

WINGED SENTINELS — BIRDS AND CLIMATE CHANGE

Wormworth, J. & Şekercioğlu, Ç. 2011. New York: Cambridge University Press. 262 pp. 41 colour photographs, 3 figures. Paperback: ISBN 978-0-521-12682-3, US\$42.

The phrase “canary in a coal mine” may have become trite through overuse, but in this book Wormworth and Şekercioğlu make a persuasive case that by more closely monitoring the dynamics of bird populations, we can better identify the impacts of climate change. They give a quick summary with many references. The book can be used by seabird biologists, ecologists and the ornithological community. Although it has an extensive bibliography, it is written in a style more for the layperson than for someone involved in research on climate change.

The subtext of this book, “the free advice of birds,” repeats throughout, using a myriad of examples of historical and current information to make a complete story. The authors begin with a broad introduction to the many effects that come with climate change using both marine and land birds, since all ecosystems are affected. The introduction jumps right in with a detailed description of Rockhopper Penguins *Eudyptes chrysocome* on Campbell Island in the Antarctic, summarizing research on how one particular colony has been adversely affected by changes in population numbers and in the prey base. They bring in examples from other colonies like the Falklands, the numbers of which have declined 86% since the 1930s. But then they show that neither the rockhoppers nor seabirds in the Antarctic are unique in the adverse effects on birds that have come with climate change. The book, however, has many caveats throughout it, as it should. It states that many of the links between population numbers and climate have not been proven to be causal, and that, often, the process by which bird populations have decreased is unknown. They do drop frightening statistics, backed by a long citation list, such as “roughly one in eight of the 1244 bird species face the threat of global extinction by wide-ranging impacts.” They underscore not only global warming, but also habitat change, or use by humans (pets, food, sport) as components of the problem. They throw out figures that are sobering, such as the fact that 46% of the world’s bird species are directly used by people, or that more than half of Costa Rica’s tree and shrub species are dispersed by birds. They highlight the impacts on birds from anthropogenic changes, as well as the effect that a decrease in population numbers of birds may have on the rest of the ecosystem. Many of the figures refer to land birds, but it is important for seabird biologists to take a more global perspective and acknowledge the land counterparts that are as equally and as adversely affected by what the authors call the “Anthropocene” epoch.

The authors tackle deforestation, increases in CO₂, increases in temperature, ocean acidification and other manifestations of climate change. They emphasize in every chapter the problem of uncertainty in weather, and the change to more frequent and severe “episodes of extreme weather.” Wild swings in temperature, rainfall, etc. will become the new norm. They show how all of these changes in abiotic factors impact a variety of parameters for birds, from timing of breeding or migration, to the co-evolution of shifting distributions of other birds, animals and plants. One entire chapter is devoted to breeding seabirds and how they are “iconic examples” of the problem, while another is devoted to “fingerprints of climate change.”

Chapter One summarizes many studies of phenology that show an increasing seasonal mismatch in timing. The authors have a nice habit of inserting quotes from authors such as Henry David Thoreau, Marjory Stoneman Douglas and David Ainley. In this chapter they emphasize the lack of long-term records on phenology, but do not point out, as they should, that much of this lack of results stems from lack of research funding from state and federal governments for studies of more than one or two years’ duration. Timing, rhythm and cues for birds, plant and insect phenology, and the ultimate constraints on breeding, all make up this chapter. There are a myriad of examples of mismatches, and the authors speculate on various outcomes, asking why climate-change shifts in timing differ among species. They realize that there are some variables that have yet to be uncovered that drive the system, and they freely speculate, but are noncommittal, simply because there is a dearth of long-term research on this.

The second chapter deals with migration, commencing with an example of a single species, the Marbled Godwit, and then quickly expanding to a generalized summary of the more than one-fifth of bird species that make regular long-distance migrations. They highlight migrants as the “sentinels” for climate effects because of their sensitivity to change across ecosystems, noting that migration schedules can easily “fall out of step with en-route fuelling resources or favourable weather for travel.” The authors remind the reader of the perks and pitfalls of migration, showing that migrants not only are mobile and able to change their habitat at will, but are also vulnerable, because climate change could adversely affect both their winter and their summer habitats. The authors’ overall thoughts are that, since the routes of so many migrants are unknown, speculation on possible effects of any kind of climate change is just that — speculation. Outcomes are unpredictable because much of global warming is uneven in time and in space. For example, in places like Europe, there is asymmetric climate change, in which spring has become earlier at intermediate latitudes but not at the northern latitudes where birds breed. In an apparent contradiction, however, they state that the “strongest average temperature increases are taking place in northern latitudes.” Thus, it is sometimes difficult to get a clear take-home message from the many examples they give throughout the book.

Chapter Three looks at bird communities, addressing ranges of species, thermal environments, food webs, disease, competition and predators. The authors reiterate that, in spite of the complex interactions of all of these factors, climate is still the ultimate yet indirect determiner of bird distributions. Having said that, again they generalize and state that, for 98% of bird species, “precise distributions are still unknown,” and that data are difficult to collect for many species that may be distributed across entire continents or among a few continents. They warn that many threatened species with narrow ranges may be rarer than their assumed ranges show, and, if birds do not adapt, and if the climate change is great, their niche could just disappear. Some examples they give are the cold-adapted Arctic seabirds. For example, mosquitoes at colonies of Brünich’s Guillemots used to peak in late July, but now peak during incubation, in late June to early July, and are responsible for an

increased number of adult deaths. Because having mosquitoes during incubation was not part of their evolutionary history, they seem unable to respond to this parasite, and cannot move or switch their dates of incubation.

The mismatch of seabird prey and of seabird distribution is addressed thoroughly in this chapter, with examples of how prey shift their range according to ocean temperatures, yet noting how seabirds are tied to their breeding colonies and cannot follow their preferred prey. Once again, the authors end the chapter stating the obvious: the need to improve estimates of ranges and range shifts, to understand the interactions of all of the species in a community and to learn how susceptibility to climate change might change with geography. There is a good pictograph figure of match versus mismatch in this chapter.

Chapter Four is entirely dedicated to seabirds, from penguins in the Galapagos and South America, to Arctic and Antarctic seabirds, seabirds at the Great Barrier Reef, and in other major seabird areas. The authors give a good description of the limiting factors of seabirds' population ecology: a long pre-breeding period, the need for quality nest-sites, the limits to foraging ranges and the effect of these factors on breeding success. The authors include again the other anthropogenic threats such as gill-net fisheries, oil spills, invasive species and introduced predators. They breeze through the temperature rise in the global heat sink, ocean acidification, bottom-up control, declining productivity, regime shifts, ENSO and shifts in sea levels. They throw out many facts: e.g., the International Union of the Conservation of Nature's (IUCN) statement that human-induced changes threaten or "nearly threaten" with extinction half of all seabird species (twice the proportion of all threatened bird species), and the US Department of the Interior's listing all 67 of the marine bird species assessed in the USA as having "medium to high vulnerability to climate change."

Chapter Five summarizes abundance and extinction, and seems to be a repeat of the preceding chapters. I found myself looking for a clearer storyline, one that went from one point to the next. For those needing a visual explanation of the El Niño process, Figure 2 in this chapter depicts a very clear comparison between El Niño–Southern Oscillation (ENSO) versus non-ENSO oceans and the ultimate effect of these abiotic factors on seabirds. However, I found myself asking "didn't I just read something similar to this two chapters ago?" Repetition can hammer in the message, but too much of it puts the reader off. Chapter Six deals mainly with land birds and the tropics, which I will not discuss in this review. The seventh chapter, the conclusion, summarizes how to monitor climate change and how to assess birds' capacity to adapt. Wormworth and Şekercioğlu showcase the latter's work assessing climate change and other "conservation challenges" on Turkey's only Ramsar wetland, Lake Kuyucuk. The third and final figure of the book in Chapter Seven compares estimated landbird extinctions by 2100, given different projected amounts of global warming.

Unpredictability and uncertainty are the repeated themes throughout the book, as is a call for the need for more long-term research, and better protection of habitats. Much of what the authors state are given, with somewhat rambling and repetitive examples. Most of the facts and statements in this book have no reference. Wormworth and Şekercioğlu may have written the book this way as to be more appealing to a lay audience, but I found it frustrating. I wanted to check the original research to verify or, more often, to find out more in detail. Despite the lack of references, there is an extensive bibliography by chapter, and the 41 colour plates are stunning and worth the price of the book.

Pat Baird, Department of Biological Sciences, Simon Fraser University, Burnaby, BC V5A 1S6, Canada (pab7@sfu.ca)