

Chapter 1 Why Study Birds?

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Birds have a special place in human science and culture: they capture our hearts, arouse our curiosities, and inspire a sense of wonder. We may revel in the diversity and simple beauty of their forms, but birds also fuel fascinations that drive us towards deeper scientific inquiries into their varied ways of life. Every student of ornithology—from recreational birders to career scientists—will find much to learn and appreciate in the extraordinary physical and behavioral adaptations of birds, their rich evolutionary history, and their commanding global presence.

One of the wonderful aspects of enjoying birds is that they are found nearly everywhere. Given that these outwardly delicate creatures must maintain an internal body temperature even higher than our own, their capacity to live in almost every environment on earth is staggering. Birds occupy windswept arctic tundra and harsh antarctic ice, fog-shrouded mountaintops and tropical rainforest understories, the world's driest deserts, and storm-swept high seas. They live amongst us in the most urbanized cities, in suburban backyards, and in the most remote wildernesses. Wherever we travel, birds are our constant companions, and by discovering more about the birds we find around us, we can come to understand many other aspects of the natural world and our relationship to it.

Birds are endlessly fascinating partly because they are so diverse. Birds make use of their myriad habitats with an almost bewildering array of foraging strategies, performing important ecological functions in the process. Many birds capture and eat other animals, from tiny insects to large vertebrates, sometimes including other birds. Some birds hunt by night, and a few even navigate by echolocation. Others hunt high in the sky with eyes far keener than our own, diving down with incredible speed and agility at a moment's notice; many are equally skilled in detecting insects on leaves or worms under the ground. Still others specialize in scavenging, thus speeding up the process of decomposition. Many birds eat nectar, seeds, or fruits, sometimes aiding in plant reproduction by serving as pollinators and seed dispersers.

The breeding strategies of birds are just as varied as their ecological roles. Many engage in complex choreography as a precursor to mating, often presenting highly decorative displays and intricate vocal performances. Some birds pair together for many years or live in extended families, while others mate only for an instant, never to see one another again. Some bird chicks are raised by groups of relatives, some by both parents, others by only their father or their mother, and a few receive no parental care at all. Some birds attempt to raise just one offspring in every alternate year, while other species can raise large broods of chicks several times within a single season. Bird nests come in a dazzling variety of forms, from simple scrapes on the ground, to intricately woven baskets, to messy piles of sticks that may weigh several tons.

Birds flap, hover, soar, glide, stoop, swim, dive, burrow, walk, hop, and even sprint. To us, they often appear—and quickly vanish—as a burst of motion and color. Through their longer movements, birds create living links among the

Opposite: This flock of Greater Flamingos (*Phoenicopterus roseus*) includes both colorful adult birds and whiter juveniles.

(Photograph by Ian Davies.)

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Fig. 1.01 Conifer needles are the principal food of the Spruce Grouse (*Falcipennis canadensis*). (Photograph by Christopher Wood.)

earth's continents, oceans, and hemispheres. Migratory species know the planet as a north-south stage to be traversed twice each year, generating one of the most remarkable global migration spectacles on earth. The annual return of individual birds to their precise breeding or winter territory seems almost miraculous, and this homing ability is a testament to their underlying adaptations for orientation as birds move across vast distances. Other kinds of birds are nomadic, sometimes wandering in great flocks in search of super-abundant food or prime breeding sites; yet other birds are home-bodies, remaining very close to their hatching site throughout their entire adult lives.

The songs of some birds are among nature's most evocative sounds. Birds make sounds primarily to communicate



Fig. 1.02 Scimitar-billed Woodcreepers (*Drymornis bridgesii*) are among the many bird species in which male-female pairs coordinate their songs to produce a synchronized duet. (Photograph by Ian Davies.)

with other birds, but they do so in a great variety of ways and across a great range of auditory frequencies. For human birders and scientists, learning bird calls and songs is often the key to discovering what species are present in a habitat or location. Going further, we can eavesdrop on the more detailed lives of birds by learning how they use songs to defend territories, advertise to mates, warn of potential dangers, and communicate about their own status.

Beneath all this behavioral and ecological diversity of birds lies a remarkable vertebrate body structure and physiological potential. Birds have unique skeletons: every bird is equipped with specialized forelimbs and fused hand bones that together form a wing. Some birds' wings are proportionally too small for flight; others have wings that are modified into flippers for swimming. All birds have beaks, lay eggs, and breathe via a system of one-way air-flow, which permits more efficient capture of oxygen than the in-and-out breathing pattern of mammals. Yet despite these similarities, birds have a wondrous variety of physical forms—from the smallest of hummingbirds to the towering ostriches—that are adapted to different ways of life. Their internal body processes are similarly multifarious: some birds can dive deep into water and remain submerged for minutes, others can fly at great heights where the air is thin and oxygen correspondingly poor. Different birds can extract energy and nutrients by digesting a great range of foods, from tough leaves to fluid nectar, and from tiny invertebrates to rodents swallowed whole. Some birds time their breeding based on subtle shifts in day length that cause cascading effects on their hormones and reproductive systems. Others use specialized areas of their brains to remember the locations of thousands of seeds that they have hidden for later consumption.

The external beauty of birds is enriched by their variety of feathers, which are magnificent in function as well as form.



Fig. 1.03 The Rufous-tailed Jacamar (*Galbula ruficauda*) uses its long bill to capture butterflies and other agile flying insects. (Photograph by Benjamin G. Freeman.)



Fig. 1.04 Penguins, like this Gentoo Penguin (*Pygoscelis papua*), have many morphological and physiological adaptations for their aquatic lifestyle. (Photograph by Christopher Wood.)

Feathers are an adaptation found in no other animal group today, but we now know that birds are the living descendants of otherwise extinct dinosaurs that also sported a great variety of feathered plumage. Feathers provide birds with thermal insulation, waterproofing, and, in many cases, facilitate their flight. Feathers come in bold or cryptic patterns, ornamental shapes, incredible shades of color, pure tones, impressive lengths, or, in just the right light, brilliant iridescence. Many birds offer a combination of these features that play a large role in both mate choice and camouflage.

There are enough species of living birds—10,000 or so—to keep the most ardent birders questing after new sightings throughout their lives. This rich diversity has evolved over 150 million years, creating the panoply of avian orders and families that populates our field guides. Over the smaller timescales that can be addressed in field studies, birds have provided some of the best examples of how evolutionary forces play out in time. Scientists have carefully documented how natural selection can change bird populations in just a few generations, and how intense sexual selection can drive the evolution of gaudy plumage and elaborate displays. Birds have therefore played a central role in our general understanding of these most basic processes by which species arise and change through time.

Birds have a similarly influential standing in our efforts to conserve the natural world. Birds serve as flagships for imperiled habitats and ecosystems, and as early warning systems for environmental toxins or other destructive forces. Conservation efforts focused on birds often help preserve many other less conspicuous organisms. And owing to their charisma and popularity with humans, birds can help inspire all of us towards being better stewards of natural systems and biodiversity.

This book is about all of these aspects of avian biology, and more. Thanks to a fortuitous combination of diversity, accessibility, and charisma, birds through the ages have

taught humans an extraordinary amount about natural history. Nearly everyone on earth has seen and wondered about a bird, and this familiarity helps give birds their special inspirational power—birds capture our imagination and curiosity by simply being in our presence. Researchers over the years have harnessed this same accessibility of birds to answer questions in the laboratory and in the field with relative ease, especially compared with the challenges of studying most other animals. Dozens of principles in evolution, ecology, biogeography, behavior, neurobiology, life history theory, natural resource management, and conservation biology have been—and continue to be—discovered and refined through studies of birds. This book is intended as a tool to help all of its readers find further inspiration in the birds that form an important part of our lives.

1.1 Engaging with birds in the twenty-first century

Whether we study them as students, casual observers, lifelong learners, or professional scientists, birds can be mesmerizing any time we stop and simply watch them. At the bird feeder, at the city park, in a parking lot, at the beach, or in the woods, these creatures share the planet with us largely in disregard of our fascination with them. Pausing to observe birds employ their adaptations—those that allow them to fly, catch a fish in a flash, or show off gorgeous songs and plumage—is one of the most satisfying ways to connect personally with the details and the larger workings of the natural world. The more we watch them, the more we are likely to want to know about birds.

Today our intrinsic interest in birds can go further than ever before. We can learn, observe, and contribute to a

dynamic and unprecedented collection of knowledge about birds. Significant gaps still exist in our understanding, but by simply watching and recording birds—even the most common ones—individuals and communities can make a big difference. Birds are extremely sensitive indicators of ecosystem conditions and quality. As humans continue to alter the natural world, the status of bird populations can provide clues about the type and scale of our impacts. Which bird species are declining, and which are increasing? Which species are successfully adapting to human-modified habitats, and why? As the planet warms, are birds changing their migratory routes, or spending the winter in different places?

Among all of the ways that we can engage with birds, “citizen science” projects deserve special mention owing to the benefits they generate for both their human participants and the avian subjects of their observations. Many local and regional citizen science endeavors provide enjoyable ways to enhance your engagement with the birds in your area. On a global scale, eBird (ebird.org) is the most geographically widespread avian citizen science initiative of all; it is based at the Cornell Lab of Ornithology, the same organization that developed this book, with partnering organizations in many countries and resources available in most of the world’s major languages. The eBird project involves simple checklists of bird sightings submitted online by birders from every country in the world. The aggregation of this vast amount of information on bird distributions allows researchers to address questions that have, until now, been impossible to pursue. By sharing observations in the same database, people from all professions and walks of life directly increase global understanding of bird populations, movements, use of habitats, and relationships with humans.

Such studies are particularly crucial as we develop strategies to facilitate the coexistence of human cultures with stable and functioning natural systems. When we take the time to listen and understand them, birds become more than captivating creatures—they reveal themselves as indicators of environmental health. All over the world, humans are taking the pulse of the planet through their interactions with birds.

1.2 A short note on the names of birds

Depending on your place of origin, you may find that some familiar birds mentioned in this book have unfamiliar names, as there is some regional variation in the “official” English names of birds, and even greater variation in their colloquial names. Similarly, there are several authoritative lists of the world’s bird species that are generally in high agreement with one another, but that differ in the way they

“lump” or “split” a handful of species or higher taxonomic groups. All English and scientific names of birds used in this book follow the eBird/Clements Checklist version 6.9, which includes taxonomic updates through to August 2014. This Checklist and its more recent updates are freely accessible at birds.cornell.edu/clementschecklist/.

In this book, we treat the full English names of bird species as capitalized proper nouns. Group names and other variants are regular nouns and not capitalized. Thus you might read a sentence like: “Among all of the world’s species of chickadees and tits, the Great Tit (*Parus major*) is one of the most widely distributed and best studied.” The two-word Linnaean name (*Genus species*) is included every time a bird species is mentioned within the text in a new context or as a new example.

1.3 Birds and ornithology are both worldwide

This book is international in scope: birds are found worldwide, and ornithologists have conducted important studies of thousands of species in all of the major habitats and biomes of the earth. The discipline of ornithology is similarly global, as the scientific process of investigation is unconstrained by national boundaries and new discoveries about birds are constantly being published in scientific journals by researchers from all parts of the world.

In choosing examples to be included in this book, the authors and editors have purposefully selected species and studies that span this global breadth. If a particular example



Fig. 1.05 The Red-billed Leiothrix (*Leiothrix lutea*) is native to Asia, but its popularity as a cage-bird has led to introduced populations in other areas of the world. (Photograph by Ian Davies.)

treats a bird that is unfamiliar to you, consider whether any of the species that you know from your own region might exemplify a similar trait or phenomenon. More generally, we hope that this global breadth of examples helps inspire you to learn about the full range of avian diversity in all of its worldwide glory.

Although ornithological expertise is now truly global, in past times the scientific study of birds was centered largely in Europe and North America, and these regions still have more academic ornithologists than do some other areas of the world. The editors and authors of this book are primarily based in North America, with a few from Europe, although most of us have done field studies elsewhere. For these two reasons—ornithological history and our own familiarity—North American and European birds are somewhat overrepresented in this book in comparison to their total fraction of avian diversity. Nonetheless, readers from every other corner of the globe are sure to find examples in this book featuring birds found in their local area.

1.4 Web resources beyond this handbook

We hope that you feel excited and empowered with this book in your hands. We encourage you to treat it as an entry point into the lives of birds, for there is so much more to bird biology than we could squeeze into these chapters. This book is a product of the Cornell Lab of Ornithology, where our scientists and outreach experts have assembled a wealth of supplemental materials that accompany this book and which are free to access online. Using this book in combination with these web resources will enhance your learning about avian biology and simultaneously be a lot of fun. These online resources include video and audio files related to the material covered in each chapter; interactive, visually compelling modules that bring to life many of the principles outlined here; and much more.

Before reading further, be sure to access additional online content for this book at birdbiology.org.