

## SYMPOSIUM

## Geographical Variation in the Availability of Natural History Field Guides? Personal Reflections, Causes, and Consequences\*

Robert D. Holt<sup>†</sup>

Department of Biology, University of Florida, Gainesville, Florida 32605

According to the old, familiar story in Genesis, the very first thing Adam did in the Garden of Eden was to give “names to all cattle, and to the fowl of the air, and to every beast of the field” (Gen. 2:20, King James Version). In like manner, one of the first steps we all take toward understanding the natural world as an ecologist or evolutionary biologist is to make discriminations among different organisms and tag them with names. Each observation is a question—“That brownish active bird I glimpsed that just snatched an insect in my garden—is it an eastern phoebe, an eastern wood-pewee, or maybe even an exceedingly rare vagrant, the Asian brown flycatcher?” Unlike Adam, we rarely name organisms entirely by ourselves in answering such questions but instead rely on the accumulated wisdom and discernment of past generations of naturalists and biologists. A field guide is a distillation of that body of knowledge into a compact, easily carried book (which these days may be electronic) that aims to help readers, both professional and amateur, to identify organisms (e.g., birds, wildflowers, damselflies) or other natural objects (e.g., minerals), as it were, on the fly while the observer is out in nature; moreover, field guides often go beyond mere naming to sketch key natural history details of a species’ “story” (Holt 2009), delineating the environment in which it lives and where it fits in the history of life.

In this short essay I will suggest that there have been historically strong geographical differences in the availability of popular and affordable field guides, which may have had an influence on the level of ecological and evolutionary research in particular regions, including, in particular (I conjecture), comparisons between temperate and tropical biomes. I will make this suggestion based on some personal experiences in my own life. I recognize that this impressionistic approach to the issue of geographical variation in field

guides might be unsatisfactory to the skeptical historian or sociologist of science, but maybe my experience and thoughts will help others to frame sharper, testable hypotheses about this issue. I will also sketch some preliminary, tentative thoughts about the causes that might underlie this pattern of geographic variation in field guide availability (given the assumption that such variation exists) and some potential consequences of such variation.

The authors and artists who create field guides are, in my opinion, some of the unsung background heroes (and heroines) of ecology and evolutionary biology. Historians of science (Shapin 1989; B. Smocovitis, personal communication) have begun to pay attention to the role of technical assistants in sustaining the development of science. Broadly speaking, Shapin (1989) argues that behind any scientific publication there are many individuals—running labs, crafting equipment, taking data, and otherwise providing invaluable and indeed essential support to the scientific enterprise—who get left out of the official history of science, because they are not authors of papers or monographs. These “invisible technicians” are closely involved in the “craft and nature of scientific practice” (Shapin 1989) but are often passed over in the formal, public historical record of science. In like measure, I think the crafting of effective and economically accessible field guides has been essential to fostering the growth of ecology and evolutionary biology and diffusing scientific knowledge from these disciplines to a broader audience. Field studies of, say, diversity patterns require identification, yet many publications do not even list in their references the identification guides that were likely required in the reported work (though there has been an uptick in such references in recent years; Farnsworth et al. 2013). Moreover, field guides that are accessible and affordable can spark interest in the natural world, enriching the experience of young individuals who chose to pursue ecology or evolutionary biology as professions or to participate as amateur scientists later in their lives.

The best field guides do not simply allow one to pin a name on an organism from its observable traits but enrich the bare bones of that name with details of natural history (including geographical distributions). The traits of organ-

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<sup>†</sup> E-mail: rdholt@ufl.edu.

isms reflect their phylogenetic history, their adaptive fit by natural selection to the exigencies of their environments, and even plastic dependencies of traits developing within particular environments (Sultan 2015). Learning the habitats in which organisms are found and watching what they are doing are essential to a deep understanding of “the ecology of place” (Billick and Price 2010) that helps provide meaning (in a certain sense) to the traits organisms have, as well as helps to shore up species identification per se. A species that seems visually splashy in a museum tray may, for instance, actually be cryptic in the environment it inhabits. The need to understand organisms in their environmental circumstances (which requires field identification if feasible) has long been understood. Sumner (1922) presciently remarked, “There are times when we need to remind ourselves that the organism—the real organism, which lives and grows, and functions and acts, and in some cases thinks—is not an isolated phenomenon in nature, but is part of a complex system of interacting forces. It is utterly unintelligible . . . except in organic relation to the external world” (p. 223). And the first step toward intelligibility is to put a name on an organism, maybe just glanced fleetingly but at least in its natural setting.

The unsung heroes creating field guides, in turn, rest on the huge labors of taxonomists, who are the individuals who first notice and then describe new species and later accumulate distributional information (among other kinds of data), historically in museum collections and increasingly in online databases. Yet the crucial roles of taxonomists (including via field guides) in underpinning the enterprise of ecology and evolutionary biology go unnoticed, at least by the usual metrics of citations (a concern noted by many authors; Krell 2000; Agnarsson and Kuntner 2007; Benitez 2014; Pyke 2014; I thank Michael Patten for this thought).

A gargantuan effort is required to put together a field guide for any group of organisms, given that for each species one would ideally have paintings or photos along with range maps and species descriptions—all as accurate as possible, organized compactly into an attractive format. *The Sibley Guide to Birds* (Sibley 2000), for instance, according to its Amazon.com entry, required more than 10 years of effort—and this guide rests on the massive shoulders of prior field guides, such as the celebrated Peterson field guide (Peterson 1934), which appeared first in 1934 and has been in print ever since (now in its sixth edition). According to Dunlap (2009), the first bird-watching field guides appeared in the late 1800s. It would be an interesting exercise for a historian of science to disinter the role of field guides in enhancing the science of ecology, which started to emerge around that same time. Ehrlich et al. (1988), for instance, remark, “In this century, no one has done more to promote an interest in living creatures than Roger Tory Peterson, the inventor

of the modern field guide” (p. 563). At times, conflicts may occur between amateurs and professionals, exacerbated by the availability of popular field guides (Barrow 1998; Pearson and Shetterly 2006). But having accurate and accessible field guides to different taxa has been an enormous boon to the disciplines of ecology and evolutionary biology, not least because, for many people, access to such guides helps to crystallize an interest in natural history, which later evolves into an interest in deeper conceptual questions.

I grew up in and near Memphis, Tennessee, and early on developed a keen interest in natural history. My mother set up a bird feeder one unusually cold winter when there was an atypical lasting snowfall blanketing our yard, and I became intrigued by the diverse array of hungry birds showing up at the feeder. The local library had a copy of the Peterson bird guide, which I checked out, and eventually I was able to purchase my own copy from my paper-throwing wages. As I wandered through the rich, swampy bottomland forests and agricultural landscapes of western Tennessee and eastern Arkansas, in addition to ticking off birds (an incorrigible habit; I still do it), I was intrigued by the great diversity of plants and many other organisms I encountered. For trees, at least, I eventually scrounged up a used copy of Harrar and Harrar ([1946] 1962), which, though unsatisfactory in comparison to Peterson, was certainly vastly better than nothing at all. But there was, as best I could discern, no field guide at all to herbaceous wildflowers or shrubs for western Tennessee. This would not have been the case had I grown up in the northeastern United States, the United Kingdom, or Scandinavia. So, at least at that time, there was a conspicuous geographical disparity in the availability of field guides for major taxa, such as plants, even within the United States. This doubtless influenced my career trajectory (I didn’t become a straight-up plant ecologist, for instance). Fortunately, this situation has now changed, and several very fine guides for wildflowers exist for Tennessee (e.g., Horn and Cathcart 2005), and much more satisfactory tree guides exist as well. I would particularly like to commend the truly splendid book by Nelson et al. (2014), which, for the first time in field guide fashion, covers all the tree species in subtropical and tropical Florida, as well as the rest of eastern North America; woody shrubs are still somewhat neglected, alas. Also, there are now guides in North America not just to birds and plants but to tiger beetles, butterflies, dragonflies, and more. But the existence of such guides is still, I suspect, highly variable both geographically and by taxa, and the availability of field guides still has the potential to influence people’s interests.

At larger spatial scales, my impression when growing up was that there was also a noticeable latitudinal gradient in the availability of field guides, at least in the New World. My first foray outside the United States was a bus trip down the western coast of Mexico, ending in the rain forests and

mangrove swamps of San Blas, Nayarit, in the summer of 1970. The only field guide to Mexican birds at the time was Blake's *Birds of Mexico* (1953), which had descriptions of species but only one colored plate (of the collared aracari; Smithe's [1966] book on birds of Tikal was useful in southeastern Mexico). Fortunately for me, the world-class birder Peter Alden had just published a detailed guide for bird finding in western Mexico, with splendid plates by John O'Neill (Alden 1969). Peter kindly gave me over the phone and by mail detailed travel advice, well beyond what he said in his book, as to where to go on this risky solo venture into the tropical wilds of Mexico. Having O'Neill's beautiful depictions of the endemic birds of western Mexico at hand (along with Blake's book) was invaluable for figuring out what I was seeing, ranging from the military macaws, flammulated flycatchers, and boat-billed herons near San Blas to the tufted jays, white-naped swifts, and brush finches I found later in the western Sierra Madre. A few years later, English-language field guides covering all Mexican birds did start appearing (e.g., Edwards 1972; Peterson and Chalif 1973), but it was not until much later that such guides were translated into Spanish (1989 for Peterson and Chalif 1973; Peterson 1989).

But for South America—the “bird continent”—there were still huge gaps. I was fortunate enough to go on a Princeton University field trip to Venezuela in the winter of 1972, which was wonderful—except when I was on my own on the muddy trails, taunted (as it were) with maddeningly brief and inconclusive glimpses of species such as woodcreepers, flycatchers, and antbirds, which are challenging to identify even with an excellent field guide in hand! The only available book (de Schaunsee 1971) had scant plates, and its text descriptions were better at describing stuffed museum specimens than living, breathing birds. Thankfully, I was with seasoned field biologists who were netting birds, and so gradually I learned to pick up field marks from birds inspected in the hand and then released to perch briefly before flinging off into the obscurity of the forest. Later there began to appear fine guides for this region (e.g., for Venezuela, de Schaunsee and Phelps 1978, with wonderful plates by Guy Tudor and others, followed by Hilty [1978] 2002), which were later translated into Spanish. This sense of geographic variation in the availability of good field guides is impressionistic, as it is based on my own experience. A more scholarly parsing of the history of field guides might start with the University of Illinois Library, which maintains a bibliographic online resource (<http://www.library.illinois.edu/bix/fieldguides/index.html>) aiming to compile all field guides. The database, International Field Guides, set up by Diane Schmidt (now retired), is maintained by Kelli Trei, the current biosciences librarian. The database currently contains more than 6,000 books across all taxa and geographical regions. Scanning this database suggests that field guides were

indeed truly slower to materialize in Central and South America than in North America, so my sense of a (possibly transient) pattern of strong geographic variation in field guide availability in the Neotropics may not just be my personal, idiosyncratic experience.

Conservation ultimately rests on the committed engagement of local stakeholders, and having excellent field guides in the local language seems to me a necessary part of the ingredients required to spark the interest of young people who can become concerned citizens later in life—and maybe even professionals engaged in ecological research, conservation, and management. It is thus a welcome development that excellent field guides, at least for birds, now exist for many corners of the globe. Some regions (e.g., China), however, still have few high-quality field guides. My tentative hypothesis is that for a long time there was substantial geographical variability in the availability of field guides (with a rather strong hint of a latitudinal trend, at least in the New World) but that now this pattern is beginning to wane to some degree. This impression is based largely on bird books; different scenarios may be at play for, say, orchids or snakes. Another cautionary thought is that just because a field guide is available in English for, say, Kazakhstan, Sulawesi, or Madagascar does not mean that it is readily available there or that something comparable exists in local languages. As noted below, rapid technological developments promise to alleviate this issue.

Given the existence of this geographic variation in field guide availability, what might explain it? There may be economic and sociological constraints on the crafting of field guides. If a human population at a tropical locale is largely comprised of campesinos struggling to feed their families by hard work in fields and forests, there might be no market for books of any kind, much less field guides. Many field guides that have been crafted for tropical regions were indeed written by expats or visitors. For instance, consider the splendid field guide by Richard ffrench (1973) to the birds of Trinidad and Tobago (which replaced Herklots 1961). Mr. ffrench moved there to teach arts in a high school and pursued his passion for field ornithology on the side. He kindly let me stay with him on one visit to Ponte-à-Pierre in 1976 and took me into an excursion into fascinating low-diversity Mora forest, and he told me at the time that nearly all purchases of his book were coming from outside Trinidad (and indeed outside the tropical Americas), often involving birders from England or the United States planning to visit his adopted country. The development of ecotourism has surely helped spark much of the recent production of bird guides for far-flung corners of the globe. One might expect field guides to be created only where there is a market for them, which might be enhanced by having higher average annual incomes and leisure time (J. Bronstein, personal communication), and so a field guide for birds in

country X might exist largely because of tourists from countries Y, Z, and so on.

Moreover, one by-product of the latitudinal gradient in species diversity may be that it is simply much, much harder to produce a field guide for hyperdiverse tropical regions. A field guide for Brazilian birds has illustrations of over 1,800 species (van Perlo 2009), whereas in North America (north of Mexico), authors and illustrators have to contend with less than half this number, and a bird guide to Iceland needs to describe just 124 regular species (Hilmarsson 2000). The magnitude of the task required to create the guide might thus influence what field guides can be created in a reasonable amount of time, by country and taxon. It is notable that there is still no comprehensive wildflower guide to Florida—which of course would be most challenging to craft, given Florida’s great habitat and plant species diversity (I hasten to add that there are a number of excellent partial guides, such as Taylor’s [2013]; this book provides lovely photos and descriptions of over 750 species of wildflowers—out of the more than 3,800 native and naturalized plant species in the state).

Michael Patten, in his review of a previous version of this article, suggested another potential explanation for geographic variation in field guide creation. Namely, a certain amount of taxonomic spadework has to have taken place, along with an accumulation of knowledge about life histories and biogeographical distributions, to set the groundwork for a field guide for a given taxon, and this requires dedicated individuals who more or less devote their lives to the task. This leads to a kind of positive feedback, in that the existence of field guides fosters natural history studies, and such studies, in turn, can lead to the crafting and improvement of field guides (M. Patten, personal communication). So the distribution of field guide creation may be explained by the factors governing the distribution and activities of passionate field naturalists who are motivated to try to share their knowledge and expertise with a broader world in book form (in turn helping to spark the interest of others in that domain of natural history). The geographical locations of such individuals may be driven by many cultural and even geopolitical forces and show considerable stochasticity. Ernst Mayr wrote his guide to tropical Pacific birds (Mayr 1945), in effect, as part of the war effort (I talked about this with Professor Mayr when I was a graduate student at Harvard back in the 1970s). Robert Cushman Murphy’s preface to that volume states:

Until war focused the limelight on the Southwest Pacific, few parts of the world were less familiar to the average American . . . And if the islands themselves lay in an indistinct haze of memory, how much greater the blank concerning their native human inhabitants and their plant and animal life! Shortly after the first our sailors

and troops had reached [the South Pacific], the American Museum began to be flooded with letters asking information about the natural history of the islands and archipelagos. And high among these requests were calls for a popular book on the birdlife of the region. (Mayr 1945, p. ix)

Ernst Mayr (then at the American Museum) happened to be primed to produce just such a volume, so this early field guide depended on the idiosyncratic availability of a scientist at this museum who had amassed a great deal of knowledge about the avifauna of the Southeast Pacific and a supportive administrator. Many early bird field guides in tropical Africa were from South Africa and British East Africa; British naturalists had spent much time in corners of the British Empire, leading to books such as Williams’s field guide (1963). Interestingly, comparable volumes are not so evident from other parts of the African continent, such as the former Belgian Congo or former Portuguese or French colonies, so having colonial rulers alone did not suffice to foster field guide production in the tropics.

My own university at present has the good fortune to have many superb graduate students from tropical America, such as Colombia and Ecuador, and they tell me that the good field guides now available for birds and other taxa in their countries have helped stimulate their interest in natural history, leading to their becoming professional ecologists, systematists, and conservationists, in turn contributing to the growth of natural history knowledge in their countries, which will make future field guides even better.

This article has been a reflection more on the past of field guides than on their future. A number of authors (e.g., Farnsworth et al. 2013; Lunt 2014) have remarked on how rapidly evolving digital technology could be leading to entirely new classes of digital field guides. Lunt (2014) suggests that “the next generation of great field guides won’t be on paper, but on a device” and that “the great field guides of the future will identify species by algorithm not allusion” (he was specifically remarking on the challenge of describing bird-songs with text). With the ever growing electronic global databases of species descriptions, distributions, linked natural history information, and so on, it will be feasible from a smartphone (which knows where you are through GPS as well as the date and time) to craft a personalized electronic file of likely species and relevant information for the purposes of identification, in whatever language one likes (I thank Owen Petchey for nudging me to mention this). There are something over seven billion humans on Earth at present—and over four billion cell phone users (Statista 2014); in the not too distant future, almost everyone will be able to be connected to anyone else and to a vast sea of electronic databases. This technological revolution may rather quickly blur the geographical distinctions that have existed in the

past for the availability of field identification guides. These technological advances may be particularly important in grappling with the problem of species identification in hyperdiverse taxa and regions. Webb (2011) notes the difficulty of crafting a traditional field guide to the more than 5,000 tree species found in Borneo; with legible print and plates, such a guide as a traditional printed book would be a behemoth. Electronic tools, he suggests, could surmount challenges such as this, as well as those of translating guides into multiple languages.

Finally, I would like to give a special shout-out to university presses, such as those of Princeton, Cornell, Yale, California, Oxford, and Chicago, as well as to some commercial publishers, such as Houghton Mifflin, which for some years have been at the forefront of publishing a wide range of field guides, on all sorts of taxa, across the world. I think that even in this brave new world of ever-burgeoning electronic media, there will always be a need for attractive, well-crafted, and accurate folio field guides—physical books, which allow the user a kind of three-dimensional spatial memory that has, to date, been difficult to replicate electronically. We all owe the authors, artists, and editors of the splendid volumes rolling off these presses (and others) a real debt of gratitude—and also acknowledge the largely unsung toils of the taxonomists and field biologists who provided the very basic knowledge that is required for these field guides to exist in the first place.

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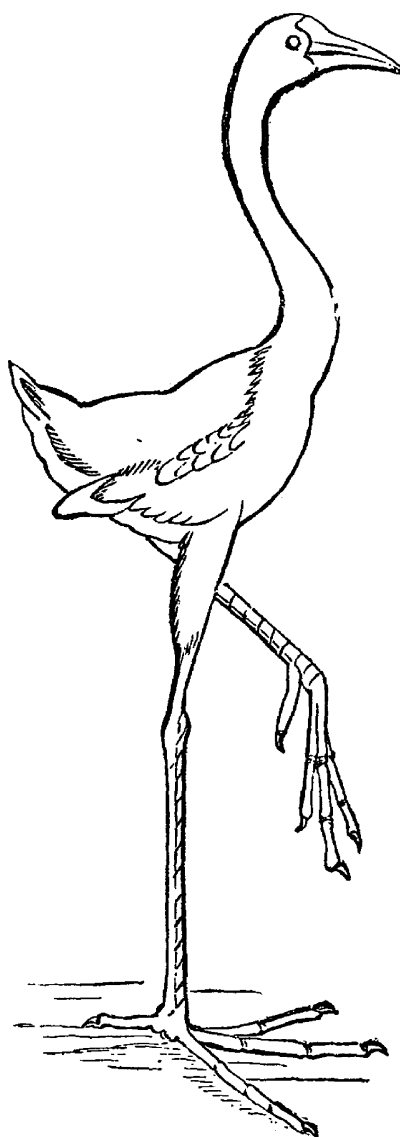
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“With the Dodo were associated a large Parroquet, the Solitaire, the Géant (*Gallinula gigantea* Schlegel), and the *Porphyrio* (Notornis?) *cærulescens* Schl. . . . We figure from Schlegel’s account in the French Annals of Natural Science, 1866, the ‘Géant,’ so called by its discoverer, Leguat, who saw this bird in 1694, since which time it has disappeared. It is allied to the Water Hens, and was six feet high; its body was as large as that of a Goose, white, with a reddish spot under the very small wings.” From the “Zoölogy” section of the Natural History Miscellany (*The American Naturalist* 1868, 1:614–616).