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Ecology of climate change: the importance of biotic interactions by Eric Post

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larity of insects in cuisine, or entomophagy, is discussed as many cultures in Asia, Africa, and Central and South America regularly incorporate insects as part of their diets. Interest has only emerged in Western cultures, despite cultural biases, as described in this chapter.

Several individual chapters highlight the barrier that invertebrates face as subjects of interest for people and various cultures that may find insects and their relatives abhorrent. Although charismatic animals, such as large mammals, may attract reliable numbers of tourists, insects may be seen as less observable, less important, or even unappealing. However, as highlighted in Part III, the rise in the number of butterfly conservatories and insect festivals around the world may indicate that our perceptions are changing. Insects provide opportunities for outdoor education of children and adults, and many serve as mascots for conservation efforts as discussed throughout this book.

Part IV is comprised of chapters that explain the importance of citizen science and technology to entomological science, and promote the use of insects as educational tools as well as a very important but overlooked area: invertebrate conservation. For example, in the U.K., very sensitive criteria are used in designation of breeding bird conservation areas. The same consideration is rarely made for insects even when the total population of a rare species can be found in a single location.

Knowledge gained through experience with insects can lead to stronger advocacy of their importance to human life. Invertebrate conservation is an emerging field that still necessitates outreach to increase public value. As described through personal experiences, scientific research, and the description of many pleasant activities based around insects, this book makes a significant case for their conservation. This is a must-read for scientific writers, extension and outreach scientists, and all who seek to spend more time among insects, whether in a butterfly house, festival, national park, or in their backyard.

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ECOLOGY OF CLIMATE CHANGE: THE IMPORTANCE OF BIOTIC INTERACTIONS. *Monographs in Population Biology, Volume 52.*

By Eric Post. Princeton (New Jersey): Princeton University Press. \$59.50. xxv + 373 p.; ill.; index. ISBN: 978-0-691-14847-2. 2013.

The influences of abiotic factors on ecological dynamics are widely studied, but the role of biotic interactions in shaping responses to climate change is

much less evaluated. *Ecology of Climate Change: The Importance of Biotic Interactions* is an ambitious attempt to summarize our current understanding of how biotic interactions such as competition, herbivory, and predator-prey dynamics affect the responses of ecosystems to climate change. The book contains nine chapters. They provide an introduction into recent and Pleistocene climate change (Chapters 1 and 2), general responses of phenology and population dynamics to climate change (Chapters 3 and 4), and the concept of the ecological niche (Chapter 5). Furthermore, insights into the effects of climate change on community dynamics and stability, biodiversity, and ecosystem functioning (Chapters 6–8) are summarized. A short overview of key considerations is given at the end (Chapter 9). Slightly disconnected, the preface at the beginning of the volume outlines two new hypotheses about the relative strength of biotic responses to climate change.

The book benefits from the extensive knowledge of the author in Arctic ecosystems, where the effect of climate change on ecological dynamics is particularly evident. Many examples from observational fieldwork, field experiments, and quantitative analytical models are provided and allow interesting insights into the interplay between climate and biotic interactions in species-poor systems. The conceptual differentiation between biotic and climatic influences that might enhance each other (“facilitation”) versus those that oppose each other (“tension”) is interesting, but a deeper integration of this concept into the other chapters is missing. Throughout the volume, a useful distinction is made between laterally and vertically structured communities, i.e., those dominated by interference interactions (e.g., competition) versus those that are characterized by exploitative interactions across trophic levels (e.g., food webs). Most exciting is the part of the book that describes the incorporation of direct and indirect effects of climate into time series models of population dynamics and their possible extensions with interaction matrices for vertically structured communities that consist of vegetation, large herbivores, and predators.

The book provides a good entry for anyone interested in biotic interactions and climate change. Nevertheless, several topics have received little attention. The historical overview of the role of biotic interactions for ecosystem structure and functioning is limited and a broader perspective beyond Pleistocene megafaunal extinctions is missing. There is also comparably little information about how biotic interactions influence macroecological patterns of species distributions and biodiversity, and how this can be incorporated into

models that aim to predict potential range shifts and broad-scale community reshuffling. Finally, there is a clear taxonomic, geographic, and disciplinary bias. Most examples come from plants or large vertebrates in Arctic ecosystems, with a strong focus at the population level. This shortage, however, provides ample opportunities for exploring more thoroughly and widely the ecological patterns and processes reported in this volume. Overall, the book is clearly recommendable, especially for anyone interested in how ongoing and future climate change will affect high-latitude ecosystems.

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THE SIXTH EXTINCTION: AN UNNATURAL HISTORY.

By Elizabeth Kolbert. New York: Henry Holt and Company. \$28.00. xiii + 319 p.; ill.; index. ISBN: 978-0-8050-9299-8 (hc); 978-0-8050-9311-7 (eb). 2014.

This volume traces an ongoing mass extinction event in the current geological epoch. The Anthropocene or Holocene extinction appears to journalist Elizabeth Kolbert—author of *Field Notes from a Catastrophe: Man, Nature, and Climate Change* (2006. New York: Bloomsbury Publishing)—as an inevitable outcome of human expansion. She uses examples from the geological and historical past to place the resulting loss of fauna and flora in a broader context of the history of life on Earth. The book traces historical conception of mass extinction to revolutionary France and the work of French naturalist Georges Cuvier, who theorized that life on Earth had been disturbed by multiple cataclysms. Earth has suffered five such catastrophic episodes, from the Ordovician to the Cretaceous. Kolbert portrays humankind as the driving force behind the sixth extinction in the Anthropocene.

Past mass extinctions are more than points of historical or scientific interest to the author. These ancient cataclysms warn of the future consequences of human actions. So the sudden annihilation of the hugely successful ammonites following the K-T asteroid impact at the end of the Cretaceous period demonstrates the fragility of seemingly ubiquitous species, including our own to catastrophic environmental change. Kolbert's book is also an environmentalist tract in this sense, covering ongoing work to preserve global biodiversity and citing studies of ocean acidification alongside accounts of cryogenic cell banks and the ultrasound scanning of pregnant rhinos.

Chapters of the book are organized around an extinct or endangered species, each indicative of the

damage inflicted by sudden cataclysms, which all too often involve humans. The great auk is an early entry, the flightless seabird suffering centuries of exploitation through egg collecting and overhunting, culminating in its extinction in 1844. Contemporary environmental damage and erosion of biodiversity take greater prominence as the volume progresses. A visceral account of white-nose syndrome, a fungal disease that threatens North American bat populations, is presented as an ongoing legacy of the transatlantic Columbian exchange. The disease exists in a benign form in Europe, but may have first emerged in North American bats via Howe Caverns, a popular New York State tourist attraction. Modern transportation has led to a reworking of the biosphere through the often inadvertent transfer of species, including the lethal genus of chytrid fungi currently wiping out amphibians on a global scale.

The Sixth Extinction places our understanding of mass extinction in a historic and prehistoric context, through an engaging and accessible manner, the author regularly drawing upon her own global travels. Kolbert offers an extensive introduction to the history of life and death on Earth, with a take-home message on the erosion of biodiversity in the Anthropocene. In the book's closing paragraphs, the author muses that human deprecation of the natural world may stem from our biological makeup, due to a driving passion for expansion and exploration, or "madness gene." If humankind is itself a virulent and invasive species, the Anthropocene extinction cannot truly be considered an "unnatural history." Instead, the sixth extinction appears to be another Cuvierian catastrophe, bearing all the hallmarks of its five precursors.

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EVOLUTION

THE PRINCETON GUIDE TO EVOLUTION.

Editor-in-Chief: Jonathan B. Losos; edited by David A. Baum, Douglas J. Futuyma, Hopi E. Hoekstra, Richard E. Lenski, Allen J. Moore, Catherine L. Peichel, Dolph Schluter, and Michael C. Whitlock; Advisors: Michael J. Donoghue et al. Princeton (New Jersey): Princeton University Press. \$99.00. xiii + 853 p. + 7 pl.; ill.; index. ISBN: 978-0-691-14977-6. 2014. This is an excellent guide to evolution; such a volume is long overdue. It is comprehensive, the entries are clearly written, and the array of contributors is drawn from among the very top re-