela.—Jean C. Roché. "1973" (= 1981?). 84640 St-Martin de Castillon, France. L'Oiseau Musicien G11 (Edwards Records). 12-in, 33 $\frac{1}{3}$ rpm phonodisc. No price given.—This is another in Roché's series of bird "concert" albums, the purpose of which is to evoke the overall vocal surroundings of a region or habitat, much as they would sound to a person on the scene. Albums by Roché in this format have sampled the bird sounds of Europe (in several installments), the Lesser Antilles, Canada, and west and east Africa. These concert albums are to be distinguished from Roché's more conventional field-guide style albums, notably his well-annotated "Sound guide to the birds of Europe," in which isolated sound specimens of each species are presented one at a time.

In this "musical illustration of the Venezuelan atmosphere" there are no separate species cuts, and the birds are not announced on the recording. The birds' voices have been dubbed together to create continuous "compositions" up to 12 min long. Each vocal composition represents the sounds of one of five Venezuelan habitats or localities, ranging from woodland and cultivation on the northcentral coast to "amazon" forest in the southeast, to the base of the Andes in the west.

The 38 species of birds include 6 wrens, 5 antbirds, 5 icterids, and 2 each of chachalacas, parrots, cuckoos, and thrushes, plus the Horned Screamer, Laughing Falcon, Gray-necked Wood-rail, Rufous-browed Peppershrike, and others. The voices of these birds are blended with the strategically-placed sounds of (unidentified) frogs and cicadas. The outstanding performances are by the Crested Oropendola (*Psarocolius decumanus*), which sounds like drowning Martians clutching at crepe paper, and the Musician Wren (*Cyphorhinus arada*), with its extended theme-and-variations improvisations.

A quick check of several major sound archive catalogues shows that most of the species on this disc have been abundantly recorded, with the possible exception of the Stripe-backed Wren (*Campylorhynchus nuchalis*) and the Musician Wren (both of which nevertheless appear on at least one other commercial recording). Most of the species are widespread in

northern South America, Central America, or both. None of Venezuela's 46 endemic species is included.

The record jacket lists the birds in order of their appearance with scientific, French, and English names, accompanied by short bilingual notes. In a few cases, the vocalizations on the recording are hard to match with the list on the jacket if one does not already know the birds' voices. The jacket material contains a fair number of typos, obscurities, and apparent contradictions. The technical quality of the recording approaches perfection. Although there are often two or more species calling at once, many individual vocalizations stand out clearly enough to be useful for sonographic analysis or for playback in the field.—THOMAS A. WEBBER.

Fauna Sinica, series vertebrata. Aves 4: Galliformes.—Cheng Tso-Hsin et al. 1978. Peking, China, Science Press, Academia Sinica. Text in Chinese. vi + 203 pp., 8 color plates, 2 black-and-white plates, 28 line drawings, 25 distributional maps. ¥4.70 and ¥2.45 Renminbi Yuan for hardbound glazed paper and paperbound newsprint respectively (about \$2.70 and \$1.40 U.S.!). [Interested parties can try to obtain copies from Guoji Shudian, China Publications Center, P.O. Box 399, Beijing, China.].—A total of 14 volumes on birds has been planned for the Vertebrata Series of Fauna Sinica. The order in which completed volumes have appeared (4: Galliformes, 1978; 2: Anseriformes, 1979) suggests that information is not equally available for all groups and that the editors responsible for this series have decided to first treat those groups for which they have the most existing data rather than adhere to taxonomic order in preparing the volumes. The Galliformes volume includes contributions by ornithologists from the Institute of Zoology, Academia Sinica; the Peking Normal University; and the Peking Zoological Garden. The names of participants and the groups they prepared for publication are listed on the page following the title page.

The introductory chapter (pp. 1–20) gives a concise general account of the order by first detailing the diagnostic morphological features and the distinctive aspects of reproductive biology in the Galliformes. Next, the various criteria proposed for establishing systematic relationships within this group (i.e. morphological characteristics, evidence of hybridization in captivity and in the wild, electrophoretic analyses of egg-white protein) and the resulting schemes are discussed. The worldwide distribution of this order is briefly described with special reference made to forms endemic to China. Successful avicultural practices developed since the time of Liberation (1949) are detailed, including particulars about durations of laying and incubation periods as well as the suitable diets and housing for many species. The section

on the economic significance of Chinese galliforms also describes the various methods of capture. As indicated by the systematic list included in this chapter, the authors consider the order Galliformes to be represented in China by two families: Tetraonidae (5 genera, 7 species, and 4 subspecies) and Phasianidae (4 tribes: Perdicipini, Phasianini, Argusianini, and Pavocini; 21 genera, 49 species, and 70 subspecies). The concluding section contains diagrams and descriptions that explain how specimens were measured and includes definitions that clarify the topographical terms used to describe the external characteristics of galliforms.

The systematic account in this volume (pp. 21–192) is organized as follows. Dichotomous keys and short diagnoses are provided for the identification of each family and genus. Relationships between genera are proposed in dendrograms and generic differences in features such as the primaries (the outermost primary is considered to be the first), tail, tarsus, and degree of sexual dimorphism are listed in tables. Similar devices are used to relate and identify species and subspecies as well. Individual accounts of species begin with a list of Chinese synonyms and then proceed to a discussion of the species' geographic distribution inside and outside of China. The distribution maps, which were taken from Dr. Cheng's 1976 Distributional Checklist, only show the species' range within China. Distinguishing features of the species are highlighted in a separate section before the general description is given. The latter includes a detailed description of the plumage pattern (male, female, and then juvenile), the color of the soft parts, and characteristics of the tarsus and toes. Also included is a table of measurements that lists, in columns from left to right, the number (in parentheses) of specimens recorded for each sex, the resulting range of measurements recorded for body weight in grams, and total length, culmen, wing, tail, and tarsus lengths in millimeters. Workers who don't read Chinese and who may attempt to use these tables are warned that columns are deleted rather than left empty when not all measurements are available for a species. It is disappointing that summary statements rather than individual accounting of collection localities and dates are given for the specimens enumerated in these tables. There is no mention of the eventual disposition of the specimens.

The taxonomic discussion that follows the descriptive section in the species account presents the rationale of the taxonomic scheme constructed by the authors. The 10 departures from Vaurie's 1965 systematic treatment of the Palearctic avifauna vary in the robustness of the evidence used in justifying a taxonomic rearrangement. Some examples will illustrate this unevenness. Specimens of *Lyrurus tetrix* regarded as having a wing length intermediate to

that of the smaller *L. t. mongolicus* and the larger *L. t. ussuriensis* are placed in the subspecies *L. t. baikalensis*. However, measurements of individuals in this subspecies arrangement (Table 7, p. 28) do not show consistent differences between *L. t. ussuriensis* and *L. t. baikalensis*. Although the authors separate *Tetraogallus tibetanus tchimenensis* from *T. t. tibetanus* on the basis of different plumage characteristics, they point out that it may not in fact be a good subspecies. Further collection is needed to substantiate its distinctness from the nominate subspecies that is to the west and from *T. t. przewalskii*, which is to the east of its range. The Chinese and Japanese populations of *Tetrastes bonasia vincinitas* are separated into two distinct subspecies on the basis of the differences in color of the upperparts—brownish-yellow in the Chinese specimens (*T. b. amurensis*) and greyish-yellow in the Japanese specimens (*T. b. vincinitas*). The splitting tendency apparent above is not entirely pervasive, as taxonomic rearrangements that unite previously separate forms also occur. *Tetrao-phasis szechenyii* is demoted to being a subspecies of *T. obscurus* because of their similar morphology and plumage and, more importantly, because mutual replacement without overlap occurs within their range. Due to the unavailability of specimens of *Alectoris graeca* in China and the poorly documented instances of sympatry between *A. chukar pubescens* and *A. magna*, the rock partridges in China are arranged as subspecies of *A. graeca*. The considerable amount of post-Liberation fieldwork that has stimulated the above taxonomic rearrangements has also resulted in the discovery of a new subspecies, *Lophura nycthemera omeiensis* Cheng, Chang, and Tang.

The length of the ecology section in the species account appears to be correlated with the economic significance of a given species. Details of habitat (vegetation type, altitudinal range), abundance, seasonal movements, pattern of social organization, foraging behavior, details of the diet, reproductive biology (breeding season, courtship displays, nest structure, clutch size, egg characteristics, care and behavior of the young), predators, etc. are discussed and documented with quantitative data when available ("We have examined the gizzards and crops from 9 [specimens of *Arborophila rufipectus*] and found the contents to consist of snails (once), garden slugs (twice), centipedes (twice), ants (once), caterpillars (once), and the seeds and fruits from oak (four times), [*Elaeagnus* sp.] (once), [*Euonymus* sp.] (twice) and [*Rubus* sp.]". . . p. 96).

The section on the economic significance of the species, also highly variable in length, first evaluates the quality and tastiness of the flesh (suitability for the banquet table), then the other uses of the bird as decoration or perhaps as medicine (According to Jia You in the "Materia Medica," "[The Common Quail] fortifies the five vital organs [heart, liver, kidney, lung, spleen]; is beneficial to the vital forces;

firm up the muscles and bones; helps the body to withstand extreme heat or cold; dissipates fever. It can cure diarrhea when cooked with small red beans and fresh ginger. Fried to a crisp, it can induce the loss of excess fat." . . . p. 82). Avicultural significance and techniques of capturing and rearing the species are discussed, as is the species' potential as game. Legislation is urged for the protection of rare or rapidly declining species. Whereas the previous sections relied upon recent fieldwork and ornithological literature (Western and Chinese) as resources, this section (and occasionally the "Ecology" section: ". . . Li Shizhen said [in the "Materia Medica"]: the Bamboo Partridge is found everywhere in Szechuan and Kwangtung south of the Yangtze living mostly in bamboo forest." . . . p. 104) additionally draws from archeological evidence and the Chinese classics such as the "Book of Songs" (600 B.C.), the "Materia Medica" (1596) and the "San Cai Tu Hui" (1609). In the species account of the Red Jungle Fowl (*Gallus gallus*), Dr. Cheng presents a scholarly essay that refutes Darwin's supposition (in "The variation of animals and plants under domestication") that the domestic fowl was introduced from India to China at about 1400 B.C. He presents a body of evidence that indicates that the Red Jungle Fowl may already have been domesticated as early as 2500 B.C. in China. This evidence also suggests that the distribution of the Red Jungle Fowl at one time may have extended as far north as central China. The individual species accounts conclude with a citation of the original species description.

The Chinese reference list (pp. 193–194) does not cite any works published between 1967 and 1972 inclusive, probably because none were published in that period. This gap reveals the profound disruption in scientific endeavors during the reign of the "Gang of Four" and further points out the achievement that this volume represents. It is also impressive that the authors have been able to assemble most of the pertinent Western references for the preparation of this volume in spite of the restricted flow of communication with the West up until the recent past.

English equivalents are presented with Chinese and Latin species names in an appendix (pp. 197–199), but it probably would have been more effective if they had been included in the species account as well. For the most part, English names were carried over from Cheng's 1976 Distributional Checklist, with the following exceptions: Chukar Partridge (*Alectoris graeca*) becomes Rock Partridge; Crimson Tragopan (*Tragopan satyra*) is changed to Satyr Tragopan; and the *Lophophorus* spp. are called monal pheasants instead of simply monal. An index of Latin species names follows an index of Chinese species names (pp. 200–203). Seven of the eight color plates contain adequate paintings of 32 species (*Syrnaticus ellioti* in Plate 4 is actually *S. humiae*; in Plate

6, the captions for *S. mikado* and *Lophura swinhoei* are transposed). Only males of sexually dimorphic species are illustrated. The eggs of 21 species are presented in Plate 8 according to the same scale, thus permitting relative size comparisons. Plates 9 and 10 are charming black-and-white reproductions of two Yuan Dynasty (1271–1368) brush paintings that depict *Tragopan temminckii* and *Chrysolophus pictus*, respectively. One only wishes that more species were illustrated in this manner.

The authors are well aware of the shortcomings of the book and do in fact point out the need for further fieldwork to fill in the gaps or to resolve the many tentative taxonomic conclusions reached in the book. Their ongoing concern for the quality of the contents is evident, as errors and the appropriate corrections are quickly communicated to workers outside of China as soon as they are discovered [*Arborophila javanica* (Gmelin) should be *A. brunneopectus* (Blyth), and an entire passage was inadvertently deleted from page 4 in the introductory chapter]. There are also various misprints of names and localities that do not detract seriously from the merits of the book.

Unquestionably, this volume will be invaluable to Chinese biologists, as all available information (ancient and modern, Chinese and Western references, and data from post-Liberation fieldwork) on Chinese galliforms has been incorporated within its pages. It is indeed unfortunate that this compilation of information is not available to Western scientists who usually do not read Chinese (there is little to no information presented for the ecology or reproductive biology of the *Arborophila* species in "Les Oiseaux de Chine" by Étchécopar and Hüe). This impasse is clearly unfortunate for the Chinese biologists as well, since they will not have a chance to benefit from the feedback of alternative viewpoints from workers outside of China. The Josselyn Van Tyne Memorial Library at the University of Michigan has circulating copies of the original volume and of a partial translation.—MARINA WONG

First aid and care of wild birds.—J. E. Cooper and J. T. Eley. 1979. North Pomfret, Vermont, David & Charles, Inc. 288 pp. \$22.50. **Caged bird medicine—Selected topics.**—Charles Steiner and Richard Davis. 1981. Ames, Iowa, Iowa State University Press. 176 pp. \$17.50.—"First aid and care of wild birds" is a series of articles—some useful and others of little value. The initial chapter on wild bird hospitals and the law is of very limited value, as it applies only to Great Britain. The next two chapters on bird structure, classification, and behavior are extremely superficial and would be of very little value to anyone except a complete novice.

Next, we find a series of chapters on examining birds, diagnosis and control of disease, and infectious diseases. These sections all have some useful

information but are generally quite superficial as well. There certainly is some worthwhile material in these sections, but, unfortunately, most of it is only dealt with briefly and in general terms. The sections on parasites and poisons are quite good and do give some very useful information. The sections on wounds, injuries, disease control, anaesthesia, miscellaneous diseases, and oil pollution are all very superficial, with only a few bits and pieces of useful information. The section on feeding birds is almost worthless—except that it does give references to some useful articles on this topic. The final sections of the book on crows, waterfowl, birds of prey, and captive breeding does not fit with the rest of the book, nor does it give any useful information related to the book's title. The book closes with a superficial section on cage and aviary design and construction.

While the intent of this book may be good, the content is sorely lacking. As it was written and published for an English audience, several sections are of no practical use to anyone outside Great Britain. If the few useful sections had been expanded and the unrelated sections deleted, this could have been a very useful book, as there is very little information available on veterinary care of birds. Unfortunately, there are few veterinarians who know how to care for birds, so any encouragement or textbook would be very helpful. This book has some helpful material, but it really only whets one's appetite for useful data on avian medicine. Probably one of the best assets of this book is the section with references and recommended readings.

"Caged bird medicine" starts off with a very superficial chapter on pet bird classification. It obviously emphasizes the types of birds that are regularly kept as pets. This chapter is probably only useful to someone who is just becoming interested in birds. The three chapters that follow on anatomy and physiology, physical examination, and nutrition are also geared for the beginner and really give little new information to someone seriously involved with birds. Chapter five on chemotherapy is certainly more useful, as it gives basic information on drug administration and dosages. The next five chapters describe diseases of the respiratory system, digestive system, lameness, tumors, and egg binding. While the information given here is quite basic, it is detailed enough to assist anyone up to a professional.

Three specific diseases are discussed briefly: Psittacosis, Pacheco's Disease, and Newcastle's Disease. These are certainly the diseases of major concern at the present time. While these accounts are brief, they should be useful to most people who are interested in keeping birds. The chapter on anesthesia is also quite useful, while the remaining chapters on first aid, cleaning oiled birds, orphaned birds, and post-mortem examination are much more superficial in content.

This book is certainly more useful than "First aid

and care of wild birds," but unfortunately it does not cover some of the topics that would be the most useful to aviculturalists, pet owners, and others interested in keeping birds. More information on regular care and feeding would have been very helpful.

While these two new books may have some value, they certainly do not add much to the books on avian medicine already available. Books such as "Diseases of cage and aviary birds," by Margaret Petrak (1969, Lea & Febiger) are far more useful. There is definitely a great need for a good book, for the public, on the care of wild and aviary birds. Most of the books available today are either very technical or very superficial—there seems to be no middle ground.

In the final analysis "Caged bird medicine" may be worthwhile for someone who is keeping or plans to keep birds, while "First aid and care of wild birds" gives little useful or new information for this purpose. Hopefully, human curiosity and interest in birds will stimulate the need for books on these topics, and then someday a really first-rate book will result.—DONALD F. BRUNING.

The descent of man, and selection in relation to sex.—Charles Darwin; with an introduction by John Tyler Bonner and Robert M. May. 1981. Princeton, New Jersey, Princeton University Press. xii + 898 pp., illus. Paper, \$10.95.—This is a reproduction of the first printing of the first edition of Darwin's classic, first published 111 years ago, now accompanied by an introduction by Bonner and May that places the work in the context of its original time and relates it to current thinking in evolution, ecology, and sociobiology. Darwin's thinking and ideas, "clothed as they are in unhurried Victorian prose," (p. vii), are of considerable contemporary importance and repay close study. This volume provides a ready and inexpensive opportunity to experience Darwin firsthand.

The first portion of the book deals with the descent of man—Darwin's argument that man bears close relationships to other animals, especially primates, rather than being a product of special creation. The second, longer portion of the book conveys his thinking (and endless examples) on the subject of sexual selection. Darwin clearly considered sexual selection to be a process that was qualitatively different from natural selection: "Sexual selection depends on the success of certain individuals over others of the same sex in relation to the propagation of the species; whilst natural selection depends on the success of both sexes, at all ages, in relation to the general conditions of life" (Vol. 2: 398). This distinction was perhaps facilitated by, or at least closely linked with, Darwin's mistaken views on the inheritance of characters. He held that variations in characters that occurred later in the life of an individual were transmitted exclusively to offspring of the same

sex, while variations appearing at an earlier age were transmitted to both sexes of offspring. This argument dominates Darwin's attempts to interpret his many examples in the context of selection and evolution, often in rather subtle ways. Darwin's thinking on the process of natural selection was also not always as clear as recent restatements of his theory would lead one to believe. Thus, speaking of "social instincts" (Vol. 2: 391), Darwin observes that "These instincts are not extended to all the individuals of the species, but only to those of the same community [social group]. *As they are highly beneficial to the species*, they have in all probability been acquired through natural selection [rather than sexual selection]" (italics mine). Elsewhere (e.g. Vol. 1: 296), he also equates natural selection with selection "for the general welfare of the species"; this is rather more of a group-selectionist stance than is usually associated with Darwin.

With the benefit of historical perspective, we may view these as misconceptions, but most of Darwin's thinking is incredibly current. He ponders the costs of reproduction, the optimal allocation of reproductive effort, the consequences of female choice, cuckoldry, or the way in which molt sequences have become overlaid with alternations of nuptial and wintering plumages (or should we say alternate and basic?) as a consequence of sexual selection. He considers the signaling features of coloration patterns in seabirds that are nuclear species in mixed-species foraging flocks. And he documents his ideas with an inventory of examples that is described in painstaking detail. It is all refreshing (if somewhat laborious) reading, and it makes one wonder, at times, whether we have really made much progress during the last century aside from couching old ideas in new jargon.

Darwin was also candid about his work. He considered it to be highly speculative and quite possibly erroneous, at least in part. But he justified this approach with words that we would do well to remember: "False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as every one takes a salutary pleasure in proving their falseness; and when this is done, one path towards error is closed and the road to truth is often at the same time opened" (Vol. 2: 385).—JOHN A. WIENS.

A complete checklist of the birds of the world.—Richard Howard and Alick Moore. 1980. Oxford, Oxford University Press. viii + 701 pp., \$49.50.—This checklist covers all nonextinct Recent birds of the world, providing for each species an English name and giving the subspecies and the geographical range of each subspecies. It has an index to generic and specific names. References are provided for each family. These start with the basic authorities

(in heavier type) accepted for the classification of each taxon, followed by other publications used to update each family. Unfortunately, no citations are given for each change from the basic reference, so the classification given is that of Howard and Moore.

Although the book is presented as an "authoritative world list for the use of both amateur and professional ornithologist," the value of listing all subspecies in the manner done (e.g. without references and with a limited range statement) is not clear to me. This information is of limited value to professionals. Anyone who works seriously with avian subspecies requires Peters's checklist plus updated regional lists and the taxonomic revisions in the primary literature. I also see no value in including a simple list of subspecies of birds for amateur ornithologists. The example of *Corvus corone* and *Corvus cornix* (page 1), which are sometimes listed as separate species and sometimes as subspecies of the same species, is a poor one. Certainly a number of borderline cases between species and subspecies exists, as do examples of well-marked subspecies that have been treated as species. These cause difficulties for all nonsystematists. But these difficulties are not resolved by a simple list of all subspecies. A better solution would be special mention of all such taxa (e.g. borderline species/subspecies, well-marked subspecies) with a brief explanation. Such information would be of value to the amateur and to the nonsystematic professional.

A major drawback of this volume is its price. Basically the same information is available in other checklists for one-third or less the price of this volume, unless a complete listing of all subspecies is desired; in this case, the present checklist is the only volume other than Peters's checklist possessing this information.—WALTER J. BOCK.

Oiseaux de N^{lle} Calédonie et des Loyautés.—F. Hannecart and Y. Letocart. 1981. Volume I. Editions Cardinalis (67 Route de Ouemo, Nouméa, Nouvelle Calédonie, BP 229, Nouméa; order from first author, BP 229, Nouméa, New Caledonia). 150 pp., numerous color photographs, 1 map, index. Cloth FF 166, \$30.00.—The authors of this beautiful book, both residents of New Caledonia, state in their Foreword that "The purpose of this book is to make people more familiar with the birds of New Caledonia," and add modestly that their work "is not a scientific treatise," being "the result of long years of field observation and photography by bird-loving amateurs."

The species of birds dealt with in this book, the first of two volumes, occur on the main island of New Caledonia (Grande-Terre). Volume II will illustrate the birds of the Loyalty Islands and some of the rarer or extinct species of the Grande-Terre not treated in Volume I. The species are grouped by habitats: savanna (pages 10–44), forest (pages 45–91), swamps and ponds (pages 92–115), and seashore and sea (pages 116–145). Each of these habitats, or groups of habitats, is illustrated by a color photograph preceding the bird illustrations and accompanying text. Both native and introduced species (e.g. Indian Myna, *Acridotheres tristis*, or Bankhiva Cock, *Gallus gallus*), and resident as well as migratory ones are shown. Some of the plates illustrate poorly known species (for instance the Black-winged Petrel, *Pterodroma hypoleuca nigripennis*) or species that have been recorded only recently in New Caledonia (such as the Dusky Moorhen, *Gallinula tenebrosa*). For most species two pages of text (bilingual: English and French) and photographs (usually two to three) describe the habitat, the size, the nesting period, and the eggs. The concise text gives a lot of valuable information, much of it new and obtained by the authors themselves. The precise documentation of these observations is not given, however, and one hopes that the authors will be encouraged by the reception of this book to write up a technical paper on the phenology, breeding biology, and general ecology of New Caledonian birds.

The illustrations are very often beautiful, at times even stunning, and all convey some information about the birds they depict. This can be either of a behavioral or an ecological nature, or of interest to students of nesting. Some of my favorite pictures are those of a Grey Fantail, *Rhipidura fuliginosa*, bringing food to its two nestlings (p. 12), of the young Shining Cuckoo, *Chalcites lucidus*, ejecting a young Yellow-sided Warbler, *Gerygone flavolateralis*, out of her nest (p. 21), of the young Kagu, *Rhynchotos jubatus*, crouching on the forest litter (p. 47), and of the family of Little Grebes, *Podiceps novaehollandiae* (p. 103).

"Oiseaux de N^{lle} Calédonie et des Loyautés" handsomely complements and brings up to date Jean Delacour's "Guide des Oiseaux de la Nouvelle-Calédonie" (Delachaux et Niestlé, 1966). Its bilingual text will permit its wide diffusion in the francophone and anglo-saxon worlds, and its illustrations will appeal to all. This new book on the birds of New Caledonia is a must for students of South Pacific birds in particular and of insular avifaunas in general.—FRANÇOIS VUILLEUMIER.

ALSO RECEIVED

Recent advances in the study of raptor diseases.—J. E. Cooper and A. G. Greenwood (Eds.). 1981. P.O. Box 25, Keighley, West Yorkshire, England, Chiron Publishers. 176 pp., numerous illus. and tables, no

price given.—This well-produced and copiously illustrated publication contains the papers, 34 in number, presented at a conference, the International Symposium on Diseases of Birds of Prey, held at London

in July 1980. Some of the papers are of more general interest than might be supposed, and many of the conclusions and treatments may be generally applied to all birds. Some of the papers are of general interest to ornithologists as is indicated by giving the titles of a few, as follows: "Causes of mortality in British Kestrels"; "The relationship of body weight, fat deposit and moult to the reproductive cycles in wild tawny and barn owls"; "Ossification of long bones in raptors." The remarkable means of examining visually various internal organs and passages ("endoscopy") has many applications other than in medical examination and pathology. It has been used for avian sex determination by laparotomy for many years but has far broader uses, as discussed by several workers. For example, there are photographs of the interior of the trachea and of the syrinx of falcons. One photograph of a trachea shows a gapeworm that has just been dislodged by drug treatment. This volume is also a useful source of references to the literature on avian diseases and treatment.—DEAN AMADON.

Edward Wilson's birds of the Antarctic.—Brian Roberts (Ed.). 1980. Poole, Dorset, England, Blandford Press. 191 pp., numerous black-and-white sketches, 60 color plates, 42 monochrome plates. \$45.00.—Edward Wilson was one of the first naturalists to study and record in detail the bird-life of Antarctica and its adjacent islands. He accompanied Scott on his two Antarctic expeditions as a surgeon and zoologist, but his talents as a naturalist and artist produced a uniquely detailed view of the birds of this remote region. His observations were recorded in notebooks, sketches, and a large number of paintings, some 300 of which are reproduced in this book. This work, most of it done from living birds under extremely adverse conditions, is of superb quality, both scientifically and artistically.

Wilson's initial venture to Antarctica was as a member of Scott's 1901–1904 'Discovery' expedition, and he returned again with Scott on the 1910–1912 'Terra Nova' expedition. On this latter journey, he conducted some fundamental work on the early embryology of Emperor Penguins, which involved gathering eggs under what must surely have been among the most severe field conditions one could experience. As Roberts describes it, "The cold was intense and often extreme, even for the coast of Antarctica (reaching -109.5°F . of frost on one occasion). Darkness was total except for occasional gleams of moonlight, the aurora and the brief, faint twilight of midday. At their destination, a blizzard blew their tent away, and surfaces were so bad that, on some days, eight hours sledging yielded only one or two

miles of progress. Barely escaping with their lives, they returned with three precious eggs." This expedition culminated with Scott's tragic journey to the South Pole; Wilson died with Scott and the other members of the party on the return from the pole.

This book, a reissue of the 1967 edition, will be of considerable interest to readers with interests in polar regions, the history of ornithology, natural history, bird art, or the excitement of early expeditions to remote areas. The paintings, most of which were reproduced directly from the originals, are of excellent quality. The emphasis is understandably upon penguins, but a variety of albatrosses, petrels, prions, and the like are also illustrated, many in studies that reveal much about their behavior and breeding biology. A series of extracts from Wilson's journals completes the main body of the book.—J.A.W.

Ecology and evolution of birds.—Hiroyoshi Higuchi. 1981 (second printing). Tokyo, Japan, Shisaku-Sha. ii + 199 pages; I-XXXIX (index and bibliography), 10 tables, 87 figures. Cloth.—Shisaku-Sha, publishers of biology, ethology, ecology, and evolution texts, including translations from foreign languages and original books in Japanese, first published this small book by Higuchi, a well-known Japanese evolutionary ecologist, in 1978. According to the author's preface, this text is intended both for an audience of general readers interested in biological problems and for college students majoring in biology or zoology. The book is divided into eight chapters: (1) species and subspecies, (2) geographical variation, (3) speciation, (4) ecological isolation, (5) ecological niche and adaptive radiation, (6) systematics and mode of life, (7) various factors affecting species diversity, and (8) environment and species formation. The book furthermore contains an extensive bibliography of references in Japanese and western languages, a glossary of technical terms, and an index of the bird names cited in the text (families, species, and occasionally subspecies) in Japanese and Latin. The attractive illustrations by Mr. Hirohiko Sato are often borrowed from works familiar to western biologists.

Judging from the table of contents, illustrations, and references, I estimate that this book is a concise and modern introduction to problems in avian ecology and evolution. I am most grateful to Dr. Higuchi, who very kindly sent me a copy of his book, and to Messrs. Yoshihiko Arakawa and Hiroshi Furusawa, of the Consulate General of Japan in New York, who took the time to translate the table of contents and to go over the book for me.—FRANÇOIS VUILLEMIER.