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Review of "A Primer of Ecological Statistics. Second Edition"

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Abstract

The second edition of this ecological statistics textbook adds two chapters on distinctive statistical methods used for ecological questions. One new chapter covers estimating species richness and other diversity metrics; this chapter focuses on rarefaction curves, although there is a short discussion of Chao's estimators of assemblage richness. The second new chapter focuses on occupancy modeling with short discussions of mark-recapture models for closed and open populations. Combined with the chapter on ordination that was in the first edition, this volume now provides an introduction to the major areas of ecological statistics.

Disciplines

Ecology and Evolutionary Biology | Statistics and Probability

Comments

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ing. There is still a lot of uncertainty about how these peoples used Lake Champlain as a resource, and how skilled they were in navigating it with small canoes.

In general, however, this volume provides an excellent update and synthesis of most of what we currently know about the earliest peoples in the northeastern United States. It is well edited and nicely designed, with many excellent black-and-white photographs. Anyone interested in how humans first populated New England needs to own this important work.

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VISIONS OF A VANISHED WORLD: THE EXTRAORDINARY FOSSILS OF THE HUNSRÜCK SLATE.

By Gabriele Köhl, Christoph Bartels, Derek E. G. Briggs, and Jes Rust; Foreword by Richard Fortey. *New Haven (Connecticut): Yale University Press.* \$40.00. 128 p.; ill.; index. ISBN: 978-0-300-18460-0. [Originally published as *Fossilien im Hunsrück-Schiefer: Einzigartige Funde aus einer einzigartigen Region*, published by Quelle & Meyer Verlag.] 2012.

Only a minuscule fraction of the organisms that once inhabited Earth has preserved remains, yet knowledge of the evolutionary history of life on Earth for the past 3.5 billion years is remarkable. The ravages of time typically destroy all but the more robust shells, bones, and plant tissue. Regardless, paleontologists can document evolutionary transitions through time and can understand intimate details of animal behavior, the paleoecology of ancient organisms, and biotic interactions among fossils. Recently, organic biomarkers have been extracted from ancient life, and DNA from ancient organisms has been isolated and evaluated (including the ancestors of dogs, woolly mammoths, and Neandertals). Konservat-Lagerstätten, deposits with exceptionally preserved fossils, unlock a portal to study ancient organisms that is typically closed. The Hunsrück Slate is an extraordinary Konservat-Lagerstätte.

Visions of a Vanished World is an album of fossils from the Hunsrück Slate, which is early Devonian in age (circa 400 mya) from the Rhenish Massif of Germany. Early collectors were drawn to Hunsrück because fossils were preserved attractively with pyrite (fool's gold). It is now recognized that Hunsrück preservation ranges from nonpyritized specimens to ones heavily pyritized. Recognized in the 1930s, the pyritized shells and soft tissues could be imaged with X-rays, which offered a unique way to study these fossils. Remarkable X-ray images are presented of bristle worms, unusual arthropods, and asteroid, blastoid, and ophiuroid echi-

noderns. The most remarkable preservation is a light pyritization that replaces ancient soft tissues. Today, development of new preparation techniques for extracting fine-scale morphology of lightly pyritized soft tissues has revealed setae on polychaete worms, antennae and appendages on arthropods, and the epidermis of ophiuroids, all illustrated in *Visions of a Vanished World*. The book begins with short explanations of the history of study, geologic occurrence, preservation, preparation, and other aspects of Hunsrück fossils. The illustrations are organized by major fossil groups, and short descriptions of these groups with explanations of the significance of illustrated fossils enhance the understanding of Early Devonian life. The new preparation methods and future use of state-of-the-art X-ray tomography will spawn a new generation of research on these remarkable fossils.

Dinosaurs and other large, long-extinct creatures may draw one into the science of paleontology. It is an affliction that strikes early in age. However, much like the Harry Potter series, a significant amount of the fascination of paleontology is that we are afforded a glimpse into an alternative world. Time is the dimension traversed in paleontology. *Visions of a Vanished World* takes one back to the Early Devonian where blastoid brachioles and crinoid arms waved in ocean currents, pycnodonts walked among brachiopods, trilobite gills breathed, and anomalocarids were feared predators that roamed the Hunsrück Sea. This volume portrays marvelously the unique fauna of the Hunsrück Slate; it is a must for the bookshelf of anyone interested in natural history and in the history of life on Earth.

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ECOLOGY

A PRIMER OF ECOLOGICAL STATISTICS. *Second Edition.*

By Nicholas J. Gotelli and Aaron M. Ellison. *Sunderland (Massachusetts): Sinauer Associates.* \$54.95 (paper). xxi + 614 p.; ill.; index. ISBN: 978-1-60535-064-6. 2013.

The second edition of this ecological statistics textbook adds two chapters on distinctive statistical methods used for ecological questions. One new chapter covers estimating species richness and other diversity metrics; this chapter focuses on rarefaction curves, although there is a short discussion of Chao's estimators of assemblage richness.

The second new chapter focuses on occupancy modeling with short discussions of mark-recapture models for closed and open populations. Combined with the chapter on ordination that was in the first edition, this volume now provides an introduction to the major areas of ecological statistics.

The first eleven chapters are an introduction to statistical methods, illustrated with ecological examples. Much of the statistical material would be found in just about any introductory statistical methods textbook. Things that set this volume apart from the ordinary include short discussions of more advanced methods at the end of most chapters, a full chapter on data management, two chapters on study design, and wonderful footnotes with historical notes and short biographies.

The presentation throughout emphasizes concepts, not equations or statistical theory. However, the discussion of analysis of variance (ANOVA) is dated because it emphasizes formulae to calculate sums of squares in balanced data sets. Modern computing makes it possible to do all of the ANOVA computations even when sample sizes are unequal. I doubt anyone today will use those sums-of-squares formulae.

A strength of the book is the attention given to Monte Carlo and Bayesian methods as alternatives to traditional model-based frequentist inference. The conceptual differences between the approaches are laid out in Chapter 5, and subsequent chapters include sections on Monte Carlo and Bayesian alternatives to traditional parametric statistical methods. When the focus is on parameter estimation, the Bayesian discussions are reasonable. However, Chapter 5 introduces the three approaches to inference using a hypothesis testing example. The discussions of Monte Carlo and model-based (i.e., traditional) inferences are reasonable, but the discussion of Bayesian inference is seriously misleading. Testing a simple null hypothesis (two groups have the same mean) versus a composite alternative hypothesis (two groups have different means, but the sign and magnitude of the difference are unspecified) is easy using Monte Carlo or traditional parametric methods. Trying to do a Bayesian "hypothesis test" raises tricky issues. Those issues are ignored here. Instead, the "Bayesian" approach presented in Chapter 5 calculates the probability, given the data, that an F statistic exceeds a frequentist critical value (5.32 in the example). The problem is that the F statistic is calculated from the data. So, given the data, F is a specific number, and there is no meaningful probability. The computation illustrated in Figure 5.8 is a power calculation, not a Bayesian posterior probability. Current Bayesian approaches to ANOVA focus on estimating the variability between treatment means (i.e., the posterior standard deviation of a random

effect for treatments) and the variability between observations within a treatment.

The second edition of this volume now provides a useful overview of both methods in ecological statistics and statistical methods for ecological data. However, look elsewhere to learn Bayesian methods.

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FIRE IN MEDITERRANEAN ECOSYSTEMS: ECOLOGY, EVOLUTION AND MANAGEMENT.

By Jon E. Keeley, William J. Bond, Ross A. Bradstock, Juli G. Pausas, and Philip W. Rundel. Cambridge and New York: Cambridge University Press. \$120.00. vi + 515 p.; ill.; index. ISBN: 978-0-521-82491-0. 2012.



CONSERVATION BIOLOGY

THE ORNAMENTS OF LIFE: COEVOLUTION AND CONSERVATION IN THE TROPICS. *Interspecific Interactions.*

By Theodore H. Fleming and W. John Kress. Chicago (Illinois): University of Chicago Press. \$50.00 (paper). xii + 588 p. + 13 pl.; ill.; species and subject indexes. ISBN: 978-0-226-25341-1. 2013. Tropical forests around the world are the scene in which each day, and every night, hundreds of species of plants, birds, and mammals interact positively with each other. As part of foraging, animals assist in pollination and seed dispersal. Such interactions, which involve many of the most spectacular animals of the tropics, true ornaments of life, represent a significant part of the functioning of the terrestrial ecosystems that harbor the highest biodiversity on the planet. They also represent at least 45 million years of history, a period during which the partners of these relationships have influenced each other in their evolution. Never before has been the titanic task of compiling the extant knowledge on such tropical vertebrate-plant mutualistic interactions so well crafted and exceptionally timely as in this volume.

The book is organized into 10 chapters that cover many aspects of pollination and seed dispersal mutualisms between tropical plants and their vertebrate visitors. These include taxonomic, morphologic, physiologic, behavioral, biogeographic, ecologic, and evolutionary subjects, which are presented from both the animal and the plant sides. Chapters start by presenting questions and hypoth-