



Review: Saving Insects: A Crisis Science

Reviewed Work(s):

Insect Conservation Biology by Michael J. Samways
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information managers.

The challenge of transition from smaller to larger scale information management has already been faced in many other disciplines. Approaches and techniques associated with computer system development methodologies such as enterprise modeling have been used successfully by many geographically distributed organizations to improve their ability to manage, integrate, analyze, and use data effectively. Many of these approaches could be adapted by the environmental community to facilitate the transition to larger scale activities. This area receives minimal treatment, slightly limiting the book's utility for the reader actually facing the challenge of developing an information management program robust enough to deal with scales ranging from ecosystem to the entire globe.

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SAVING INSECTS: A CRISIS SCIENCE

Insect Conservation Biology. Michael J. Samways. Chapman and Hall, London, UK, 1994. 358 pp., illus. \$81.95 (ISBN 0412-454-408 cloth), \$29.95 ([1995] ISBN 012-634-503 paper).

Many people regard insects as nuisances or potential pests, even though, out of the millions of known species, only a few are pests. That we might seriously attempt to conserve insects may seem strange, and to consider insect conservation a crisis science may seem even stranger. Although the conservation movement is well established for plants and many animals, the most species-rich group of all—the insects—receives little attention except for a modest few, chiefly butterfly species. Estimates of the actual number of insect species vary from 1 million to 30 million; only a few

would dispute that there are more insect species than all other species combined. This fact emphasizes one of the problems of insect conservation—the question of numbers. How could any group that is so abundant be threatened in any way? *Insect Conservation Biology*, by Michael J. Samways, carefully and thoroughly explains this situation. He considers the need for insect conservation to be so urgent that he regards it as “a crisis science.”

The literature on insect conservation is found in many journals, symposia, and reports. But only recently have several general books appeared (e.g., Collins and Thomas 1991, New 1984). The present book is a welcome addition to contemporary literature. Samways, a professor of entomology at the University of Natal in Pietermaritzburg, South Africa, where he is associated with the Invertebrate Conservation Research Centre, has conducted personal research on grasshoppers and crickets, ants, scale insects and their predators, dragonflies, and butterflies in both the Southern Hemisphere and Northern Hemisphere. This backdrop of field experience shows throughout the book. One interesting section compares the insect faunas of the two hemispheres.

The comprehensive 35-page reference section is a treasure trove of articles that could easily provide background for a book on insect ecology as well. The author's broad coverage of topics on insect systematics, biology, and ecology sets the stage for more focused discussions on insect conservation per se (that topic taking up the latter part of the book). But the central theme of conservation is never ignored during earlier portions of the book as the author discusses the factors that impact insects' lives. Starting with discussions of reasons for the general success of insects, the reader is introduced to the roles insects play in virtually every ecosystem examined by any scientist—not just their roles as pests or as conspicuously beneficial pollinators or biological control agents.

Samways shows that the new concern for insect conservation grows out of the drastic changes that have occurred across the face of the earth.

The records of these changes are written on the earth's landscape. Some alterations occurred so long ago as to produce naturalized landscapes that resemble undisturbed landscapes. Throughout the book, Samways gives examples of the diversity and roles of insects in every possible habitat. Gradually, he leads the reader to understand why there are so many different species in so many different places.

The book moves on to a detailed discussion of scaling and the impact of landscape fragmentation and disturbance on insects. Here Samways draws heavily on his knowledge and experience in applied entomology. Examples chosen from the literature document the direct and indirect consequences of habitat modification that accompanies gradual development of cropping systems. In general, ecologists have tended to pay little attention to information available on insects of economic importance, so it is refreshing to find use of this rich source.

The latter part of the book focuses on insect conservation. It starts with a discussion of rarity of species—a topic more often discussed when dealing with the more modest numbers of vertebrates or plants. Samways discusses rarity in the context of a group that contains millions of species. The impact of pest control receives special attention, as indeed it should, because much of the world's attention to insects focuses on the reduction or elimination of a few unwanted species. The section is appropriately titled “Entomological Dilemmas”—controlling offending species while conserving others is not easy, and one wonders just what ethical questions are to arise here. Just how valuable is a landscape complete with all of its inhabitants?

As a taxonomist also interested in conservation, I appreciate the repeated references to the usefulness of systematics in insect conservation biology. The current pool of expertise is being depleted as we see the gradual decline in numbers of specialists in systematics at a time when the need has never been greater. Samways expresses concern about the inadequacy of the systematics work force to provide the taxo-

nomic and evolutionary knowledge required for intelligent decisions.

The final section outlines actions that should be taken to cope with the enormous numbers of unknown species and to slow the rapid destruction of habitats, especially but not exclusively in the tropics. Habitat preservation is recommended as the best path even though detailed knowledge may be minimal. Time is of the essence. Although restoration and breeding programs are discussed, and their value acknowledged, Samways believes the massive losses due to habitat destruction everywhere require immediate action.

In spite of recognition of dire need, this book is not a pessimistic one. On the contrary, Samways has a positive outlook—he favors action to inaction and the use of available information for problems that can be solved. In short, one should forge ahead despite the odds. There have been successes, such as the apparent success in restoring a threatened tiger beetle species on the east coast of the United States (Lane 1995).

Samways took on a seemingly impossible task. How can any author deal with the vast numbers of species of insects? How can a balanced account be given of the diversity and complexity of the largest group of organisms on Earth? The author must acquire first-hand experience in many areas of entomology, select appropriate sources, examine vast amounts of literature, sift out basic concepts and ideas, and provide evenhanded coverage of taxa and geographical locales.

This fine book is filled with diverse but focused information on the most speciose group in the world. After reading it, one cannot fail to appreciate the diversity of form, habit, and function of the insects. A conservationist is likely to find much of value. An entomologist is likely to find a marvelous source of ideas that have immediate application.

Although bugs have lately been badly maligned as being of no value to people, failure to recognize and use the vast storehouse of information represented by this diverse and abundant group of organisms would be a mistake. Insects are fine-scale

reflectors of ecosystem function and health. Right now we need all the help we can get for intelligent resource management. Our lives quite literally depend on it.

Insect conservation biology is indeed a crisis science, as Samways suggests. We should heed his advice.

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THE BIOLOGY OF AGING

Genes and Aging. M. S. Kanungo. Cambridge University Press, New York, 1994. 322 pp, illus. \$69.95 (ISBN 0-521-38299-8 cloth).

In this book, which is intended for “all students and researchers interested in the molecular biology of aging,” M. S. Kanungo, a well-known biochemist and theoretician of aging, attempts to bring together the major themes of molecular biology in aging research. A scholarly man, he draws upon a lifetime of voracious reading to present his interpretations and suggestions for future research.

The book begins with a general introduction in which Kanungo briefly reviews general concepts of aging, including phases in life spans, longevity, evolution of aging, and cell death. It continues with a review of phenotypic changes during aging, by which the author refers primarily to enzymatic changes in level, form, and kinetics of proteins and enzymes and in RNAs.

Chapters on chromatin and eukaryotic genes summarize the physical and biochemical structures and

properties of genetic material. They describe structures and modifications of chromatin and DNA including acetylation, phosphorylation, ribosylation, methylation, and ubiquitination of proteins as well as higher-order structures of chromatin and processing and modification of RNA and DNA. The chapters briefly cover DNA binding proteins and assess their role in regulating accessibility to transcription. These subjects are illustrated by line drawings and photographs of gels displaying behaviors such as retardation of migration. These reproductions are not always of the highest quality, but they illustrate the point being made.

The chapter entitled “Changes in Gene Expression During Aging” tackles the meat of this issue, including the varied and not necessarily connected topics of changes in gene expression in organs, in vitro cell senescence, amyloid precursor protein, telomerase, and deletions in mitochondrial DNA. Kanungo readily admits that frequently conclusions or causal interpretations cannot be drawn from the results but explains that he is trying to whet the appetite of the reader.

Finally, in chapters on theories of aging and future prospects, he attempts to generate an overall concept, reviewing the relevance of somatic mutation, error, disposable soma, imbalances in steady-state levels of various products of differentiated tissues, such as hormones, and gene regulation hypotheses. One can question the relevance, except on a historical basis, of continuing the discussion of some of these points. Kanungo concludes that “basically it is the breakdown of the regulation of gene expression that causes aging” (p. 286), and he urges that modern tools such as subtractive hybridization and the analysis of regulators of transcription be applied to the study of this breakdown. He acknowledges but does not expand the hypothesis that failure of gene regulation may result from alterations of the nuclear milieu that may themselves derive from more external alterations.

The catholicity of the work is both the strength and the weakness of this book. A major strength is