

REVIEWS

EDITED BY KENNETH C. PARKES

The waterfowl of the world, vol. 4.—Jean Delacour. 1964. Country Life, London. 364 pp., 6 color plates (by Peter Scott), numerous maps and drawings. 6 guineas (*ca.* \$18).—The first volume of this series was eagerly awaited by waterfowl biologists. Their expectations were not fulfilled by volumes 1–3, published in 1954 *et seq.* The main criticisms were the lack of specific detail and the seemingly haphazard, inadequate, and sometimes inaccurate bibliographies. To many, the first volumes seemed to have been thrown together by a man of great talent and experience, more or less “off the top of his head.” The present effort, volume 4, is a vast improvement, but its merits heighten one’s awareness of the deficiencies of its predecessors. This book is basically a general review of what was known up to 1961 of a variety of matters relating to waterfowl.

Of a total of 11 chapters, Delacour has contributed three—Aviculture, Domestic Waterfowl, and a final chapter of Corrections and Additions. Six chapters are by Milton Weller, Iowa State University, who writes on General Habits, the Reproductive Cycle, Ecology, Distribution and Species Relationships, Fowling, Conservation and Management. The Anatomy of Waterfowl is by Philip S. Humphrey, U. S. National Museum, and George A. Clark, Jr., Peabody Museum. A chapter on Fossil Anseriformes is by Hildegard Howard, emeritus Chief Curator of Science, Los Angeles County Museum.

Each author’s contribution is more or less complete in itself, and as a result the volume suffers somewhat from a lack of cohesiveness. Because of the additional biological data presented, however, it does much to draw together the other volumes, which were deficient in that regard. Each chapter is followed by a comprehensive and pertinent bibliography.

Weller’s major, six-chapter contribution is generally excellent although heavily slanted toward Nearctic species. In Chapter I, two-thirds of the references are to the North American literature. Six of seven tables and graphs in Chapter II and more than 80 per cent of the references cited following Chapter III are likewise North American. I would prefer a broader representation, although the indicated ratio may accurately reflect the emphasis placed on waterfowl biology in North America.

Weller’s statement (p. 60) that anatids are indeterminate layers is questionable, at least as a generalization. Removal or addition had no effect on the total number of eggs laid by *Branta canadensis hutchinsi*, *Branta canadensis parvipes*, or *Anser caerulescens* (of either phase) in experiments I conducted at Boas River in 1953. I also noted that *Somateria mollissima borealis* do reneest but that Canada Geese and Lesser Snow Geese at the same latitude (65° N) do not. This probably reflects differences of habitat. The eider is marine, and feeding habitat is available into late October; the two geese are terrestrial, and habitat is generally not available after mid-September. Young from a reneesting attempt by geese would probably not survive to migrate south.

In Chapter III, Weller (p. 80) briefly refers to the apparent exceptions to Bergmann’s Rule and Allen’s Rule provided by some representatives of North American *Cygnus*, *Branta*, and *Anser*. This supports Salomonsen’s (*Dansk. Biol. Medd.*, 22: 1–62, 1955) view that those rules are governed more by temperature on the wintering grounds than conditions on the breeding grounds. A recent addition to the list of apparent exceptions is *Branta canadensis maxima*.

Jaegers are notable omissions from Weller's list of avian predators. T. W. Barry (pers. comm., 1963) records that Parasitic Jaegers (*Stercorarius parasiticus*) effected a 49 per cent reduction in nesting success of Black Brant (*Branta bernicla nigricans*) and Lesser Snow Geese at Anderson Delta, Northwest Territories, Canada. Similar reductions occur regularly throughout all known snow goose colonies. Jaegers usually take more eggs than young while gulls take eggs and goslings in more or less equal amounts.

Omitted from the list of mammalian predators is the Barren Ground grizzly (*Ursus horribilis*) which has been recorded by T. W. Barry and others as an effective predator of nesting snow geese, brant, and eiders at Anderson Delta and Kendall Island, Northwest Territories. I have observed that polar bears (*Ursus maritimus*) tend to ignore eggs and goslings.

Ground squirrels show variation in predatory behavior. Sowls (*J. Mamm.*, 29: 113-137, 1948) showed that prairie ground squirrels (*Spermophilus tridecemlineatus*, *S. franklinii* and *S. richardsonii*) were regular and effective predators of eggs. Parry's ground squirrels (*S. parryii*) inhabiting the tundra at McConnell River could not be induced to eat snow goose or eider eggs, even when the latter were punctured and placed beside the entrance to squirrel burrows.

There are likewise some additions to Weller's admittedly incomplete list of beneficial animal associates. Barry has reported that Sabine's Gulls (*Xema sabini*), Ruddy Turnstones (*Arenaria interpres*), and Arctic Terns (*Sterna paradisaea*) are all beneficial nesting associates of Atlantic Brant because of aggressive defense of their nesting sites, which are found in close association with those of Brant.

Chapter IV, Distribution and Species Relationships, is to me disturbing. I have no particular quarrel with the text, but five of eight maps, i.e., *Anser*, *Branta*, *Anas*, Aythyini, and Oxyurini contain what appear to be major errors. For example, *Anser* breed at Cape Henrietta Maria, Ontario; McConnell River, Tha-ane River, Austin Island, Somerset Island, and Axel Heiberg Island, Northwest Territories, but these are not shown on the maps. On the other hand, *Anser* breed primarily on the west coast of Ellesmere Island and around Lake Hazen, not on the east coast as shown. Further, Snow Geese do not breed on the south coast of Foxe Peninsula. The map incorrectly indicates that *Branta* is absent from Newfoundland, Southampton Island, Axel Heiberg, and the east coast of Baffin Island. *Branta* are recorded as breeding on Japan and the Kurile Islands, whereas in Volume I it is stated that those populations "formerly wintered" there.

I have only a few miscellaneous observations on the excellent chapter on fowling. The common steel fox or muskrat trap is used extensively in North America, not always deliberately, but nevertheless with success. The take of birds in heavily trapped areas such as coastal Louisiana or Chesapeake Bay is undoubtedly significant. Crudely twisted newspapers are used effectively in western Louisiana and eastern Texas to decoy Lesser Snow Geese. A more recent innovation near Cape Tourmente, Quebec, has been the use of white plastic Clorox and detergent containers or boulders painted white as permanent decoys for Greater Snow Geese.

The world population of Ross' Goose (1964) is between 32,000 and 42,000, not 12,000. Indeed, kill in Saskatchewan alone exceeds 1,000 birds per annum and similar situations exist elsewhere in the range of the species. For many years North American waterfowl biologists suspected that the "accidental kill" equalled the then stated "world population." Little was said until recently because it was believed in some quarters that indicated rarity would be an effective conservation method. In fact,

the number of Ross' Geese taken now equals (in some seasons at least) the number of Greater Snow Geese (*Anser caerulescens atlantica*). The former are more vulnerable than the latter because they are indistinguishable from the abundant Lesser Snow Geese with which they associate. The latter form a discrete population which cannot be confused with other forms. Thus the take of Greater Snow Geese is more easily controlled.

In his list of natural decimating factors (pp. 129-130) Weller does not refer to the effects of agricultural chemicals. The adverse effect of insecticides, especially the chlorinated hydrocarbons, on avian fecundity and reproductive success is only now becoming clear. In 1963, 23 of 28 clutches of eggs of the Black Duck (*Anas rubripes*) collected from Delaware to Maine contained pesticide residues in amounts greater than those experimentally shown to produce significant reduction of breeding success in the closely related Mallard (*Anas platyrhynchos*).

In addition to the standard methods of assessing reproductive success, selective hunting, and hunter identification listed by Weller, the U. S. Fish and Wildlife Service recently instituted a collection of wings and tails of ducks and geese shot by hunters. These are used in addition to pre-season banding and population surveys to provide unbiased information on age, sex, and species. This is necessary because the average North American hunter is seemingly incapable of identifying what he shoots.

Although North America is probably furthest advanced in waterfowl inventory and assessment of harvest, other countries are progressing rapidly. A seeming provincialism again creeps in because nowhere was there reference to the non-North American situation commensurate with its importance.

I have not compiled this list of addenda and errata merely to point out deficiencies in Weller's chapters. He has done a remarkable job in bringing together a mass of data on waterfowl behavior, ecology, and management. If his record is incomplete, the fault is partly that of the waterfowl biologist (especially of North America) who publishes relatively little. The volume of data accumulated by wildlife biologists but never published or completely analyzed would stagger the imagination of the non-waterfowl ornithologist. If Weller's treatment appears at first glance somewhat superficial, it is because all four volumes of this series could not hope to cope with the subject.

Chapters VII and VIII are by Delacour. His section on aviculture is skillfully done and demonstrates why he possesses an avicultural "green thumb." Raising and propagating birds in captivity is a mixture of scientific fact and art. Delacour has vividly conveyed the art in rearing waterfowl. The section on domestic ducks and geese, with plates by Peter Scott, is a valuable synopsis of the history of domestication of three principal species of waterfowl.

Chapter IX, by Humphrey and Clark, is well done and collates succinctly much of what is known of the anatomy of waterfowl. The supporting bibliography is especially useful.

Chapter X, by Howard, is impressive. Knowing little of fossil Anseriformes, I was intrigued by the scope of the presentation. A map indicating the distribution of anatid fossils in the world would have been useful.

The final chapter, by Delacour, Corrections and Additions, is laudable and essential in such a series. A plate by Peter Scott gives modifications in selected paintings from volumes 1-3. I searched in vain for a retraction of the description of the 26-inch Trumpeter Swan with a 10-foot wingspread which appeared in volume 1, p. 75. The description of the color of its upper mandible is also wrong. I was also unable to

find, in the Literature Cited, the source of the long, quoted passage on behavior of Whistling Swans during migration through Alberta. This chapter contains more additions than corrections—a better ratio would have been one to one.

This may seem to some a harsh review, but one expects the utmost care in a work of this price and authoritative authorship. Volume 4 is the best of the series and a useful reference by itself.—F. G. COOCH.

Avian myology.—J. C. George and A. J. Berger. 1966. New York and London, Academic Press. Pp. xii + 500, numerous illustrations, \$18.00.—The offspring of two different but carefully chosen parental stocks frequently possess greatly superior qualities—the phenomenon of hybrid vigor. The same phenomenon apparently also exists for the writings of ornithologists if the authors are selected carefully. And in the case of *Avian myology*, the authors were most carefully chosen. J. C. George, who pioneered the comparative study of the histochemistry and related physiology of avian muscle fibers, and A. J. Berger, who is one of the outstanding authorities on the gross anatomy of avian musculature, form an excellent team. The result of their combined efforts is a most stimulating treatise on avian myology that will serve as a basic source in this area for many, many years. The book contains two major topics, one being a review of the research on histochemistry of avian muscle fibers (which is primarily the work of George and his associates) and the other being a comparative description of the musculature of birds. Both topics are supported by excellent bibliographies, the usefulness of which is enhanced by employment of chapter bibliographies. Ornithologists will benefit by having an extensive list of the papers by George and his co-workers available in one place.

Avian myology represents a bold stride into an extremely difficult and little-explored area of avian biology, and because this book is a review of a little-known aspect of morphology, physiology, and biochemistry, it contains some deficiencies and weak spots. Many of the weak points in this book reflect nothing more than the lack of work and knowledge in these areas and cannot be blamed on the authors. Because I believe that *Avian myology* is a most significant contribution to avian biology, I feel that a critical analysis of the areas of difficulty is essential. I present the following comments in the hope of enhancing the value of this book for ornithologists.

It is quite understandable that the authors restricted their analysis to the phases of myology they know best; however, nowhere do they present a clear discussion of the important research areas in myology. Many major areas of myological research are not even hinted at, leaving the average reader with no idea of the full scope of muscle studies and with no pertinent introduction to the vast and diverse literature on other areas of myology. Most important, the integration of the biochemical and cytological aspects and of the gross anatomical aspects of avian myology falls far short of the authors' presumed aspirations. This lack of integration is the greatest weakness of the book, and is the best indication of the huge amount of work remaining to be done before a synthesis of the diverse areas of myology is possible.

Although the chapters are not signed, the major responsibility (and, presumably, authorship) for each chapter is obvious. George has apparently written chapters 3–8 and 10 and probably chapter 1, and Berger has apparently written chapters 2 and 9, as indicated by the close relationship between the material in these chapters and the previous writings of each author and by differences in style.

Far too much stress is given to the two major flight muscles throughout the book, reflecting the interests of George. Birds are more than flying machines and much of

their musculature is not associated with flight. This emphasis and the attempt to generalize on all avian muscles from a detailed study of the flight muscles has resulted in discrepancies and some serious errors.

The analysis of the cytology, histochemistry, and biochemistry of the pectoralis and supracoracoideus (chapters 4, 5 and 6) constitutes a major part of the book. These chapters are, in general, clear and well presented. The properties of the two fiber types—red and white—distinguished by George are described in detail and then summarized in a table; the position of this table (IV.1, p. 75) should be marked, as the reader will refer to it constantly as he studies these chapters. An extensive comparison of the fiber types in the pectoralis and the supracoracoideus of most avian groups is presented; the functional significance of the fiber types is well covered. The value of these chapters would have been improved by description of the method by which the exact amount of myoglobin in a fiber is ascertained (how to distinguish the “redness” and “whiteness” of fibers), and by addition of a general appendix on the histochemical methods. Nowhere do the authors say how the muscles were fixed, how the problem of muscle contraction and shortening during fixation was avoided, and how shrinking and other effects of preparation of the slides were handled. In the absence of these considerations, results such as the values for diameters of muscle fibers lose much of their meaning.

The text discussions and the table (IV.1) of characteristics of fiber types omit any standards or limits for each property. It is also hard to determine which of the listed properties are mutually linked, as there are certainly functional groupings of some of these properties. The table also omits some properties, such as the activity of succinic dehydrogenase, which was used as the primary characteristic for distinguishing fiber types in the survey of the flight muscles. Some of the properties such as activity (“sustained” and “rapid” are not contrasting opposites) and contraction (“slow and fast” mean at least two quite different things in the muscle literature) are too vague. It can be pointed out that the pectoralis of the hummingbird is a pure red fibered muscle, but I doubt that anyone would consider the contraction of this muscle to be slow.

The presented evidence argues more against the existence of distinct fiber types than for them; it appears far more likely that a range of characteristics exists, with red and white fibers representing the extremes. The use of an intermediate type (I type) argues for a continuous range. A careful examination of the photomicrographs in the survey of avian flight muscles indicates the existence of a smooth gradient of fiber conditions. No clear standards appear to exist (none were given) because fibers identified as red in some birds could not be separated from fibers identified as intermediate in other birds, and some intermediate fibers could not be told from white fibers. Generalizations on red and white fibers based upon investigations of the flight muscles appear to be impossible at this time. For example, George states (p. 52) that, in the appendicular muscles of pigeons, the red fibers contain more glycogen than the white fibers, in contrast to the condition in the pectoralis and supracoracoideus (no statement is made about the condition of the associated enzymatic properties in the appendicular red fibers). Yet these problems are largely passed over in the formulation of general conclusions. I doubt, therefore, that the homology of red, white, and intermediate fiber types in different birds rests upon solid ground. Even the question of similarity of fiber properties in different muscles of the same bird has not yet been solved.

A far more basic problem is the confusion between red versus white fibers and

twitch versus tonus fibers. Twitch fibers are the "normal" rapidly contracting and relaxing vertebrate striated fibers while tonus fibers contract and relax very slowly; these fibers differ in a number of morphological and physiological properties (see pp. 177-183, but the discussion is weak). From the statements on p. 138, bottom, that "red fibers . . . indulge in sustained tonic contractions," and "white fibers . . . possess the necessary qualities for rapid tetanic contractions," and on p. 183, where the pure tonus-fibered latissimus dorsi is considered as a "red mixed" and the pure twitch-fibered latissimus dorsi posterior as a "white mixed" muscle, there is no doubt that George equates red with tonus and white with twitch fibers. This conclusion is wrong. Avian muscle fibers cannot be classified into just one set of two types; at least several independent sets of properties exist. If red and white fibers differ in speed of contraction, which has not been demonstrated in this book, then they will probably fall into the categories of slow twitch and fast twitch.

The long chapter (9) on musculature and the chapter (2) on the skeleton form the second major part of the book and probably should have been placed closer together. The description of the skeleton is not sufficiently detailed to provide an understanding of the attachments and actions of the muscles. Too much space is wasted on details and figures (e.g., II.1 and II.3) that are unnecessary for comprehending the myology. In general, the figures of the skeleton and of the musculature are too small, and much of the finer detail is obscured. The weakest part is the description of the skull and jaw muscles. There is no justification for following Beecher's description of the passerine jaw muscles; Fiedler's treatment is far superior. Moreover, it is time to lay to rest the famous "pseudotemporalis bulbi muscle" (mentioned on p. 246), as Hofer, Fiedler, and others have shown this structure to be a rete of blood vessels going to the eye. The chapter on musculature is a pure comparative descriptive treatment and, except as noted, is excellent as such. But no attempt is made to include any functional analysis, nothing is said about the fiber arrangement within a muscle, and the list (p. 229) of needed types of research in avian muscular systems is too incomplete to be of much use. The general literature on the musculature of most regions of the avian body is cited in the beginning of each section, and an excellent review of the hand digit problem is given. The decision to follow a conservative approach in the use of muscle names (p. 226) must be applauded.

A major confusion does cloud the chapter on musculature because (a) no cut-off date is given in the book for citation of literature, and (b) the authors state: "We have intentionally refrained from citing or quoting from certain published papers, feeling they are unreliable" (p. 225). Thus the reader does not know why, for example, William George's 1962 paper on hyoid muscles in passerine birds was not mentioned in the text, although it was listed in the bibliography; why Starck's 1940 paper on jaw muscles of hornbills is not cited, or why Fiedler's excellent study on passerine jaw muscles, Engels' study of jaw muscles in thrashers, and Hofer's extensive monograph on avian jaw muscles were not followed. The ornithological public deserves to know from authorities in a field exactly which earlier works can be relied upon and which cannot. Unfortunately, they cannot obtain this information from Berger's chapter on the musculature.

In spite of the above criticisms, *Avian myology* is an excellent combination of a comparative analysis of the histochemistry of avian muscle fibers and a comparative description of the musculature of birds that can be recommended to all ornithologists. We are indebted to George and Berger for their excellent and lasting contribution to avian biology, and they should be heartily congratulated.—WALTER J. BOCK.

OTHER BOOKS RECEIVED

Field biology and ecology.—Allen H. Benton and William E. Werner, Jr. Second edition, 1966. New York, McGraw-Hill. Pp. x + 499, illus. $9\frac{1}{4} \times 6\frac{1}{4}$ in. \$9.50.—A thoroughly revised and enlarged edition of an attractive ecology text, with strong emphasis on field problems, first published in 1958. Much new material has been incorporated, but the type faces and reproduction of photographs are inferior, the glossary has been dropped, and the price raised by three dollars.—K.C.P.

Home book of animal care.—Esther L. Guthrie. 1966. New York, Harper and Row. Pp. xiv + 302, illus. (cage designs). $8\frac{1}{2} \times 5\frac{5}{8}$ in. \$5.95.—An eminently sensible book, aimed primarily at parents and teachers, covering invertebrates and vertebrates. Among mammals and birds, both domesticated and wild species are included, with admirable emphasis on the problems of maintaining wild animals as pets. The only native wild birds included are the unprotected corvids.—K.C.P.

Evolution above the species level.—Bernhard Rensch. 1966. New York, John Wiley & Sons Science Editions. Paper, pp. xviii + 419, illus. $8\frac{3}{8} \times 5\frac{1}{2}$ in. \$2.45.—This paperback makes readily available one of the major modern synthetic works on evolution. Students should note, however, that this revision was originally published in German in 1954; the English translation was published in 1959, but Rensch's preface to the English version is dated March 1956, and states that "only a few alterations and additions have been made" to the 1954 German edition.—K.C.P.

The Ivory-billed Woodpecker.—James T. Tanner. **The Roseate Spoonbill.**—Robert Porter Allen. **The California Condor.**—Carl B. Koford. 1966. New York, Dover Publications. Paper, $9\frac{3}{8} \times 6\frac{5}{8}$ in. \$2.00 per vol.—Offset reprints of National Audubon Society Research Reports nos. 1 (1942), 2 (1942), and 4 (1953), at a bargain price. Page size has been somewhat reduced without loss of legibility, and the paper covers are stronger than those of the original editions. The color frontispieces have been reproduced in black and white, but appear in color on the covers. Data on distribution and population size must, of course, be read with original publication dates in mind.—K.C.P.