BOOK REVIEW

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Rare and Endangered Biota of Florida.—Peter C. H. Pritchard (Series Editor). **Volume One. Mammals.**—James N. Layne (Ed.). xx + 52 pp., 11 figures, 37 maps. 1978(1979). $5.00. **Volume Two. Birds.**—Herbert W. Kale, II (Ed.).xix + 121 pp., 36 figures, 67 maps. 1978(1979). $7.00. **Volume Three. Amphibians & Reptiles.**—Roy W. McDiarmid (Ed.). xxii + 74 pp., 42 figures, 44 maps. 1978(1979). $5.50. **Volume Four. Fishes.**—Carter R. Gilbert (Ed.). xviii + 58 pp., 33 figures, 43 maps. 1978(1979). $5.00. All volumes available from University Presses of Florida, Gainesville.—The publication of the first four of the proposed seven-volume series of books on the rare and endangered biota of Florida is a significant advance in the development of natural history, ecology, and conservation in the state. Private, state, and federal funds have all been used to support this project for the Florida Game and Fresh Water Fish Commission (FGFWFC). But the major credit goes to a dedicated and knowledgeable committee of biologists led by their chairman, James N. Layne, Director of the Archbold Biological Station near Lake Placid, Florida. This committee realized that after the passage of the Federal Endangered Species Act in 1973, states were documenting lists of their endangered animals and plants. Once established, these lists could be used as a basis for management decisions, land acquisition, and research priorities. The results of the labors of the Florida Committee on Rare and Endangered Plants and Animals (FCREPA) with regard to vertebrates are published in these four volumes.

The Florida legislature, the Department of Natural Resources (DNR), and the FGFWFC could do a lot more toward taking responsibility for the preservation of native animals and plants, and in public education about the natural environment. But the cooperation and support that produced this series, sponsored by the Florida Audubon Society and the Florida Defenders of the Environment, is a solid step forward toward this goal. The books are an attractive and readable summary of our present understanding of those animals that are known to be rare and may be threatened with extinction if present trends continue. Although states such as Alabama, Georgia, North Carolina, Missouri, New Mexico, and California have produced publications of a similar nature, none excel the professional quality and thoroughness of Florida's contribution. But this is just one step. The level of environmental awareness of the average citizen of Florida is much lower than in many other states; many of Florida's delicate natural habitats are being degraded rapidly; there is no state-supported biological survey; and with certain restrictions it is still legal to kill black bear (*Ursus americanus*). The taxa listed in the Rules of the Game and Fresh Water Fish Commission (Ch. 39-27, Supp. No. 105, August 1979) as endangered, threatened, or of special concern, have legal protection. The FCREPA list served as a basis for compiling the official state list, but there are 15 fishes, 23 birds, and 1 mammal that occur in these categories in the FCREPA list but not in the FGFWFC list. The educational and scientific value of the FCREPA volumes is high, but the practical value will depend on the commitment of the legislature, the FGFWFC, and the DNR to increase their program for endangered species. The FGFWFC is presently adding seven new staff members for this purpose (D. Wood, pers. comm.).

Following a thorough introduction by the editor of each volume, the text is devoted to an illustrated inventory of animals that are in trouble. In all four volumes the term "endangered" is applied to taxa that are in danger of extinction if present trends continue. The term "threatened" is applied to forms that are threatened nationally or are in particular trouble in Florida; the term "rare" is for species that are sparsely or locally distributed, but not necessarily in trouble. In addition to the FCREPA Committee, other specialists contributed to the preparation of some of the species accounts. These have sections for descriptions of external morphology, geographic range, habitat, life history and ecology, special characteristics, basis for classification, recommendations, and references.

Of the 19 endangered and threatened mammals that have federal and/or state protection, some are more amenable to help by management than others. The gray bat (*Myotis grisescens*) needs additional protection immediately. This colonial species migrates to Jackson County, Florida, where it hibernates in the few caves that are still undisturbed. The account should have been more explicit on this point. One form of the fox squirrel (*Sciurus niger avicennia*) remains only in the Big Cypress Swamp and the Everglades. Another form (*S. n. shermani*), inhabiting most of central Florida, was common in the pine-turkey oak association

but that association along with the squirrel is greatly reduced. Although populations designated as "of special concern" in the Wildlife Code (FGFWFC, 1979) are supposed to be protected from hunting, there is an open season on fox squirrels lasting from November 1979 to March 1980 except in the seven southernmost counties, the range of *S. n. avicennia.* Some of the other endangered rodents, such as the Goff's pocket gopher (*Geomys pinetis goffi*), the Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*), and the Key Largo woodrat (*Neotoma floridana smalli*) are so rare and local that preservation may already be hopeless. The protection and wise management of the smallest form of the white-tailed deer, the Key deer (*Odocoileus virginianus clavium*), within the Key Deer National Wildlife Refuge is a good example of what can be done to prevent extinction of a population. Procurement of additional habitat on Big Pine Key would assure a more substantial and stable population for deer and for several other endemic forms mentioned below.

One listed mammal occurs exclusively in Florida, the Florida mouse (*Peromyscus floridanus*), and a second, the round-tailed muskrat (*Neofiber alleni*), is confined to Florida except for the population in the Okefenokee Swamp of southeastern Georgia. The latter species is of special concern because, although it is locally common in the Everglades, its status elsewhere is poorly known.

For most species the problem is one of providing adequate habitat. We need research on the habitat requirements of each species and then we need a way to provide the necessary habitat in sufficiently large areas to support stable populations. Thus for the Florida mouse we need additional protection for interior sand dunes; for the Key Vaca raccoon (*Procyon lotor auspicatus*), red mangroves; for the Florida form of the mink (*Mustela vison lutensis*), salt marshes; for the beach populations of the oldfield mouse (*Peromyscus polionotus*), dunes.

Volume 2, edited by Herbert Kale, is a thorough treatment of 68 species of birds native to Florida, plus six additional races that have distinctive isolated populations. There is also an account for the Great White Heron, a special color phase of the Great Blue Heron (*Ardea herodias*) that nests in mangrove islands in the Florida Keys. This is an interesting example of a localized genetic variant that is apparently being maintained within a balanced polymorphic population. Of the eleven taxa of birds listed as endangered, eight are also on the U.S. Department of Interior list (Federal Register, Vol. 42, No. 135, July 1977). Two forms of the Seaside Sparrow (*Ammospiza maritima*) are on both lists. The Dusky Seaside Sparrow (*A. m. nigrescens*), common in Brevard County before mosquito control, has declined until by the summer of 1979 only 13 birds could be found (W. Post, pers. comm.). In spite of the protection offered by the Merritt Island and the St. Johns National Wildlife Refuges, and a major research effort on the biology of Seaside Sparrows by the FGFWFC, this population seems doomed. The South Florida form, the Cape Sable Sparrow (*A. m. mirabilis*), is now confined to a restricted area of the interior marshes of the Everglades National Park. It has been decimated by habitat alteration, but several thousand birds remain. When there were 1000 Dusky Seaside Sparrows 10 years ago, the population was judged to be secure. Four species on the endangered list that could certainly be helped by habitat protection are the Wood Stork (*Mycteria americana*) that breeds in south Florida swamps and mangroves, the Everglade Kite (*Rostrhamus sociabilis*) of open freshwater marshes, the Snowy Plover (*Charadrius alexandrinus*) that nests on isolated sandy beaches of the Gulf Coast, and the Red-cockaded Woodpecker of mature open southern pinelands. Recent Florida records of the Ivory-billed Woodpecker (*Campephilus principalis*) (Agey and Heinzmann 1971, Fla. Nat. 44: 46-47, 64), Bachman's Warbler (*Vermivora bachmanii*), Kirtland's Warbler (*Dendroica kirtlandii*) and the isolated Florida race of the Grasshopper Sparrow (*Ammodramus savannarum floridanus*) are so few that governmental protection is impractical.

The accounts of birds that are threatened, rare, of special concern, or of undetermined status include many specific recommendations that could be implemented rather easily. Protection for the unique set of species associated with the Florida Keys seems particularly urgent. The only Florida breeding colonies of Roseate Terns (*Sterna dougalii*) are in this area. Major breeding populations in Florida for the Reddish Egret (*Dichromanassa rufescens*) and Roseate Spoonbill (*Ajaia ajaja*), and in the United States for the Mangrove Cuckoo (*Coccyzus minor*), the Antillean form of the Common Nighthawk (*Chordeiles minor vicinus*), Black-whiskered Vireo (*Vireo altiloquus*) and the Cuban form of the Yellow Warbler (*Dendroica petechia gundlachi*) are all on the Keys.

The presently remaining interior prairies and scrublands of peninsular Florida are remnants of habitats that were once continuous across the continent to the Rocky Mountains. So our isolated populations of the Audubon's Caracara (*Caracara cheriway*), the Burrowing Owl (*Athene cunicularia*), and the Florida Scrub Jay (*Aphelocoma c. coerulescens*) are relics of great scientific interest. They are part of a former community of species adapted to open prairie and scrub habitats. To the birds should be added the Florida mouse, and the Florida scrub lizard (*Sceloperus woodi*), and other forms discussed below.

Some of Florida's waterbirds are of special concern. Species accounts for herons, egrets, ibises, the limpkin, rails, and marsh wrens, all call for increasing protection for marshes. Accounts for the terns and shorebirds document the need for additional protection for open beaches. The long-term benefits of preserving natural areas are very evident from the refuges and parks that have already been established. Such foresight is of much greater value to Florida's future than the short-term economic benefits of the development of these habitats for agriculture or real estate.

In the introduction to Volume 3, Roy McDiarmid gives an excellent summary of the broad distributional patterns of Florida's amphibians and reptiles by geographic provinces and by specific habitats. After I read these species accounts, in addition to those in the other volumes, I realized more than ever that the entire question of endangered biota hinges on understanding the relationship between the animal in question and the species-specific resources it requires. The destruction of habitats that characterized Florida's landscape in the past has reduced entire sets of species to the remnants of their former habitat that are now held in public ownership or have not been altered in critical ways. Thus the remaining sand pine (*Pinus clausa*) scrub association that once dominated the xeric central ridge of Florida is now a living museum of relic populations. Preservation of a substantial area of the remaining scrub association, say in Highlands County near Sebring, would protect the rare Florida scrub lizard, the endemic sand skink (*Neoseps reynoldsi*) and short-tailed snake (*Stilosoma extenuatum*), the threatened blue-tailed mole skink (*Eumeces egregius lividus*), plus the threatened gopher tortoise (*Gopherus polyphemus*) and the Florida gopher frog (*Rana areloata aesopus*). Protection for additional sites in the Lower Florida Keys is also urgent. The Keys' rare and endangered fauna include fewer than six threatened or rare snakes, turtles, and lizards, the Key deer, the unique avifauna of the Lower Keys, and two rare fish nearby, the Key silverside (*Menidia conchorum*) and the Key blenny (*Starksia starcki*). The tables in the first three volumes for the distribution of species by habitat are helpful, but a major effort to reorganize the species treated in all four volumes into one system of quantitative information on habitats would be very useful for setting priorities for the preservation of our endangered biota.

As the least mobile vertebrate class, the amphibians have a striking number of disjunct distributions and endemic forms. The endangered Pine Barrens tree frog (*Hyla andersoni*), that occurs in seepage bogs in the Panhandle, is a prime example. The threatened seal salamander (*Desmognathus monticola*) in Escambia County and the four-toed salamander (*Hemidactylum scutatum*) in Walton County are disjunct populations as well; the one-toed amphiuma (*Amphiuma pholeter*) and the Georgia blind salamander (*Haideotriton wallacei*) are endemic to northern Florida and a few localities in southern Georgia. Of the six endangered reptiles, three are sea turtles. Beaches where the green turtles (*Chelonia mydas*) and the threatened Atlantic loggerhead (*Caretta caretta*) nest, such as on Jupiter and Hutchinson islands on Florida's east coast, need protection from disturbance from May through August.

In volume 4, edited by Carter Gilbert, the terms "threatened" and "rare" are also used for forms that have stable populations outside Florida and the periphery of whose geographic ranges extend into Florida. The terminology for the Key silverside, proposed for the federal list, may need reconsideration after the completion of taxonomic studies by Charles Duggins, a graduate student at Florida State University. He has evidence that this form is a race or a distinctive population of a silverside widely distributed in the Atlantic and Gulf coasts. The endangered Okaloosa darter (*Etheostoma okaloosae*) needs particular attention in Okaloosa and Walton counties where intense competition with another darter occurs. A striking example of the insufficiency of our information is the blackmouth shiner (*Notropis* sp), which after its initial discovery in 1937 in Santa Rosa County was not relocated until 1976.

A particularly interesting feature of Florida's vertebrate fauna is the great extent of

geographic variation in the size, shape, and color within species. This is recognized in the official taxonomy by the designation of subspecific trinomial names. But in cases of continuous distributions, many subspecific categories are artificial and the geographic variation is actually clinal (Barlow 1961, Syst. Zool. 10: 105-118 for fishes; Christman 1975, Ph.D. Diss. Univ. Fla., Gainesville for snakes; James 1970, Ecology 51: 365-390, and Howe, Layborne and James 1977, Fla. Sci. 40: 273-280 for birds). The subspecific categories have more validity in cases of discontinuous distributions, but the designation of endangered forms in all federal and state publications relies too heavily on subspecies that were described many years ago and might not survive scrutiny with larger samples and statistical analysis. It is important to protect isolated populations, but it is also important to distinguish between isolated populations and endangered species.

I think lists of endangered species should be organized by species and should give the common name of the species as well as the subspecies. For instance, for the Key deer you would have: white-tailed deer, *Odocoileus virginianus,* in the Florida Keys (Key deer, *O. v. clavium*); for the blue-tailed mole skink: mole skink, *Eumeces egregius,* in Polk and Highlands counties (Blue-tailed mole skink, *E. e. lividus*) and for the gray bat: gray bat, *Myotis grisescens,* entire range including winter sites in Jackson County. This would distinguish between endangered species and endangered local populations, and would avoid problems with multiple common names and emphasis on subspecies that may turn out to be invalid.

Overall these four volumes form a marvelous summary of Florida's rare and endangered biota. They can be used as a stimulus for further investigation. When a revision is prepared there should be more synthesis among the volumes, with a unified system of habitat categories that apply to all groups. An index would have been useful, and there should have been more attention to the clarity and accuracy of the range maps.

The proposed final volume, after plants and invertebrates, is to be on recommendations. Some are already stated in the species accounts and by the editors. Clearly we need a vigorous state-supported program to: 1) increase public ownership of critical habitat; 2) initiate a state supported biological survey; 3) enforce regulations to prevent exploitation of the fauna; and 4) publicize information so that the citizens of Florida will appreciate their nongame wildlife. I am grateful to Ralph Yerger for comments on Volume 4, and to Noel O. Warner, William B. Robertson, Jr., Don Wood, and Henry M. Stevenson for comments on the manuscript.—FRANCES C. JAMES.

Also Received

Rare and Endangered Biota of Florida.—Peter C. H. Pritchard (Series Editor). **Volume 5. Plants.**—Daniel B. Ward (Ed.). Gainesville, University Presses of Florida. xxix + 175 pp., 90 figures, 170 maps. (1979). $10.50—Same format and style as Volumes 1-4 reviewed in this issue.