

keyed to species. Within the keys, family names are presented in bold face to facilitate keying by the more experienced users. Each chapter is followed by a list of references on the systematics and biology of the group in question.

The book is easy to use, and the keys seem to be robust and complete. I used the keys successfully to identify specimens from outside the Northeast. Presumably, eventually there will be taxa found in the Northeast that are not included in the keys, especially among the more poorly known or difficult taxa, but this is not likely to be a problem any time soon.

Many of the illustrations either are original with this work, or are reasonably good modifications of illustrations from the work of others. It is nice to see new illustrations rather than another re-publication of the same figures that everyone has published for the last 50 years.

*Freshwater Macroinvertebrates* will prove to be a valuable key for students in aquatic entomology classes and for professional consultants working in

the region who need a comprehensive general treatment of the fauna. The main drawback of the book is the near complete absence of biological information on the organisms. This restricts its use to identification of the regional fauna, leaving students needing a more comprehensive resource for additional information. However, I suspect aquatic entomology students will not mind, as long as they are not required to purchase another text to fill the gap. Those who are interested in pursuing further information will probably want to buy additional reference works, anyway. Consultants will no doubt welcome the restricted geographic coverage because it will reduce the time spent keying and will decrease the likelihood of making mistakes. For both groups, then, I recommend they get a copy and put it beside their microscopes. It's likely to become a well used reference within a short time.

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## Neotropical Rainforest Mammals: A Field Guide

By Louise H. Emmons. 1990. The University of Chicago Press, Chicago. xiv + 281 pp., illus. Cloth U.S. \$45.00, paper U.S. \$19.95.

This book is the first attempt at synthesizing biological knowledge into a field guide format for mammals that live in the Neotropical lowland rainforest, an area defined as Central and South American rainforest below 1000 m in elevation. Covering an ecological region is a different approach because usually geographic regions are used. The objective is to present information in a standardized format within a single reference for both the naturalist and scientist. This provides for a comparison of closely related mammals and identifies species that require further study.

Contents are presented systematically with species or genus accounts with general descriptions for higher levels of classification such as family and order. Most accounts are for individual species, however, due to varying degrees of knowledge of certain groups of small mammals some are left to the generic level because much research is still needed to fully comprehend the subtleties of evolution and ecological distinctions. A brief introduction outlines the sections and format used within each account.

Accounts are prominently identified in bold type with common English names followed by scientific names and a cross reference to illustrations and distribution maps. Sections entitled "identification", "variation", and "similar species" give traditional body measurements, description with diagnostic features in

bold, slight differences observed over its range, and distinguishing characteristics that will hopefully allow for proper identification in the field. "Sounds" which may be the only evidence of occurrence, "natural history", and "geographic range" elaborate on any noises emitted, social behaviour, foods eaten, habitat, distribution, and elevation. The remaining topics are "status", "local names", and "references" which explain economic value of the species in terms of hunting for meat or fur, abundance throughout its range, endangered species designation if any, commonly used regional names, and literature sources for more in depth detail on current research.

Six appendices provide further information not suitable within the format of the species accounts. These include definition of scientific terms, field identification key to the generic level, information pertaining to conservation and the study of systematics which deals with the explanation and documentation of organismic diversity, illustrations of large mammal tracks, list of general references, and index of scientific and common names.

The text is supplemented by 29 colour and 7 black-and-white plates in addition to other figures by Francois Feer covering a wide selection of mammals. There are about 500 different species of mammals found in the Neotropical lowland rainforest, for which there are almost 300 written accounts in the book with all genera covered. Most of the genera are represented by an illustration, however, the majority of the bats have only black-and-white sketches of the

head. I was disappointed with the lack of detail in the colour plates because they frequently are the first to be consulted and diagnostic features should be obvious and accurate. This was not the case for the common opossum which should have had at least the terminal half of the tail white although the caption and text were correct.

As is usually the case for books covering a broad subject matter, particularly with an area still needing further study, our knowledge of basic biology of many species is lacking and perhaps justifies a generic account for the terrestrial spiny rats, a group that may include over 20 different species. Likewise, the bats are summarily handled to genus, however, some

could have warranted separate species accounts (e.g., bulldog bats). This decision was probably a space constraint because there are over 100 species of bats which would have made the book unwieldy in the field.

I have already consulted this book freely during two trips to Guyana and found it very useful. The presentation and wealth of information contained in this field guide is outstanding and will satisfy the needs of both the "tourist" and "researcher" traveling to the Neotropics.

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## Interpretation and Explanation in the Study of Animal Behavior

Edited by Marc Bekoff and Dale Jamieson. 1990. Westview, Boulder, Colorado. 2 volumes, xxvii + 505, illus., and xxvii + 465 pp., illus., U.S. \$45.00 each.

How objective are our studies of animal behaviour? What significant evolutionary accounts can we generate? To what extent can we understand the worlds of other species? What features are we justified in attributing to them? What moral obligations do we owe them? Is Lloyd Morgan's canon a loose one? These are some of the difficult, important, and current questions under scrutiny in this work. Following a foreword by Griffin predictably urging greater attention to the study of animal mentality, the 21 chapters of the first volume are clumped into four groups. In the first, and strong, group, on interpretation and understanding, Fentress examines the problems of the categorization of behaviour, Bernstein and Galef provide tough-minded analyses of animal relationships and traditions respectively, Gruen evaluates three feminist critiques of gender-biased knowledge, and Fisher untangles several senses of "anthropomorphism". The second group, on recognition, choice, and play, seem scarcely related to each other or to the theme embodied in the title. In particular the two chapters on play are very much at odds. (And does "self tickling" really exist as claimed?) If, as the editors aver, this set of topics is the most likely to provide empirical support for the existence of animal minds, then cognitive ethology is indeed the non-starter that we skeptics maintain. The third group, on communication and language, is a mixed bag with some tangential material but interesting chapters by Herman on semantic and syntactic comprehension by dolphins and Sue Savage-Rumbaugh on language skills in pygmy chimpanzees. The chapter by W. John Smith, when contrasted to his justly influential 1977 book, indicates the intervening influence, but not benefit, of cognitive lingo. Wilder doubts that cuing of experi-

mental animals, as in the famous case of the turn-of-the-century German horse Clever Hans, can ever be excluded, but in her preceding chapter Savage-Rumbaugh assures us that "this is patently false". The fourth group, on animal minds, is philosophically the most demanding, drawing on most major figures between Descartes and the Churchlands. Not surprisingly the contributors differ over the extent to which animals enjoy mental powers and to which we can understand other species. Crisp confuses clades and grades, and unsuccessfully criticizes the theory of Nicholas Humphrey, relating consciousness to social interaction, which is the best in this problematical field. Dupré astoundingly asserts that behaviourism has been unsuccessful, and Clark concludes the volume in a fog of poetic nonsense.

The 17 chapters of the second volume are clumped into three groups. Among the first group, on explanation and confirmation, Burkhardt reviews historical practice, Wynn considers tool behaviour, and Byers and Bekoff examine the fallacy of affirming the consequence in the theory of social evolution. Mitchell criticizes the use of "rape" by Thornhill who, in his preceding chapter, focuses on entirely other criticisms. In the second group, on method, analysis, and critical experiment, the heterogeneity includes neurobiology, artificial intelligence, phylogenetic ethology, quantitative modeling, and behavioural ecology. In an examination of experiments and hypotheses in avian dialects, Kroodsma shows the mismatch between hypotheses of interest and hypotheses actually under test. Koenig and Mumme provide a balanced account of the valid controversy surrounding the interpretation of helping behaviour. In the third group, on moral dimensions, there are chapters on domestication, ethics in genetics, and animal rights and feelings, ranging from tight analyses to emotional waffle. Some provocative matters are usefully raised, such as that by Finsen on the treatment of potential human/chimpanzee hybrids.



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