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A Review of Wildlife 2001: Populations

McCullough, Dale R., and Reginald H. Barrett (eds.). 1992. **Wildlife 2001: Populations.** Elsevier Science Publishers, New York. xv + 1163 p. $363.50. ISBN: 1-85166-876-4.

The primary and stated purpose of this volume was to bring together specialists from all over the world to address the state of the art in the understanding and analysis of wildlife population dynamics. Secondarily, the messages from contributed papers were to set an agenda for research and management into the next century. Clearly, the first goal was achieved by this book. I cannot recall a recent conference proceedings with a more respected cadre of organizers, section editors, and authors dedicated to the preparation and presentation of a single volume. By default, the second goal undoubtedly will emerge due to the sheer volume of ideas, analytical tools, and research recommendations offered between the covers of this substantial work.

The book is organized into 15 sections (excluding the "Introduction"). The first three sections are devoted to general methodological approaches to the analysis of population dynamics, while the last 12 cover specialized topics or species groups. Between them, the sections cover most of the major vertebrate taxonomic groups (*sans* primates and fish) familiar to professional wildlife biologists and managers.

The first section on "Population methods" is superb, covering important topics like model selection and proportional hazards modelling of survival. However, I disagree with the premise stated by the section organizers that valid methods beget valid conclusions. What analysts need and want are robust methods that perform well in the face of violations, not valid methods. Validity of conclusions is more a function of problem formalization and subsequent experimental design, which in turn, dictate the analytical methods used. The "Population modelling" section is strong, especially the overview paper, with only one weak entry in the section on chaotic dynamics in wildlife populations. Because it fell under a general heading, I expected more from the "Threatened populations" section, which is lackluster. The section on "Overabundant populations" is stimulating and covers most of the problem areas in wildlife management contexts.

The remaining sections cover a broad range of taxonomic groups including a section on "Reptile and amphibian populations," a long overdue and refreshing addition to the topic of wildlife population dynamics. Avian sections include studies of passerine birds, seabird populations, waterfowl, game birds, and raptor populations. The paper on California condors, presented in the "Raptor populations" section seems out of place. It might have been better suited for inclusion in the "Threatened populations" section.

The "Small mammal populations" section is one of the better series of papers in the book. It includes just the right blend of theory, modelling, and data. The section on large herbivores is also noteworthy. Sections on furbearer populations, marine mammals, and large carnivores round out the volume.

The editors succeeded in achieving a functional organization to an otherwise unwieldy collection of papers. The uniformity of format and typesetting of the papers gives this book a very clean and professional look. In addition, the depth of topics insure that both seminal and more recent references on a variety of topics can be found. The book is comprehensive (over 1000 pages) and expensive. The price tag of about $400 will likely preclude some from adding it to their personal libraries. In its defense, there are few other books I would consider more thoughtfully. The book's major failing is the absence of a subject area index, which would greatly increase its functionality as a reference.

In summary, the analytically inclined will find the front end of this book very stimulating, and every student of population dynamics and management will find the application of cutting-edge techniques to a variety of species' populations interesting and enlightening. By their own admission, the editors realize that the state of the art has not progressed far enough to offer a synthetic view of population dynamics. However, it is my opinion that between the covers of this book lie segments of the pathway to that goal.

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Darwin Goes to the Doctor

Nesse, Randolph M., and George C. Williams. 1994. **Why we get sick: the new science of Darwinian medicine.** Times Books, New York. xi + 291 p. $24.00, ISBN: 0-8129-2224-7.

We live on the threshold of the birth of a new discipline, one which might be christened "Applied Evolutionary Biology." This emerging discipline consists of the rigorous application of the Darwinian conceptual revolution (aided by technological advances, such as molecular techniques) to all sorts of applied biological problems—from pest control, to

harvesting strategies, to waste management, to conservation policy.

For most people, the medical sciences are far and away the most important application of biology, yet until very recently medicine has almost lacked principles and perspectives from evolutionary biology. In this stimulating, well-written book, an eminent evolutionary biologist (Williams) and professor of psychiatry (Nesse) apply Darwinian logic to the question of why illness, emotional anguish, and, ultimately, untimely death inflict us all. Their basic perspective is that Darwinian logic can explain why our bodies and psyches are the way that they are, and that this approach provides a rigorous conceptual framework both for understanding the nature of disease and for designing effective clinical practice.

The core assumption of the "adaptationist program" is that major structural, life history, and behavioral features of organisms make functional sense. Working out the details of course requires sensitive attention to constraints set by history, the need for adaptive compromises, environmental change, and conflicts between competing organisms. Yet the absence of functional interpretations fosters intellectual myopia in the practice of medicine, where diseases are studied and treated stripped from their broader context in the human life cycle.

The authors discuss many fascinating examples of the potential utility of functional reasoning in understanding the genesis and mitigation of medical problems. Rather than attempt to summarize the wealth of examples discussed in the book, let me mention a few examples:

1. Infection produces symptoms such as fever and altered body chemistry (e.g., reduced iron in the blood) or behavior (e.g., sneezing), often leading to discomfort. An understandable impulse that informs much medical practice is to alleviate discomfort, e.g., reducing body temperature. Yet such efforts may be tragically misguided, if the symptoms are actually part of a battery of host defenses mounted against the infection. The authors tellingly argue that knowledge of the functional nature of symptoms—are they adaptive responses by the host? or, manipulations of the host by the pathogen?—should be fundamental to the design of treatment of infectious diseases. They also (depressingly) note that this basic insight is still foreign to the training of most medical practitioners.

2. Many diseases are produced by rather common genes. Given such genes, Darwinian physicians should automatically suspect the existence of beneficial, possibly well-hidden, pleiotropic effects that compensate for the manifest costs. The authors present numerous examples, ranging from well-documented cases such as sickle-cell anemia to more speculative instances involving trade-offs between life-history stages and the utility of the immunoglobulin-E part of the immune system. In the future, it may be feasible for gene therapy to inactivate genes associated with particular diseases; such therapies need to ascertain potential subtle, indirect benefits of the genes, which can be presumed to be present if the genes are at all stably common in the population.

3. Natural selection sculpts adaptations to particular physical, biotic, and social environments. Change the environment, and formerly useful adaptations may become quite dysfunctional. Humans have been living in an environment changing by their own actions for the past ten thousand years, and the magnitude of change has greatly accelerated over the past few centuries. The authors provide many examples of how such change may have led to physical and mental diseases, indicators of human maladaptation in novel environments. Medical practice needs to be sensitized to the environmental and social components of disease etiology.

Ecology, per se, should contribute to evolutionary medicine and the training of medical practitioners. Here are some examples:

1. Evolution by natural selection results from the fusion of demography and genetics. For instance, understanding the evolutionary theory of aging requires knowledge of basic population biology (e.g., demographic components of fitness, age structure, and reproductive value).

2. The core concepts of evolutionary ecology—that rigorous analyses of the adaptive value of traits require cost-benefit bookkeeping throughout an organism's lifetime, and must account for competitive interactions between competing replicators—should become part of medical intuition, and integral to studies of disease etiology.

3. Interactions between hosts (as individuals or populations) and infectious diseases are a special kind of applied population and community ecology. For instance, the struggle between individual hosts and populations of infectious agents can be profitably viewed in terms of modern resource-consumer theory (see Smith, Val H. 1993. Implications of resource-ratio theory for microbial ecology. *Advances in Microbial Ecology* 13:1–37 for such an application). Physicians need to think as ecologists if they are to manage infectious disease ecology and evolution in the interests of both individual patients and the entire human population (e.g., in controlling the evolution of resistance by pathogens to antibiotics).

The lucid prose makes the authors' perspective accessible to a wide readership. Both general readers and a wide range of specialists should enjoy the book, which I recommend highly. I predict that some years in the future, this book will be fondly remembered as a prophetic prologue of a rigorous body of evolutionary medicine, part of what will by then be a larger robust discipline of applied evolutionary biology.

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