

REVIEW

Avian ecology in wetlands.—The current decade has been witness to a significant advance in our understanding of the ecology of wetlands. The research propelling this advanced has focused principally on vegetation, plant adaptations, nutrient cycling, and other aspects of the chemistry of wetlands. Such interest is not unexpected as these factors, along with hydrology, determine much of the functional attributes of these ecosystems. With the notable exception of waterfowl, and of shorebirds in Europe, studies of avian use of wetlands have been sketchy at best and nonexistent at worst. Nonetheless wetland avian biologists are in the enviable position of being able to know a great deal about the environments in which their species live.

Within this decade, several volumes have been published that together encompass much of our new understanding and deserve to be brought to the attention of avian biologists concerned with birds that use wetlands. These volumes are of two types: those that summarize and synthesize information about particular regional ecosystems, and those that attempt to provide a more general understanding of wetland processes. Together they illustrate both the exciting strides achieved in wetland ecology and the glaring need for additional studies on the ecology of wetland bird.

The several recent volumes that have summarized the state of knowledge regarding specific sorts of wetlands generally do so in context of achieving appropriate management strategies. Pre-eminent among these studies is the contribution by Ewel and Odum (1984). This is a thorough explication of the ecology of cypress swamps from a strong systems perspective. It concentrates on reporting the study of H. T. Odum and his colleagues on the experimental addition of sewage to a cypress dome in Florida, USA, but it also includes relevant information from other cypress wetlands. In doing so this volume brings cypress swamps into an exquisitely clear focus. The 51 contributors encompass the succession of colleagues and students that

passed through the University of Florida Wetlands Center in the 1970's, most of whom are now doing important work in aquatic systems elsewhere. The study naturally emphasized nutrient and energy flows. Not unexpectedly, birds played a minor role in both the ecosystem and the study. Larry D. Harris and Charles R. Vickers found that the annual energy transfer of the avian community was only 18 kcal/m². Although low, it is a figure three times that of an eastern deciduous forest. These birds are primarily the small arboreal species, in that the study swamp did not support the large populations of wading birds found in larger systems. The prize of the collection is Dr. Odum's final chapter, "Cypress Swamps and their Regional Role," a precis on wetland ecology to be recommended to all wetland scientists.

Cohen et al. (1984) provided a collection of papers on a similar forested wetland, the Okefenokee Swamp in Georgia, USA. History, ecology, biochemistry, paleoecology, and geology are all covered, in a "camera-ready" format. The various contributions provide much food for thought on the ecology of wetlands. However, birds are seldom mentioned in the volume. One would expect that the colonies of colonial waterbirds within the swamp may subsidize the localized movements of energy and nutrients within the swamp. This volume re-emphasizes the historical fact that most studies of wetlands have been of plants and nutrient cycling.

This view similarly characterizes Richardson's (1981) important contribution on pocosin wetlands, small evergreen shrub bogs of the southeastern USA coastal plain. The book presents an exciting overview of the ecology and values of these wetlands and emphasizes alternatives for their management. Tom D. Monschein discusses the importance of pocosin wetlands to game species in North Carolina, USA, although principally from the point of view of mammals and upland game birds. Henry M. Wilber points out that pocosins are crucial habitats for several species of amphibians and reptiles but their relationships to birds are not known.

An example of a regional study from Africa is that of Bruton and Cooper (1980). This collection of essays describes the ecology, faunistics, and sociology of Maputaland, southern Africa. Included are the wetlands associated with Lake Sibaya, Lake St. Lucia, and the Pongolo River. It is easy to overlook the rich African wetlands when mesmerized by the more famous upland game parks. K. H. Cooper classifies the birds into habitats, nine of which are aquatic. The region supports important populations of colonial waterbirds that have been little studied and are unappreciated except by those who have had the opportunity to visit the area, especially Lake St. Lucia. Although the state of understanding is below that of the US wetlands, the book demonstrates that important strides are being made to define African wetlands and their conservation needs.

An example of such a regional study in Europe is that of Wolff (1983), which summarizes long-term studies on the Wadden Sea, a shallow coastal estuarine lagoon along the northern and western coasts of The Netherlands, Germany, and Denmark. This three volume treatise is the most thorough of all the books reviewed here and the one that most emphasizes avian studies. C. J. Smit and W. J. Wolff present a comprehensive picture of the bird fauna of the area, its habitat requirements, feeding ecology, and conservation threats. They found that the Wadden Sea is an important foraging ground for water birds that nest from Canada to Siberia, with over three million being present simultaneously in late summer. Twenty to thirty percent of the European spoonbill population breeds and feeds in the area, as do large waterfowl and shorebird populations. Among the larids, about 30% of the European Sandwich Tern population nests there, representing recovery from a severe decline in the 1960s owing to pollution. Other gulls using the area also comprise significant portions of their European populations. The estuary produces 15-20 g dry organic matter of potential prey items per m² per year, and birds take 4 g of this. Unlike the other systems reviewed, it appears that birds may be important movers of energy, a conclusion in concert with the many ecological studies

of European shorebirds conducted over the past decade.

Such regional wetland studies are important contributions to our understanding of wetlands and provide crucial background for the study of avian use of these ecosystems. Lacking until recently have been overviews of wetland ecology, but two recent books have attempted to meet that need. Mitsch and Gosselink (1986) is a fine textbook for both new students and old time practitioners. It is a superb synthesis of the extremely scattered North American wetland literature. It covers the history and definitions of wetlands, their ecology, and their management and includes chapters on the ecology of the major types of North American wetlands. As in the other volumes, this book thoroughly explores the plant ecology, biogeochemistry, and management of wetlands but leaves one rather forlorn after searching for information on birds. Continental waterfowl numbers are briefly summarized and the works of Milton Weller and L. H. Fredrickson on habitat use are well illustrated. But missing is an appreciation for the functional relationships of aquatic birds to their wetland ecosystems. This is disappointing in that even those few examples presently understood are both compelling and instructive as to how wetlands function at the consumer trophic levels. Whooping Cranes, Cape Sable Sparrows, waterfowl, blackbirds, and Wood Storks all have interesting stories to be told. But in such books, decisions must be made on what not to include. Perhaps two problems exist. We must learn much more about avian use of wetland ecosystems and that which we know must be more widely disseminated. Mitsch and Gosselink have created a classic text that is both comprehensive and readable and will be essential reading for anyone working in wetlands.

Where then should an avian biologist turn for comfort? To the little book by Weller (1981). Although written for non-scientists this is by far the best statement about the functional relationships of wetland birds to their ecosystem. Furthermore it provides a concise introduction to Milton Weller's own fundamental studies on avian use of marshes. This is a book that deserves wide distribution and recognition, a gem

to be cherished by wetland ornithologists, who should reread it yearly.

These books provide many explanations and many more hypotheses of interest to avian ecologists. The regional studies share their insights into specific systems as well as broader understandings. This is particularly so of the volume by Ewel and Odum. Mitsch and Gosselink have provided a gratifying first general textbook for this emerging discipline, and Weller has established an exciting foundation for the future study of the ecology and management of wetland birds. Thanks to these authors and editors, the path for wetland avian ecology over the next decade should be clear.—**James A. Kushlan**, Department of Biological Sciences, East Texas State University, Commerce Texas 75428 USA.

BOOKS REVIEWED

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