sis, but it is limited and suggestive rather than decisive. The book thus appears at a most appropriate stage of evolution studies to stimulate research, especially in areas identified in the final chapter as requiring particular attention: measuring the effectiveness of adaptations, systematic study of species composition and interactions in ancient communities, and phylogeny, the determination of ancestor-descendant relationships. With the impressive scope and rich synthesis of this work, the author has assumed the mantle of a provocative pundit of paleobiology.

ALAN J. KOHN
Department of Zoology, University of Washington, Seattle, WA 98195

Fishery Biology

Population Genetics and Fishery Management. NILS RYMAN and FRED UTTER, Eds. Washington Sea Grant Program, Seattle, WA, 1987 (distributor, University of Washington Press, Seattle). xviii, 420 pp., illus. $35; paper, $17.50.

Humans are still primarily hunter-gatherers, albeit highly efficient ones, of aquatic food resources. Total world catch was nearly 83 million metric tons in 1984 (*FAO Yearbook of Fisheries Statistics*). Overexploitation and habitat alteration, however, pose grave threats to sustaining yields of fish stocks, the legislated goal of fishery management in the United States. That sustained yield has often been exceeded is all too evident in the history of fisheries collapses. Such failures obviously represent short-term economic losses, but what of the long-term genetic consequences of pushing natural fish populations to, and occasionally beyond, their production limits? As reviewed in this book, application of the principles and methods of genetics to exploited fish stocks has demonstrated losses of genetic diversity, both within and between species, to the detriment of yield. Fisheries must clearly be managed to maintain genetic diversity and stability, yet genetics is rarely mentioned in current fishery textbooks or curricula.

Nils Ryman and Fred Utter, two pioneers in the study of fish population genetics, have provided a book that makes a strong and timely case for the application of population genetic principles to fishery and fish hatchery management. Twenty-four leading authorities, including the editors, have written 15 chapters covering the history of genetics and fishery management, relevant quantitative and population genetic theory, details of useful molecular and statistical methods, and consequences of fishery practices and management on genetic diversity. Cross-referencing among chapters, consistent use of scientific nomenclature, an index of species, and the collection of nearly 1000 literature citations into a single bibliography give cohesion to this comprehensive multiauthored volume.

What emerges about the biology of fish populations and current methods used to analyze their genetic structure and evolutionary divergence should be of interest to a wide audience of population biologists. Allendorf *et al.* call attention to phenotypic variation that is an order of magnitude greater in fishes than in other vertebrates, yet heritabilities of traits are lower in fishes, owing in part to indeterminate growth, poikilothermy, and unusually flexible relationships between growth and sexual maturation; this last theme is expanded by Nelson and Soulé in their discussion of the effects of size selection on life histories. High fecundities and great variation in reproductive success may result in gross overestimation of genetically effective sizes for both hatchery and natural populations (Gall; Allendorf and Ryman; Nelson and Soulé). For hatcheries, the unanimous recommendation is to reduce or eliminate variance in family size.

The related management problems of detecting hybridization and introgression (Campton) and of sorting out the separate contributions of subpopulations to mixed stocks (Pella and Milner) have fostered development of sophisticated statistical estimators of admixture, based on information at multiple allozyme-coding loci. Detecting introgression also appears to be a strength of methods for revealing nucleotide differences in maternally inherited mitochondrial DNA (Ferris and Berg; Gyllensten and Wilson).

Though this book ought to succeed in introducing fishery managers to population genetics, it is sobering to consider how much of the chasm between the two fields remains to be bridged. Perhaps a limitation of the book is that it is written solely by geneticists. Discussions of some topics—partitioning of genetic diversity, phylogenetic inference from molecular data, and dating of specific divergence—have the tone of dispute among cognoscenti rather than of communication with nongeneticists. A central issue, whether fishery management can adopt the long-term view that population geneticists take for granted, remains unresolved. Do fishery managers care whether two species diverged 5×10^6 years ago when bureaucratic memory extends only to the last election? How can fishery managers utilize information on processes that reach equilibria in thousands of generations when their own future is often delimited by the next budget appropriations battle? Converting sociopolitical institutions and fishery managers to the cause of genetic conservation may itself be a process that approaches stable equilibrium at a rate measured in human generations, but this book takes a much-needed first step.

DENNIS HEDGECOCK
Bodega Marine Laboratory, University of California, Bodega Bay, CA 94923

Seasonal Rhythms

Monsoons. JAY S. FEIN and PAMELA L. STEPHENS, Eds. Wiley-Interscience, New York, 1987. xxii, 632 pp., illus. $74.95.

"With this book," write the editors, "we have tried to provide a multifaceted view of the monsoon: its lore, its societal impacts, and its meteorology. . . . Our intended audience includes administrators and policymakers, researchers and students, and interested laypeople."

Although monsoons occur in various areas around the tropical belt, research on the subject has been focused on the summer monsoon of India. For over 100 years British and an increasing number of Indian and other scientists have been engaged in an effort to understand and predict this particular monsoon. *Monsoons* maintains this emphasis.

The six major parts of the book are: Introduction; Literature and Folklore; Impacts and Government Response; Past and Present Concepts; Interactions and Variability; and Prediction and Government Action. A brief introduction to each part is provided by the editors. The presentations, in 19 chapters, review the literature and offer speculations about the future, many of them based on computer models. Fewer than half of the 16 authors are writing from Asia, and although Soviet participation in monsoon experiments has been strong, there are no contributions from the U.S.S.R. or China. The authors, who for the most part have avoided duplicating one another's material, supply useful cross-references to other chapters. The chapters can be read in any order.

The introductory chapter, "The elementary monsoon" by P. J. Webster, discusses monsoon generation, structure, and cycle. Webster notes that "if we consider only differential heating, moist processes, and rotation, it appears that the essence of the observed monsoon circulation and structure can be explained." For those interested in monsoon physics, J. A. Young's "Physics of

monsoons: the current view" is a fine amplification of Webster's account.

Two noteworthy chapters are contributed by M. S. Swaminathan, director of the International Rice Research Institute near Manila. He treats "abnormal monsoons" and their economic consequences in chapter 6; then, in the book's last chapter, he discusses monsoon disasters and what public actions to take. Too much monsoon can be as disastrous as the generally feared and more discussed monsoon failure, because of the rotting of crops in excessive water. On the effort to achieve stable agricultural production despite the vagaries of the monsoon, the Rice Research Institute and the "green revolution" have had some of their major impacts.

This reader started with "The Indian monsoon in literature" by K. Singh, a member of the Indian parliament. Singh first describes the premonsoon dryness after perhaps nine months without rain. The greatest heat comes in April and May, when everything is driest. Thus the transition to monsoon is especially impressive, and one speaks of the "burst of the monsoon." However, not everyone experiences the monsoon as a violent beginning. J. Nehru, for instance, wrote: "Like a thief in the night the monsoon had come to Bombay .... Another illusion gone" (p. 371).

"With the monsoon the tempo of life and death increases." The Indian attitude toward clouds and rain is conveyed in descriptions of the monsoon by India's classical and modern poets; the examples given range from verses written in Sanskrit between the 4th and 15th centuries A.D. to excerpts from an early-20th-century poem by R. Tagore. Singh maintains that to the people of India clouds are symbols of hope; to the Westerner, of despair. (We may wish to argue that point.) He concludes on a sad note: the advent since 1947 of technology for a stable water supply has reduced the intensity of emotion about the monsoon, thereby affecting its appeal for poets and novelists. "It remains the favorite time of year for lovers, but few now write about it."

In "The changing pulse of the monsoon" J. E. Kutzbach examines the geological record for evidence of monsoon fluctuations. Radiocarbon dating has revealed that the climate of India through the western Rajastan desert and beyond was humid during the interglacial period, roughly 5,000 to 12,000 years ago, compared to marked dryness during the last glacial epoch some thousands of years earlier. The entire long-term event might be related to the precession of the equinoxes, best described by F. Zimmermann in "Monsoon in traditional culture." The rate of precession is about 28 days in 2000 years, or not quite one astrological sign. This backward shift of the seasons must be taken into account in interpreting the many references to very old times, for instance in the dating of annual festivals described by B. J. Murton in "Monsoons in agricultural proverbs in Tamilnadu."

A part of the huge effect of the northern mountains described in "Orography and monsoons" by T. Murakami is the occurrence of a second precipitation season in the Himalayas and northern plains in winter. This results in the snow accumulations that H. F. Blanford used to predict summer monsoons in the earliest days of the Indian Meteorological Department (British weather service) in the 1870s and '80s (J. Shukla, "Long-range forecasting of monsoons").

P. K. Das, in "Short- and long-range monsoon prediction in India," gives average dates of onset and retreat (p. 553). In an otherwise complex chapter on monsoon models, T. Krishnamurti shows that a simple difference in sea-level pressure between Diego Suarez Island (in the western Indian Ocean, near Madagascar) and Bombay has been used to forecast onset dates. His monsoon rainfall chart (p. 494) shows that there is reason to be concerned about the annual total, since the averages shown are by no means high for a tropical continent. In former days, one might have asked: "Why not stabilize monsoon rains through weather modification?" It is of interest that this phrase does not appear in the index.

In summary, the reviewer feels that the initiative of editors Fein and Stephens has been successful and that their concept may well serve as a model for overviews of other subjects in science. The book can be recommended to the wide variety of potential readers to whom it is aimed. Even readers interested in only one aspect of the subject, such as the history of monsoon meteorology (treated in chapters by B. A. Warren and G. Kutzbach), may find that they have the urge to look around a bit more.

HERBERT RIEHL
Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309

Some Other Books of Interest

Essays on the History of Organic Chemistry. JAMES G. TRAYNHAM, Ed. Louisiana State University Press, Baton Rouge, LA, 1987. xii, 145 pp., illus. $25. Based on a symposium, Baton Rouge, 1984.

The 1984 session of the annual Louisiana State University Mardi Gras Symposium in Organic Chemistry had a historical theme, and this collection of eight papers (some of which have been published in other forms) is the result. The opening paper, "Convention versus ontology in nineteenth-century organic chemistry" by Alan J. Rocke, analyzes debates between theorists who "regarded the goal of theory as taxonomic convention" and those who "sought to approach the ultimate reality behind sensible appearances." The second paper, by John Wotiz and Susanna Rudofsky, deals with the purported dreamlike revelations experienced by Friedrich August Kekulé. There follow two papers on the development of stereochemistry by Stephen F. Mason and O. Bertrand Ramsey. In the next paper John A. Heitmann uses an account of sugar chemistry in Louisiana to shift attention from elite scientists to the "lower tiers" whose "application of organic chemistry to the solution of practical problems was in part responsible for the drive to industrial maturity that occurred in the United States between 1875 and 1914." In two further papers, Leon Gortler recounts the development of physical organic chemistry in the United States in the 1930s and '40s, with a focus on major institutions in the field and interconnections among their faculties, and James G. Traynham outlines the development of rules for chemical nomenclature. The final paper, a "compendium of chemical trivia" by Jack H. Stocker, includes among other items structural formulas for such compounds as *cis*-boom-bah and mercedes benzene, texts of chemical papers written in rhyme, and an abstract of a paper demonstrating that chicken plucking is of doubtful value as an index of tornado wind velocity.—K.L.

An International History of Mammalogy. KEIR B. STERLING, Ed. Vol. 1, Eastern Europe and Fennoscandia, 1. One World Press, Bel Air, MD, 1987. xxvi, 198 pp., illus. $25; paper, $20.

This volume is the first publication from a project that is expected to produce a total of 10 or 12 volumes over the next decade. The project, instigated by Keir B. Sterling, who serves as general editor, has an advisory board including members from Australia, Sweden, the United States, and the Soviet Union and has been endorsed by the (1978) International Theriological Congress and the Section on Mammalogy of the International Union of Biological Sciences. The volumes, whose chronological coverage is to be concentrated on modern times (specifically, starting with 1758, when the tenth edition of Linnaeus's *Systema Naturae* was published), are expected to provide "materials for a history of mammalogy rather than