

as the allocation of the genus *Phodilus* to the Tytonidae, are confirmed. Relationships that make biogeographic sense, such as the monophyly of New World *Otus* and of Old World *Otus*, are recovered. Other results are surprising: the two *Otus* clades are not sister groups, and *Ketupa* and *Nyctea* are deeply embedded within *Bubo*. Overall, however, these molecular results are not very robust and ought not to be used as the basis for a revision of owl taxonomy. Alternate methods for inferring phylogenetic trees were used, such as parsimony, likelihood, and neighbor-joining, and they led to some surprisingly different results. In addition, the usually employed indices of robustness in phylogenetic analyses, such as bootstrap confidence levels for nodes on trees, are moderately high only for some nodes in the neighbor-joining tree. For example, they range from 0.5 to 0.7 for older, intergeneric relationships, but for the most part are less than 0.5 for the parsimony analysis. Much more mitochondrial data or slower-evolving nuclear genes are going to be required to settle the problem of intergeneric relationships among owls. It is fortunate, therefore, that König et al. have not adopted many of the DNA results in their classification. For example, most New and Old World *Otus* remain in that genus, and the Snowy Owl remains in *Nyctea*. However, *O. leucotis* becomes *Ptilopsis leucotis* and *P. granti* (taxa that may be more closely related to *Asio* than to *Otus*), and *Ketupa* and *Ciccaba* are merged into *Bubo* and *Strix*, respectively.

Despite our criticisms, König et al.'s *Owls* will be useful as the only medium-sized (and thus easily transported) book that illustrates and discusses all of the world's owls and as a source for many of the latest thoughts about owl systematics. However, readers must be cognizant of the fact that the lack of scholarship revealed in this book renders it nearly useless as a modern summary of what is known about the biology of the world's owls. The door continues to remain wide open for someone to tackle the challenging task of adequately synthesizing the current literature on the more than 200 species of strigiforms thought to occur in the world today.—JEFFREY S. MARKS, *Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, Montana 59812, USA. E-mail: jmarks@selway.umt.edu* GEORGE F. BARROWCLOUGH, *Department of Ornithology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA. E-mail: gfb@amnh.org*

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**A Manual for Wildlife Radio Tagging**—Robert E. Kenward. 2000. Academic Press, London, United Kingdom. x + 311 pp., 107 text figures. ISBN 0-12-404242-2. Cloth, \$65.00.—Radio tagging provides a convenient and cost-effective means of remotely monitoring the physiology, movements, resource selection, and demographics of wild animals. Consequently, radio tagging has become an important and attractive tool for ecologists. The past 10 years have been a particularly interesting time for users of telemetry. Radio tags have become smaller and more reliable; advancing technologies such as satellite telemetry, global positioning systems, and user-friendly, PC-based geographic information systems (GIS) have emerged; and new data-analysis techniques to incorporate those advancements are numerous and impressive. Despite those advancements, there has been no up-to-date synthesis on radio tagging wild animals. Kenward's *A Manual for Wildlife Radio Tagging* fulfills an important niche. In this book, Kenward has provided a scholarly review of study planning, available equipment, tag-attachment methods, and data-collection techniques in an informative and timely text. Assuredly, anyone embarking on a radio-tracking study, particularly first-time telemetry users, would benefit from Kenward's keen insight and cogent recommendations.

This book updates Kenward's *Wildlife Radio Tagging: Equipment, Field Techniques and Data Analysis*

published in 1987. Chapters 5 (Making Tags), 7 (Radio Tracking), and portions of other chapters were retained and modified from the original edition. However, this update contains several new additions: ~70% more text contributing to 10 chapters in total, a detailed glossary, a thorough literature cited section containing >600 historical and contemporary references, ample figures, and appendices indexing equipment suppliers and software vendors. Of particular interest to ornithologists, there are several examples of fitting tags to and collecting data on birds. As with the original edition, this book is intended to provide guidance to first-time telemetry users for choosing equipment and collecting and analyzing radio-tracking data. This book successfully accomplishes many of those aims.

Chapter 1 begins at a rudimentary level with an instructive discussion on whether radio tagging is the best approach to answer questions posed in your study. This chapter challenges researchers to improve the biological questions they ask and to more carefully plan their study to answer those questions, as well as to better train those involved in telemetry research. As Kenward stresses, a good telemetry study requires more than attaching radio tags to a few animals and following them around haphazardly. He describes four stages to plan a radio tracking study: obtaining equipment, successfully tagging the animal, collecting satisfactory data, and analyzing those data. By posing a series of questions, Kenward helps you determine whether radio tagging is right for your project. Although more experienced users may be aware of many of these issues, the sensible recommendations made by Kenward are ideal for someone beginning their first radio-tracking study.

A review of basic VHF transmitting and receiving equipment is the topic of Chapter 2. As done throughout the book, a historical context is provided so the reader has a feel for how the field has developed. In addition to frequency selection and allocation, there is a succinct and thorough review of receivers, antennas, and transmitters. Kenward provides a detailed description of VHF receivers available, including specific models and their capabilities, prices, and mode of operation. This is an especially balanced review of current options, and anyone considering buying a VHF receiver may be surprised at the advancements and new capabilities available. Practical advice and comparisons of different antenna designs are presented in a way that even a novice reader will be able to select the most appropriate portable antenna for their study. General advice on transmitter construction and ways to optimize tag range and tag life through use of microcontrollers and power sources is offered. Sensors available to indicate posture, activity, moisture, and a host of important processes round out Chapter 2.

One of the most important recent technological developments in radio tagging has been increased use of satellite tracking and GPS tags. In Chapter 3, general principles, advantages, and disadvantages of automated systems are described, along with cost, size, and potential uses of those technologies. Ground-based stations, capable of recording presence or absence and azimuths to estimate locations by triangulation are adequately described. Those sections are well referenced so a reader can locate the original literature for additional information. There is useful advice for evaluating those automated systems, especially in light of biological questions posed.

Any first-time buyer of radio tracking equipment must read the first four pages of Chapter 4. Contained here are detailed, useful tips on selecting equipment and manufacturers to suit your needs. Kenward also reminds us to select analytical software at the outset, which may be a daunting task. For example, I am aware of at least 25 software packages (including PC and MAC operating systems) that will conduct home range analyses alone! Certainly waiting until the end of one's research project to select software is not a good idea. Using the RANGES V software suite (Kenward and Hodder 1996) as a model, Kenward demonstrates how to prepare telemetry data for analysis. Options for obtaining digital maps and a review of the relative advantages and drawbacks with various formats are provided at the end of Chapter 4.

In keeping with the old adage "you don't have to know how to build a clock to tell time," you don't have to know how to build a radio tag to use one. However, Chapter 5 provides explicit details on tag components and construction. Although most of us will never build our own radio tags, this section does provide valuable information for those purchasing manufactured equipment. For example, the request for new super-elastic nickel-titanium alloy wire as a whip antenna on small bird, bat, and reptile radio tags is bound to gain you respect from that transmitter manufacturer! For those ambitious types, Kenward covers the construction of eight different radio tags that could be modified to fit a variety of species. Tag designs include glue-on, tail-mount, back-pack, implant, necklace, and collar devices. He provides detailed descriptions of tag construction while avoiding unnecessary jargon. This chapter also would be helpful to anyone interested in refurbishing radio tags.

Chapter 6 provides a thorough and thoughtful account of tag attachment techniques and the possible effects of transmitters on animals. I applaud Kenward for making this a significant section in the book. In any radio tagging study, we assume that radio-tagged animals behave, function, and survive similarly to animals without tags. It would be difficult to overstate the importance of that assumption. Many useful references are provided, and will assist

the reader in identifying literature pertaining to their study. Here, Kenward provides helpful guidance on placing radio tags on animals using glue-on, harnesses, tail mounts, necklaces, collars, implant, and ingested tags. Careful consideration is paid to animal welfare, appropriate fit, and the merits of each attachment technique. Ornithologists will particularly appreciate his thoroughness in describing harness and tail-mount attachment techniques.

How to radio-track tagged animals is the subject of Chapter 7. Here, basic information on radio wave behavior, taking bearings, and estimating tag distance and position are described in great detail. Kenward effectively underscores the point that practice is necessary to efficiently use tracking equipment. For beginners, advice on selecting triangulation sites, overcoming tracking problems in obstructed country, and locating lost signals is informative and worthwhile. Throughout this chapter, Kenward's >25 years of experience with radio-tracking techniques is evident. A discussion of motorized tracking from a vehicle or aircraft completes this chapter. Illustrative figures will help the reader determine how to affix antennas on airplanes or vehicles.

In Chapter 8, Kenward describes data collection methods. After a brief description of radio surveillance techniques, there is a discussion of experimental design issues related to VHF radio tags. As discussed, a researcher must either collect continuous data or point data at specified intervals; the choice is related to the stated objectives of the study. This raises the issue of autocorrelation in point observations (Swihart and Slade 1997); an issue with a 15-year history. In a constructive manner, Kenward describes some problems that may arise by strict adherence to the temporal-independence assumption. This section will certainly help people evaluate the implications of violating that assumption. Techniques to minimize error and bias, such as team tracking and minimizing time between successive azimuths, are drawn into a discussion of location accuracy. However, for those interested in testing and calibrating a radio tracking system, the work of White and Garrott (1990) is a more appropriate reference. Very appropriately, Kenward emphasizes the need for pilot studies and systematic sampling, themes extended in other chapters.

The last two chapters describe analysis of radio-tracking data. Specifically, Chapter 9 describes analysis of daily and seasonal movements, with an emphasis on home-range analysis. A strength of this chapter is the attention given to the virtues of various home-range estimators. Mathematical expressions are provided, although Kenward reminds readers twice that those equations can be ignored. Personally, I encourage the reader to review the mathematical notation to understand exactly what those estimators are doing. You might be surprised how the home-range estimate for your study animal is actu-

ally computed! This recommendation is extended to software; knowing exactly what analytical options your software package incorporates is essential when comparing your results to others. Also notable is a series of illustrative figures that help to demonstrate how features such as grid cell size, grid placement, and outliers ultimately influence home-range estimates. Appropriately, this chapter concludes with a summary discussion on choosing estimators and includes a classification scheme of six common home-range estimators.

Chapter 10 describes techniques for analyzing demographics (e.g. density and survival estimation), resource selection, and social interaction among species. The chapter begins with brief descriptions of direct population estimation, density estimation correction, and enhancements to line-transect techniques using radio-tagged animals. A minor criticism is that some important assumptions and developments in population estimation using radio tags, such as sightability models (Rivest et al. 1998), were not included. Following those summaries, survival analysis is examined. Although this review is not exhaustive, it does provide a starting point for more in-depth accounts. Unfortunately, only six pages are devoted to resource selection analyses. Admittedly, entire books have been written on the subject (Manly et al. 1993) and an exhaustive review would be much to ask, but there is an unbalanced discussion of available techniques. For example, there is no discussion of Euclidean distances, discrete choice modeling, or logistic regression. Kenward does, however, effectively point out that individual locations should not be considered the experimental unit and he describes a couple of interesting, yet not commonly used analyses (e.g. habitat dependence analysis). The chapter concludes with a brief discussion on social interaction analyses.

In addition to the extensive literature cited section and a functional glossary, two appendices complete the book. The first provides addresses and contact information for suppliers of telemetry hardware, complete with addresses, e-mail addresses, phone numbers, and web-sites. The concluding appendix provides some sources for radio tracking software, general purpose GIS vendors, sources of map data, and pertinent web sites.

In summary, this book represents an important resource for anyone conducting or supervising a radio-tagging study and is a must-read for first-time users of telemetry. I recommend it without hesitation to all researchers and students interested in study planning, telemetry equipment, tag attachment procedures, and how to collect data from radio-tagged wildlife. The book should be in every university library. It contains a wealth of practical and useful advice in a clear and readable format from which everyone can learn.—JOSHUA J. MILLSPAUGH, *Department of Fisheries and Wildlife Sciences, University of Missouri, 302*

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**A Thesaurus of Bird Names: Etymology of European Lexis Through Paradigms**—Michel Desfayes. 1998. Musée Cantonal d'Histoire Naturelle, Sion, Switzerland. Two volumes, 1240 + 1288 pages, CD-ROM. ISBN 2-88426-021-8. \$476 for the set or each component can be purchased separately (Volume 1, Cloth, \$238.00; Volume 2, Cloth, \$251.00; CD-ROM, \$338.00).—This monumental work deals not with scientific names or "Linnaean" nomenclature, but with names for birds that exist in other than the scientific idiom—the so-called "common" or "folk" names for birds. The first volume is a compilation of such names for all of the species of European and Middle Eastern birds, plus a few others that are almost universally known, such as the domestic fowl (*Gallus gallus*) and the Ostrich (*Struthio camelus*). Unfortunately, the introductory material does not clearly state or list which languages are included, but most of them appear in the list of abbreviations. Names for birds have been sought in Indo-European languages including "Iranian, Caucasian, and Hamito-Semitic languages" because "the area covered by these languages includes the Palaearctic region, a

zoogeographical entity within which can be found most of the European bird species. . . ." Names in Finnish, Estonian, and Hungarian are omitted because they are not Indo-European languages. Names from languages written with different alphabet characters, such as Cyrillic, Hebrew, and Greek, are transliterated with Roman characters.

The first volume proceeds species by species, with each account consisting of a list of names, given language by language, arranged in a geographical sequence more or less from the northwest (British Isles) to the south and east. All names that the author could discover are presented along with information on the counties or provinces in which each name, no matter how local, is used. The amount of detail is staggering. The section on names for the Magpie (*Pica pica*), for example, comprises 13 pages, of which more than 6 deal only with names used in Germany.

Being Swiss, with an interest in etymology, Desfayes naturally has several languages at his command and has written his book using more than one. In the species accounts, explanatory remarks are generally in French, except for names from the British Isles, for which English is used. Remarks about German names seem to be in either German or English. Definitions in Volume Two may be in either English or French. Anyone who is linguistically challenged would have considerable difficulty using this work, but would have little need for it in any case.

The second volume is less easily characterized. About two-thirds of it consists of what Desfayes refers to as his "paradigms" (Appendices 3–14). Here, names or the words used in names, along with various cognates (or perhaps pseudocognates), are arranged according to qualities, somewhat in the manner of the familiar Roget's *Thesaurus* of English words. The major groupings include terms of chromatic origin (e.g. red, dark, spotted), morphological (e.g. tall, tufted, swollen), acoustic (mostly onomatopoeic), kinetic (e.g. fly, wag, dive), and others.

The ultimate subheadings are combinations of sounds used in words that Desfayes identifies as being related to a given quality. Thus, section 3.2.54.2 is a list of words that contain the sounds "r-p" and mean "red", including the Greek, Latin, English, Czech and other words for turnip (*rapys*, *rapa*, *rape*, *repka*). The list also contains a Russian word for menstrues (*repaki*), Serbo-Croatian, Polish, Ukrainian and other words for linnet, robin, and whinchat (*repka*, *rzepoluch*, *repel*, *repalsic*), and a French word for the caruncles of a turkey (*roupie*), among others.

There are fascinating diversions to be encountered here. For example, we learn that the traditional (and believable) derivation of "belladonna" is folk etymology, and that "mayonnaise," according to Desfayes, is related to words meaning flecked or spotted, and is not derived from the siege of Port Mahón, Minorca, as given in many etymologies. These paradigms will be of as much interest to philologists and