

BIRDS OF PUERTO RICO AND THE VIRGIN ISLANDS. Herbert A. Raffaele, Clive Petrovic, Sergio A. Colón López, Lisa Yntema, and José A. Salguero Faria. 2021. Princeton University Press, Princeton, New Jersey. 224 pp. ISBN: 9780691211671. \$24.95.

As the third edition of *A Guide to the Birds of Puerto Rico and the Virgin Islands* by Raffaele (1983, 1989), this book represents a major advancement by including a more user-friendly format with new and additional bird illustrations and by providing substantive updates on the status of the region's 347 bird species and their conservation, as well as key birding sites. In the more than 30 years since the publication of the earlier editions many changes have occurred that potentially affect the status and distribution of birds on these islands, including changes in habitat and climate, advances in molecular genetics clarifying avian relationships, and a marked increase in bird watching on these islands (see eBird activity). The inclusion of some of the most experienced local birders as co-authors has ensured an accurate update to our knowledge of the birdlife on these islands.

The aim of the book is to stimulate an appreciation for the birds of this region and thereby further bird conservation, especially by island residents. To accomplish this aim, the book was revised to simplify bird identification for novices. This redesigned edition has text and species illustrations on facing pages that facilitate quick identification; an improvement over the earlier editions' arrangement where all plates were grouped together at the front of the book, followed by text descriptions.

Species accounts and illustrations are now primarily arranged by the location where birds are most likely to be encountered and with other species in that location with which they might be confused. This arrangement is a departure from the phylogenetic sequence depicting evolutionary relationships, as used in most other field guides. The species accounts are arranged under categories of "Ocean Birds", "Coastal Seabirds", "Long-legged Wetland Birds (mostly waders)", "Medium-legged Wetland Birds (mostly waders)", "Other Wetland Birds", "Ducks and Duck-like Waterbirds", "Medium- and Long-legged Upland Birds", "Birds of Prey", "Land Birds", and "Vagrants". Within these groupings, species are generally placed in families and arranged by similar species. A few closely related species, however, are not shown with members of their family but are placed with the unrelated species with which they are most likely to be confused. For example, Smooth-billed Ani (*Crotophaga ani*) is not included with the cuckoos, with which they are unlikely to be confused, but are instead included with the "Heavy-billed Primarily Black Birds" with which they might be confused. Some duplications of illustrations are necessary when a species is found in more than one location. Vagrants (documented once every 10 years) are shown

separately so as not to add complexity to the identification of more common species. Vagrants with insufficient records (less than 1 record per 10 years) are not illustrated, but are instead listed at the back of the book, followed by a list of unestablished introduced nonnative species and a list of hypothetical species. Although the book's unorthodox species sequence will be quickly noted by experienced birders accustomed to the more traditional phylogenetic sequence of species, it is unlikely to hinder their use of the book for identification while facilitating a quick—and perhaps less frustrating—reference for novices seeking species identification.

The 87 plates produced by several illustrators are of sufficient quality to enable identification of most species by illustration alone, without reference to the text. Text descriptions of diagnostic physical characteristics and behavior, although necessarily concise, are adequate for identification. As with earlier editions, local names in Spanish and English are provided in the species accounts and index along with English common and scientific names. Each illustrated bird is accompanied by a few short lines highlighting traits that distinguish the species (as per R.T. Peterson field guides). Especially confusing groups, such as gulls, shorebirds, and warblers, are presented on multiple plates in breeding and non-breeding plumage to allow comparisons of similar species. Species commonly observed and identified in flight are shown both in flight and while standing, perched, or swimming (e.g., pelagic seabirds, shorebirds, gulls, terns, waterfowl, raptors). For quick reference, endemic species are highlighted with colored symbols next to their species accounts. I suspect that some users of the book will only refer to the illustrations for identifications, supplemented occasionally by the text, and will ignore the introductory chapters. Ignoring the introductory chapters, however, would be unfortunate, as they provide definitions with justifications for the status terms used in the species accounts and a summary of the region's birdlife, history, and conservation concerns.

The islands covered in the book represent a natural biogeographic group, most situated on the Puerto Rican bank, which, when exposed during the Pleistocene glacial maximum, consisted of a single large land mass connecting Puerto Rico and the Virgin Islands, except for small islets, St. Croix and Mona Island, which remained isolated. Within these islands, the authors recognize 19 endemic species (16 exclusive to Puerto Rico and its satellite islands and 3 species in Puerto Rico and the Virgin Islands). Newly recognized as endemic since Raffaele (1989) are the Puerto Rican Oriole (*Icterus portoricensis*), Puerto Rican Spindalis (*Spindalis portoricensis*), and Adelaide's Warbler (*Setophaga adelaidae*), as per the American Ornithologists' Union Checklist of North American Birds (1998) and supplements. The taxonomy of this checklist is generally followed, except for the elevation of two endemic subspecies to species status. Specifically, the authors recognize the Puerto Rican Kingbird (*Tyrannus taylori*) as

an endemic species based on Garrido *et al.* (2009), instead of a subspecies of the Loggerhead Kingbird (*T. caudifasciatus*) as still classified in the AOU checklist. Similarly, the authors recognize the Puerto Rican Pewee (*Contopus blancoi*) as distinct from the Lesser Antillean Pewee (*C. latirostris*) as per the current AOU checklist. The endemic status of these two taxa may be clarified by molecular genetic studies, which may prompt endemic species recognition by the checklist committee, as urged by the authors.

Contributing further to this avifauna's uniqueness is the newly recognized family Nesospingidae in Puerto Rico. Taxonomists now recognize that the endemic Puerto Rican Tanager (*Nesospingus speculariferus*) is sufficiently distinct from other tanagers to merit its own family (Nesospingidae) endemic to Puerto Rico. The restriction of an avian family to a single island is unusual, as emphasized by the authors who point out that few islands anywhere in the world share this distinction. The authors note, however, that Cuba and Hispaniola each have single island families as well.

In addition to endemic taxa, Puerto Rico and the Virgin Islands share 17 species restricted to the West Indies (i.e., West Indian endemics) and two West Indian endemic families: Todidae and Spindalidae. Todidae, or todies, are now restricted to the Greater Antilles (5 species with one each on Puerto Rico, Jamaica, and Cuba and two species on Hispaniola) and represent relics of a wider distribution, as supported by mid-Oligocene fossils in North America and Europe. The spindalis tanagers (formerly stripe-headed tanagers) have now been recognized by taxonomists as sufficiently distinct to warrant their own family, Spindalidae, including the endemic Puerto Rican Spindalis and three other *Spindalis* species found on islands elsewhere.

Puerto Rico is globally exceptional in terms of the number of naturalized exotic or nonnative species among its avifauna (32 naturalized species with possibly two more). As a result, Puerto Rico has the largest number of breeding land bird species of any West Indian island despite being the smallest of the Greater Antilles. Puerto Rico's diversity of nonnative species is partly attributable to the escape or release from a robust pet trade driven by the popularity of cage birds. Many of the nonnative species (mostly Psittacines and finches) have readily colonized human-disturbed habitats with nonnative plant species in urban and abandoned agricultural lands. Despite the abundance of nonnative bird species, none have colonized the montane forests and no detrimental effects have been attributed to their presence. The authors caution, however, that the potential problems arising from introduced species, including competition, disease transmission, and crop damage, should be of concern.

The list of extant species is missing notable extinctions or extirpations that occurred during the period of human occupation, reminding us that a species' tenure on these islands may be precarious. Three species that were lost from these islands during Amerindian and early European occupation are mentioned in the Introduction. One of the earliest species to disappear from Puerto Rico was the flightless, ground-dwelling DeBooy's Rail (*Nesotrochis debooyi*), which like many other flightless island bird species, succumbed to depredation by humans (e.g., bones found in Amerindian middens) or introduced animals (e.g., dogs, cats, rats, pigs, goats, etc.). The Puerto Rican Parakeets (*Psittacara maugeli*) endemic to Puerto Rico, Mona, and possibly

Vieques, were apparently almost fearless and hence vulnerable to the arrival of humans and other predators to which they had not evolved adequate escape responses. The parakeet was persecuted because of its crop depredation on Puerto Rico, where it disappeared in the 1700s and lingered on Mona until the late 1890s. A macaw species (*Ara autochthones*) known only from bones in Amerindian middens on St. Croix and Puerto Rico, disappeared before European arrival. Whether the macaw was endemic to these islands is unknown, but its loss along with the parakeet extinction contributed to the high Psittacine extinction rate in the West Indies.

More recent losses include a subspecies of the Puerto Rican Parrot (*Amazona vittata gracilipes*) common on Culebra in 1899 but absent by 1912. The authors suggest that shooting to control crop loss along with overhunting were likely endangerment factors on this small island (26 km²). The Puerto Rico Parrot on the main island undoubtedly would have been lost in the 1970s if not for a monumental, and so far successful recovery effort. Restricted to just 13 wild parrots in 1975—primarily in the Luquillo Mountains, the site of the largest remaining forest patch at the time, in eastern Puerto Rico—the once widespread parrot population declined due to deforestation, shooting to deter crop losses, harvesting for pets, and hurricanes. Similarly, the White-necked Crow (*Corvus leucognaphalus*) was widespread on Puerto Rico in the 1700s, but by the early 1900s the diminished population was confined to the Luquillo Mountains, where it was last seen in 1963. Habitat loss and shooting to control crop losses were likely factors contributing to the crow's extirpation from Puerto Rico; however, a small, threatened population still persists in the Dominican Republic. Once widespread breeding residents in Puerto Rico and the Virgin Islands, the American Flamingos (*Phoenicopterus ruber*) were extirpated by the late 1800s. Poaching of flamingo eggs and young as well as nest depredation by the introduced small Indian mongoose (*Herpestes auropunctatus*) are believed to have contributed to its loss. Mongoose depredation also likely contributed to the extirpation of the Black Rails (*Lateralus jamaicensis*) breeding on Puerto Rico, whereas overhunting is believed to have contributed to the loss of the breeding population of Black-bellied Whistling Ducks (*Dendrocygna autumnalis*).

The introduction includes an assessment of species the authors believe to be threatened with loss (extirpation or extinction) from Puerto Rico and the Virgin Islands. Their assessment, summarized in a table with ranked categories (critically endangered, endangered, or threatened), each with its endangerment cause, is customized to these islands and, as the authors emphasize, does not necessarily correspond with familiar global lists of endangerment. For example, a geographically widespread species with healthy populations elsewhere (e.g., the Brown Pelican) may be threatened by extirpation on these islands. The author's tally of endangerment causes for the 24 endangered species indicates that invasive pests (e.g., rats, mongoose, cats, goats, and pigs) are the most important threat for over half of the species (13 species) on the list. The next most important endangerment causes are loss of islets to human disturbance or development (8 species), forest loss (7 species), overhunting (7 species), loss of freshwater wetlands (5 species), loss of mangrove wetlands (5 species), and cowbird parasitism (2 species). This assessment of risk and underlying threats should be useful for prioritizing

conservation interventions by managers and for those advocating for conservation.

As tallied by the authors, the avifauna of Puerto Rico and the Virgin Islands has increased by 73 species in the more than 30 years since the publication of Raffaele (1989). However, ten species have been lost in this period (White-necked Crow and 9 introduced nonnative species), resulting in a net increase of 63 species. Many of the recently documented species added to the list are vagrants or rare migrants, some of which were likely overlooked by the few observers before the 1990s. Parsing out actual changes in species abundance and distribution from increased detections due to more birding activity is challenging, as the authors recognize. Nevertheless, changes in the status of some conspicuous bird species over the last 30 years correspond with changes in habitat availability. For instance, the authors have observed that freshwater and brackish wetlands on Puerto Rico have been better protected in the past 30 years. Increased wetland protection may have contributed to the recent re-appearance of the Limpkin (*Aramus guarauna*), a wetlands snail specialist. Although the Limpkin was considered by Raffaele (1989) to be rare and local on Puerto Rico and possibly extirpated, it is now breeding and widespread on the island. Increased wetland availability likely also contributed to the increase in West Indian Whistling Ducks (*Dendrocygna arborea*) and other breeding waterfowl as well as the recent colonization and breeding by White Ibis (*Eudocimus albus*) on Puerto Rico.

Increased habitat availability undoubtedly contributed to increases in forest and scrubland bird species as farmers abandoned agricultural lands for employment in urban industry, services, and tourism. Correspondingly, forest cover increased on Puerto Rico from a low of about 6% cover in the 1950s to 32–42% in 1990 and further to 57% cover in 2003 (Brandeis *et al.* 2007). The range expansion of the Puerto Rican Nightjar (*Antrostomus noctitherus*) corresponds with these forest cover increases, especially in the south coast dry forests of the island. Similarly, Adelaide's Warblers expanded their ranges on Vieques and in eastern Puerto Rico as agricultural lands reverted to second growth scrub and forest. More recently, the warbler has expanded its range to include the U.S. Virgin Islands, although the authors are uncertain as to the underlying cause.

Contributing further to increases in some species on these islands is the dramatic success of the reintroduction of flamingos, now numbering in the hundreds in the British Virgin Islands (BVI), where they were previously extirpated. Flamingos dispersing from these colonies may contribute to the increasing sightings and recent breeding in eastern Puerto Rico, though wandering individuals from elsewhere in the West Indies cannot be ruled out. The nonnative Scarlet Ibis (*Eudocimus ruber*) was also introduced and is now breeding on Necker Island, BVI—the likely

source of individuals now observed in Puerto Rico.

Over half of the regularly occurring native species on these islands are migrant and winter resident species (155 species, including many shorebirds and warblers). Most are Nearctic-Neotropical migrants: species that breed in North America and migrate south in winter. The authors note a curious pattern of some migrants, especially Scarlet Tanagers (*Piranga olivacea*), which are primarily recorded in Puerto Rico during southbound migration in the fall and are conversely recorded primarily in the Virgin Islands during northbound migration in the spring. The authors liken this pattern to a “migration shadow” in which the southbound birds are blocked by Puerto Rico, where they accumulate (“precipitate out”) in fall, only to move into the Virgin Islands when passing north in spring. Curious indeed, but as the authors recommend, this phenomenon deserves more study.

In summary, this revised edition provides a user-friendly guide for bird identification on these islands with an update on the status and distribution of birds, which advances our knowledge of the region's avifauna. The quality of the illustrations and their arrangement facilitates easy comparisons of potentially confusing species. This revised book makes a valuable contribution to ornithological knowledge, appreciation, and conservation of the birds of these islands. This edition should be distributed widely throughout these islands, is essential for anyone planning to visit this region, and belongs in the libraries of anyone interested in Caribbean birds.

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