



Book Reviews

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BOOK REVIEW . . .

The Microsporidia of Vertebrates, E. U. Canning and J. Lom. Academic Press, Ltd., 24/28 Oval Road, NW1 7DX, England. 1986. 289 pp. \$64.00 U.S.

This reference text is designed to aid recognition of microsporidial parasites by nonspecialists and aid species diagnosis by specialists. Overall, the book is successful in achieving its goals. Although Canning and Lom worked together, Canning was overall editor and wrote Chapters 1, 3 and 4; Lom wrote Chapter 2 with Dykova; and Canning and Lom wrote Chapter 5. The text has more or less uniform style and content.

The volume is divided into five chapters. Chapter 1 (Introduction to the Microsporidia) describes the economic importance of microsporidia, and their general characteristics and development (i.e., diagnostic features, and meronts and merogony, sporonts and sporogony, sporoblasts, spores and transmission). This chapter provides definitions of all genera of microsporidia parasitic in vertebrates.

Chapter 2 discusses microsporidia of fish, beginning with a list of fish hosts. It would be useful to have references with this list. The next section describes pathogenicity of microsporidia on fish hosts at the cellular and tissue level both histologically and ultrastructurally. Species descriptions usually have the following format: Species Name, Synonyms (where applicable), Hosts (including type of environment), Geographical Distribution, Site of Infection (within host), Signs of Infection and Pathology, Structure and Life Cycle, and Remarks. Several species descriptions are augmented by some or all of the following: Organization of the Xenoma, Relation to Host Age, Development in the Central Region, Commercial Importance, Transmission, Seasonal Fluctuation of Infection, Host Specificity, Taxonomy, and Treatment.

Unfortunately, the format of Chapters 3 and 4 are not consistent with Chapter 2. Neither Chapter 2 nor 3 has a host list.

Chapter 3 describes microsporidia parasitic in amphibians and reptiles. Each species description (usually) had the following format:

Species Name, Synonyms, Hosts and Localities, Morphology, and Lesions. The above headings were sometimes supplemented by Structure and Life Cycle, Transmission, Notes, and Comment.

Chapter 4 describes microsporidial parasites of birds and mammals. A brief section on birds precedes the mammal section. The species format included Species Name, Host and Locality, Lesions and Signs, Morphology (and Development), and Notes. The description of *Encephalitozoon cuniculi* is extended by Transmission, Diagnosis, Pathogenesis, Mechanisms of Resistance in *E. cuniculi* Infections, Interaction of *E. cuniculi* with Concurrent Infections, Relation between *E. cuniculi* and Tumors, and Control and Therapy of *E. cuniculi*. The section on the medical importance of microsporidia would be more appropriate in Chapter 1, integrated with the section on economic importance.

Chapter 5 is a brief guide to methods used for handling and studying microsporidia. References to specialized techniques are provided. This "techniques" chapter should be moved up as Chapter 2.

Although the book is published by Academic Press and is expensive, the paper is of lesser quality than usual; numerous pages of the reviewer's copy were damaged. Also, the quality of the photomicrographs is uneven. The grouping of the micrographs causes the reader to constantly "flip ahead and back" to match pictures with the text. Numerous line drawings of good quality, including schematics of life cycles, are used throughout the book. There is an extensive Table of Contents and an extensive Index. Relatively few errors (i.e., typographical, terminology) were noted. The References include references published in 1986.

Overall, the volume is a well written and adequately illustrated reference text of microsporidial parasites of vertebrates. Both nonspecialists and specialists will find the book useful.

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BOOK REVIEW . . .

Parasites and Diseases of Fish Cultured in the Tropics, Z. Kabata. Taylor & Francis Inc., International Publications Service, 242 Cherry Street, Philadelphia, Pennsylvania 19106, USA. 1985. 318 pp. \$54.00 U.S.

In many regions of the world the intensive culture of fishes and shellfishes are economically important and provide for important sources of protein for human consumption. Intrinsic to this type of animal husbandry are technical problems and losses in productivity attributable to the unnatural or perturbed conditions of maintenance (high densities in small ponds, floating cages, etc.) and the presence of pathogenic micro- and macro-organisms. To resolve these problems and reduce losses in productivity, there are needs for fish and shellfish health specialists well trained in the principles of fish culture and aware of the diseases and parasites of these organisms. The preparation of this volume, targeted at these issues in the tropical regions of southeast Asia, was stimulated by such concern expressed at the First Tropical Fish Disease Workshop held at Cisarua, Indonesia in 1978. Dr. Kabata has drawn upon a fragmented literature pertaining to fish pathogens in this region of the world and synthesized it with the principles and concepts of fish culture and management. He has reviewed an extensive literature and prepared a book of significant instructional and practical value.

The contents of the book are presented in four major parts: fish anatomy; diagnosis, prophylaxis and therapy; diseases; and parasites and pests. The first and shortest part of the book presents information on the internal and external anatomy of a hypothetical fish. Moreover, rather than address anatomy as it would be considered in a traditional ichthyology text, the fish is considered as a complex assemblage of substrates/habitats and the reader is cleverly introduced to the general types of pathogens one might expect to encounter in each anatomical location. This tact is a logical and sound starting point in the education of a diagnostician.

Diagnosis, prophylaxis and therapeutics are the subject of the second part of the book. This valuable portion of the volume is concise, yet complete, and introduces the reader to the principles of diagnosis, rational disease management and approaches to disease control. Emphasis is placed on the complexity of the task and the importance of a sound scientific approach to the collection of factual information pertaining to the host, pathogen and the physical and chem-

ical conditions of the habitat. Awareness of the norm and the use of common sense before rendering a decision with respect to the control or elimination of a pathogen from a pond or other aquatic system is also wisely emphasized. Considerable practical and logistical information including suggestions for the establishment of a diagnostic laboratory, methodologies for the examination of fishes, and approaches toward treatment are presented.

The remainder of the book, constituting the bulk of the volume, addresses the specific pathogens of fishes from southeast Asia. Kabata has reviewed the occasionally scant literature and when appropriate has supplemented discussions of major groups of organisms with information from other regions of the world. This is done, however, only to the point of presenting the basic concepts and with the purpose of stimulating future research in the contexts of the tropics. The viruses, bacteria and fungi are surveyed in Part III, Diseases; while the protozoa, platyhelminthes, nematoda and acanthocephala, crustacea, and leeches and mollusca are presented in Part IV, Parasites and Pests. Although a distinction is made between Diseases and Parasites and Pests, each group of organisms is discussed with respect to taxonomy, biology, prevention, treatment and, when relevant, control. Emphasis is placed on disease, pathogenesis and injury. Part IV also includes a chapter addressing nutritional and environmentally induced disorders. These chapters provide the basics and as such are both informative and instructive.

The title of this volume indicates a book with very limited and regional applicability, the tropics. This is somewhat misleading, for although it highlights pathogens in fishes from southeast Asia, the book emphasizes the principles and concepts of diagnosis, treatment and disease management with applicability to an aquarium in the family room and fish ponds in central Missouri. It is my impression that one need only insert the pathogens appropriate to the region of the world in which one works and the book becomes regionally relevant. This well written and readable volume presents a clear description of a great deal of technical information and is ideally suited for training specialists in fish health. I highly recommend this volume to aquaculturists and fisheries biologists in general.

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BOOK REVIEW . . .

CRC Handbook of Tapeworm Identification, Gerald D. Schmidt. CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, Florida 33431, USA. 1986. 675 pp. \$186.50 U.S.

During the last quarter-century, the literature on the systematics of cestodes has been voluminous, and the important earlier works by Wardle and McLeod (1952) and Yamaguti (1959), as well as the keys published by Schmidt (1970), have been long outdated. The *Handbook of Tapeworm Identification* by Gerald D. Schmidt was prepared with the objective of providing a modern reference in the English language that would permit the identification to genus of all known cestodes and cestodarians. In this effort, the author has been eminently successful.

The book is well organized, and the keys are uncomplicated and easy to use. The 513 figures consist of 720 line-drawings that primarily illustrate taxonomic characters at the generic level. The preface and a brief introduction are followed by sections on the general structure of cestodes, techniques of study, and instructions for the use of the keys. The main body of the book begins with keys to the subclasses of the Cestoidea and to the orders of the subclass Eucestoda. Thirteen orders of cestodes are recognized, including Dioecotaeniidea Schmidt, 1986, which was established to contain the monotypic family Dioecotaeniidae Schmidt, 1969. Because of the structural complexity of the Trypanorhyncha, a glossary of terms applicable in the taxonomy of these organisms has been included. With the exception of those of the order Trypanorhyncha, suborders of the Eucestoda have not been recognized. As was noted in the preface, the system of higher categories of cestodes remains somewhat controversial, and Dr. Schmidt has chosen not to accept the suborders established by K. I. Skriabin, which have provided a logical basis for the organization of the several volumes in the series *Osnovy Tsestodologii* (Akad. Nauk SSSR, 1951 *et seqq.*). He appropriately rejects the system advocated by Wardle, McLeod, and Radinovsky (*Advances in the Zoology of Tapeworms, 1950-1970*, University of Minnesota Press, 1974), that would confer full ordinal status on the aforementioned suborders proposed by Skriabin and coworkers. Keys to families are presented by order. A new family, Bothrimonidae Schmidt, 1986, has been established in the order Spathebothriidea. Keys are provided to all genera in each family. Type species, with synonyms, are indicated for each

genus, after which "Other Species" are listed with synonyms and hosts. The lists of species of several genera unavoidably include taxa that have been placed in synonymy or have been transferred (changes have been made also by taxonomic papers published since the volume went to press, e.g., revisions of dilepidids by E. P. Hoberg). The scientific names of the hosts are those given in the original publications concerning cestodes; of course, some of these names are no longer valid, and in some cases, different names are included for a single species of host (e.g., page 224, under *Taenia crassiceps*, both *Vulpes vulpes* and *Vulpes fulva* designate the red fox, a species now known to have an holarctic distribution). Such discrepancies should not present any problem, since host-names should always be checked against current taxonomic lists before they are used in publications. Following the section on the Eucestoda, the subclass Cestodaria is considered. This is followed by a glossary of terms used in the book.

The references, of which 4,103 are cited, also represent an important contribution. They register the taxonomic information available in the world literature on cestodes, but which has never before been comprehensively covered in a volume in the English language. The earliest papers cited are two by J. L. Frisch (1727), concerning cestodes of ducks and fishes. The two most cited authors are A. A. Spasskii and Ch. Joyeux. Titles of publications in Russian have been translated, but not those in Czech, Romanian, and other less prominent languages. As the author pointed out in the preface, citation of Russian authors is complicated by the variants of names resulting from different methods of transliteration. For example, the name of K. M. Ryzhikov also appears in the references as Rzhikov, Ryjikov, and Ryzikov. Moreover, transliterations of authors' names published routinely in the Russian literature (as authorities for scientific names) often involve Germanized spellings, probably because of a tradition dating from the early years of the Imperial Russian Academy of Sciences, founded in 1725. I found only a single lapsus in the references cited that is attributable to this practice: the same publication was cited twice, with authors listed as Chertkova and Kosupko (ref. 518) and as Tschertkova and Kosupko (ref. 3,700). On pp. 202-203, as one of the authorities for taxa in the family Mesocetoididae, the original spelling "Tschertkova" is given. The final section of the book, the index, lists all taxa of cestodes and cestodaria considered.

Minor errors are almost unavoidable in a volume of such size and complexity as the present one. In a rapid reading of the book, I recorded errors that were obvious; perhaps others were overlooked. On page 203, *Mesocestoides beringi* is given as *M. "bergini"*; on pp. 203 and 224, the name of the sand fox, *Vulpes corsac*, is written *V. "corsak"*; on page 220, the golden plover, *Squatarola squatarola* (= *Pluvialis squatarola*) is designated "*Squatarola squatarola*"; on page 221, the authority names for *Insinuarotaenia spasskii* Andreiko et Iun'-Lian' are given as "Andreido et Yun"; on page 224, the authority for *Taenia cervi* is spelled "Christionsen," instead of Christiansen; on page 225, the authorities for *Taenia krepkogorski* (Schulz [=Shul'ts] et Landa) are written "Sculz et Landa," and the authority for *Taenia michiganensis* is given as "Cower," instead of Gower. On the same page, the name of the jaguarundi (*Felis yagouaroundi*) is misspelled twice; on page 278, *Aploparaksis "zemae,"* instead of *A. xemae*; on page 340, "*Anoncotaenia*" for *Anonchotaenia*; ref. 1,278, "Hugerbühler," for Hungerbühler; ref. 2,964, "Bebiete" for Gebiete; and ref. 2,973,

"*Blanfodimys*" for *Blanfordimys*. Factual errors are few, but I did note that on page 287, *Gvosdevilepis fragmentata* is stated to occur in "rabbits," whereas it is known only from hares, *Lepus* spp.; on page 378, the Eurasian bittern, *Botaurus stellaris*, is listed as occurring in North America; and a distribution of "Asia and Europe" is indicated for *Diphyllbothrium dendriticum* (page 88), an holarctic species widely present in northern North America. But inaccuracies such as those are insignificant relative to the great quantity of detailed information that is provided.

As the first complete monograph of the cestode-fauna of the world to be available in English, Schmidt's *Handbook* will surely stand as an essential reference for many years. The book is indispensable to zoologists, wildlife biologists, and all others who have a serious interest in the taxonomy and biology of tapeworms.

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BOOK REVIEW . . .

Diseases of Marine Animals, Volume IV, Part 2. Introduction, Reptilia, Aves, Mammalia, O. Kinne, ed. Biologische Anstalt Helgoland, Notkestr. 31, D-2000 Hamburg 52, Federal Republic of Germany. 1985. pp. 543-884. DM 75.

When presented with a diagnostic investigation of disease in exotic animal species, it is often helpful to approach literature reviews on the range of infectious and parasitic disease for the species in question. Yet often much of the published work for marine vertebrate animals can be found only after extensive searches through several collections. This book effectively addresses this problem by bringing together and condensing an extensive literature into an appropriate survey for the diagnostician and biologist.

One outstanding concept this book offers is the introductory chapter, in which summaries of subsequent chapters are presented. This introduction allows quick reference of major infectious diseases of interest within a given host group, and greatly enhances the usefulness of the entire review.

Many of the host taxa represented, for example the Sirenia, have simply not been well studied in either free-living or captive environments. Those diseases which have been reported in such hosts are often presented as isolated, anecdotal accounts. The authors address this problem in several instances, and often offer helpful speculations to fill in gaps of understanding or to direct areas of future research. On the other hand, those host-pathogen systems which have been adequately investigated are presented in a superior manner. Based on the available literature, most of these well known systems represent metazoan parasitism, but protozoal, bacterial, and viral diseases are also reviewed with the same diligence whenever possible. Review of the indirect effects of disease, for example the economic effects of pinniped population on commercial fisheries, was fascinating reading and provided some insight into similar effects for other less studied host-parasite systems.

The authors make an important and valid argument for the inclusion of shore and estuary bird species in this review on the basis of their importance in the marine food chain, and thus their involvement in many cycles of pathogen and parasite transmission. However, they do not extend this argument to the polar bear, which is also a primary carnivore of the arctic marine ecosystem. Inclusion of a review of polar bear

disease would have enhanced the importance of this book for many workers in mammalian pathology, and may have provided interesting comparative information on marine carnivore diseases.

Although it may be beyond the stated purpose of the book, more detail on specific medical management in some cases would have been helpful from an applied point of view. Specifically, the case of special contraindication of aminoglycoside antibiotics for reptilian bacterioses deserves reiteration. Our laboratory occasionally examines reptiles from research colonies and collections which were treated and needlessly killed with these drugs.

As the importance of many marine host-pathogen systems for workers in animal disease lies in the comparative aspects of pathogenesis and host response, more discussion on these topics relative to the hosts reviewed would have also been helpful. Probably as a function of deficiencies in the available literature, both accurate morphologic description of host response and photomicrographs of specific lesions were found lacking in several cases. For example, the host reaction of sea turtles to hirudinean infestation was described as a highly vascular fibroma. The term fibroma in vertebrate pathology implies a dense, scirrous tumor relatively devoid of neovascularization. This lesion might be better interpreted as a primary vascularization, induced by either tissue hypoxia from injury or exogenous endothelial growth factors elaborated by the parasite, together with secondary fibroplasia due to chronic tissue injury and inflammation. Another example was the review of an anecdotal report of metastatic leiomyosarcoma in a sea otter. Although this tumor is seen on occasion in other carnivores, and could be suspected as an isolated case in this species based on the original report, the author seeks to associate the lesion instead with a previously unreported rickettsial pathogen. More thorough characterization of the lesion by careful morphologic description could have helped to clarify this erroneous conclusion. In another case, the description of flipper defects observed in adult baleen whales as congenital, implying present at birth, seems questionable when the photographic evidence is examined. The lesion in this case may more likely have been acquired from shark attacks or other sources of trauma over the animal's considerable lifespan.

Despite its few deficiencies, this book presents an excellent survey of what is currently known of the infectious diseases of these vertebrate

classes in marine habitats. Perhaps more importantly, the extensive information available to the authors is reviewed in an organized and highly accessible manner. I would recommend this book as an important resource for those biologists, students, and veterinarians actively

involved with the care, management, and study of these marine species.

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BOOK REVIEW . . .

North American Species of *Cuterebra*, the Rabbit and Rodent Bot Flies (Diptera: Cuterebridae), Curtis W. Sabrosky. Thomas Say Foundation Monograph, Entomological Society of America, 4603 Calvert Road, College Park, Maryland 20740, USA. 1986. 240 pp. \$33.25 U.S.

This monograph, largely taxonomic in scope, is the most comprehensive review based on the largest assemblage of specimens to date of the Nearctic species of the genus *Cuterebra*, the bot flies of rabbits and rodents. The first 42 pages of the text consist of a short introduction describing the scope of the work, and brief sections on history and classification, origins and association with mammals, host-parasite relationships, rearing and handling *Cuterebra* spp., and terminology used for taxonomic purposes. Unfortunately, the section on host-parasite relationships was disappointing to this reviewer. Although not within the primary context of this monograph, a concise but thorough presentation of the pathologic and immunologic host responses to the larvae of *Cuterebra* spp., with appropriate references, would have been of considerable value to the uninitiated reader. Additionally, comments on the potential impact of *Cuterebra* spp. larvae on the population dynamics of their hosts would have been appropriate (Boonstra et al., 1980, Canadian Journal of Zoology 58: 1683-1692). The discussions on the rearing and handling of these bot flies and on terminology used for identification are particularly useful, especially the former since the larvae cannot be separated taxonomically and these must be reared to the adult stage in order to be identified to species level.

The following 13 pages (43-55) are keys to the species groups and respective species of the genus *Cuterebra*. Many species complexes can be separated only on the basis of individual sexes; thus separate keys are included for males and females. Many of the couplets include principal locality records, which may or may not be of value depending on the extent of the collection records for the particular species.

The next 160 pages of text are individual species accounts, including descriptions of 11 new species, two new subspecies, and three new

varieties. A total of seven species groups (species complexes), and 34 species are listed. For each species there is an outline of the taxonomic history of the species, the species diagnosis, taxonomic descriptions of the adult males and females, a discussion of the disposition of type specimens, a list of the number of specimens examined and discussions of distribution of the species with maps for the more common species, hosts, immature stages (little information available), biology (very brief with only a listing of the literature), variation and taxonomy. There are numerous photographs illustrating the respective species, but there is a complete absence of line drawings of morphological features that could facilitate the differentiation of the respective species.

The final pages of the text include a listing of the taxonomic position of the natural hosts of *Cuterebra* spp. in the Nearctic Cuterebridae. This is one of the more valuable sections of the text, especially for those requiring additional information on this important group of parasites. The final eight pages of the book contain individual host and parasite indexes, listing the species which are referenced in the text. The host species are not cross referenced with the parasite species anywhere in the volume.

In general, the quality of presentation, printing, and photographic reproductions are of excellent quality. There are numerous black and white photographs and five color plates of adult males and females of *Cuterebra* spp. Likewise, the text is clear, concise, easy to follow, and free of grammatical and spelling errors.

This volume will be a welcome addition, as a reference on the taxonomy and as a source for the available literature, to the library of any Wildlife Disease Association member interested in, or working with, lagomorphs and/or rodents infected with these interesting parasites. This reasonably priced volume especially should be useful to anyone, including this reviewer, who has attempted to identify species of *Cuterebra* reared from the larvae found in infected hosts.

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BOOK REVIEW . . .

Ecology of Biological Invasions of North America and Hawaii, H. A. Mooney and J. A. Drake, eds. Springer-Verlag, New York, New York, USA. 1986. xvii + 321 pp. \$59.00 U.S.

This is volume Number 58 in a series of publications dealing with broad-based topics in ecology. The book is a result of a symposium held in Asilomar, California, on 21-25 October 1984, which explored biological invasions in North America and Hawaii. There are 16 chapters, couched under the broad headings of: (1) invasion patterns; (2) attributes of invaders; (3) site characteristics promoting invasions and impacts of invaders; (4) modeling; (5) biogeographic case histories; and (6) control of invaders. Many of the 20 contributors to this volume are recognized as foremost authorities in their respective research disciplines.

This volume attempts to provide some general indication of what is currently known about invasion processes. The title is, however, somewhat misleading in that the authors deal with invasion processes from around the world. Those cases from North America are confined principally to the western United States and Florida. As typical of the many multiple-author books that we now see on the market, this one has a number of personalities that reflect, among other things, differences in writing styles and in the taxa studied. A salient characteristic of this edition is its breadth of disciplines. A large portion deals with plant invasions, but other chapters cover fish, butterflies, birds, and mammals. Probably the chapter of most interest to Wildlife Disease Association members is Chapter 4 by Dobson and May entitled: "Patterns of Invasions by Pathogens and Parasites."

While the chapters are varied in their content, the thread with which the editors try to tie this volume together is the question of whether predictions can be made as to which particular species will be a successful invader. From the many diverse, and often conflicting answers provided by the authors of each chapter, it is obvious that we do not yet possess the knowledge or tools to make precise predictions of the potential establishment and success of a given invading species. Simberloff (Chapter 1) sums up this problem by saying that only through extensive field study on each species in question can any reasonable answer be obtained, and that systems are so idiosyncratic that they will defeat any attempt at concise generalization. It is immediately apparent to the reader that the complexity of an ecosystem and the stochasticity of

events that occur within that system are overriding factors which obfuscate any predictive aspects of modeling specific invasion processes. One other aspect of this book that points up the fact that this study area is still in its infancy, is the lack of agreement on what to call an invading species. Some of the authors call them "aliens," while others refer to them as "weeds, exotics, introduced, non-natives, colonizers, immigrants, or invaders." Bazzaz (Chapter 6) feels that the terms "aliens" and "weeds" are strongly anthropomorphic terms and should be avoided. This reviewer agrees, and would add to his list "exotics."

Dobson and May (Chapter 4) attempt to model the invasion process of pathogens and parasites. They achieve somewhat better success than other authors in this volume, in that they address this question on a much broader scale. They divide all pathogens and parasites into two broad categories: (1) those with direct life cycles (DLC); and (2) those with indirect life cycles (ILC). In comparing the number of protozoan and helminth parasites of freshwater fish from Great Britain and Canada, they found a predominance of DLC over ILC parasites (in a rough proportion of 4:1). From this they conclude that DLC parasites are more likely to be successful invaders than are ILC parasites. The next part of their chapter deals with parasites in two hosts. They consider the theoretical situation where introduced parasites can not successfully sustain themselves in a newly invaded host species without the presence of an alternative introduced host species, giving some possible examples where this might have occurred. An intriguing section discusses examples of how introduced parasites may alter the competitive relationships between two species (using fish from Great Britain), and how hosts may become more successful invaders if their parasites are not present (starling and house sparrow ectoparasite data from Great Britain and the United States). The last portion of their chapter is perhaps the most interesting, and deals with modeling coevolutionary patterns of hosts and parasites. The basic message from their derived equation is that: "the characteristic time for resistance to appear depends linearly on the generation time, and only very weakly on other factors." Throughout this chapter the authors emphasize that anthropogenic disturbances accentuate not only parasite introductions, but also create situations that permit increased establishment and spread.

In summary, this book is clearly written and factually sound. It is an important contribution

to science because it attempts to tie together, for the first time, what is presently known about the characteristics of invading species. It is surprising what little is really known regarding the dynamics of these organisms. For those interested in modeling diseases, and those interested in the question of invasions, this book would prove useful. However, for the person working in wildlife disease, the book offers little more than the chapter by Dobson and May. Disease is mentioned only in passing in other chapters

(e.g., Vitousek, Chapter 10; Moulton and Pimm, Chapter 14). With a price of \$59.00, I suspect that most wildlife disease workers would be better off copying those sections of the book that they find interesting.

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BOOK REVIEW . . .

Pathogenesis of Bacterial Infections in Animals, C. L. Gyles and C. O. Thoen, eds. Iowa State University Press, 2121 South State Avenue, Ames, Iowa USA. 1986. 227 pp. \$18.95 U.S.

The study of the pathogenesis of bacterial disease—the way in which bacteria interact with the host to cause disease—seems to me one of the most interesting aspects of veterinary medicine. Moreover, it is an aspect that may be of particular concern to the wildlife veterinarian; faced with such questions as the behaviour of an organism in an unfamiliar species, the existence of a carrier state, or the role of disease amid a complex of environmental stressors. It is an area of research in which there has been a good deal of activity in recent years and some exciting discoveries. So, I approached this book with high expectations.

I have to admit that, overall, I was disappointed. There are 25 chapters written by 22 different authors, including the two editors, each chapter dealing with a different organism or group of organisms. The information, so far as I can judge from the areas with which I am familiar, is up to date and reasonably complete. There is, however, no introductory or unifying chapter to outline the general principles of pathogenesis—bacterial strategies, host defence mechanisms—or to acquaint the reader with the various lines of research. This, I believe is the book's greatest weakness; a weakness compounded by several of the authors, who list the properties and products of the bacteria and their possible actions, but make no attempt to integrate all this information into a coherent picture of how an organism actually comes to grips with its host. No doubt this caution arises from the incomplete and often contradictory nature of the evidence, and this is perhaps the reason why some of the most satisfactory chapters are the four that deal with the clostridia, which produce powerful toxins that have been well studied.

Perhaps also, the authors expect the readers to make their own judgements from the evidence presented. This, however, raises another problem of the book: for whom is it intended? The editors hope that it will be useful to "microbiologists, pathologists and clinicians," and so it may be, but the latter two groups, with neither introduction nor glossary to help them, could find themselves in difficulties with some of the biochemical and microbiological terms. On the other hand, those unfamiliar with the diseases discussed are well catered for, since most chapters begin with a description of the relevant

bacteria, then go on to list the diseases produced, with their signs and pathology, and even therapy and prophylaxis. The veterinarian who has forgotten the clinical signs of strangles will be able to find them here, but if he does not know what a glycocalyx is, or a ganglioside, he will get little help.

As the editors point out, "different bacteria lend themselves to different presentations" and certainly the presentations vary considerably, both in content and quality of writing. The chapters by J. F. Prescott for example (on *Corynebacterium*, *Campylobacter* and gram-negative anaerobes) are lucid, well organised, and a pleasure to read. Others are less rewarding: the writing sometimes ambiguous, with needless repetition and irrelevant detail. A few writers seem to have mistaken "pathology" for "pathogenesis." It must be admitted that some authors have had a more difficult task than others. To cram, for example, all that is known about pathogenesis of streptococcal diseases into one chapter can have been no easy undertaking. Most of the bacteria of veterinary significance are covered, including mycoplasma but omitting rickettsia and chlamydia. A few, such as the genus *Actinobacillus*, *Proteus* spp., and anaerobic cocci, are overlooked or receive only passing mention. The quality and usefulness of the figures, like that of the text, varies greatly. There are some excellent scanning electron photomicrographs; these give, as perhaps nothing else can, a glimpse of what life is really like on the battlefield, at the interface between invader and host. There are unhelpful photographs of bacteria and of histopathology, some useful diagrams and some that are lacking in adequate labels, and a half-page figure showing the chemical structure of a glycolipid, which seems a strange use of space. There is also a small number of printing and other accidental errors, the most glaring being a reference to *Escherichia coli* with 2 m long pili!

Most of the diseases dealt with are those affecting the conventional domestic animals, with occasional brief references to wild or zoo animals or to farmed wild species such as salmon and mink. The chapter on *Clostridium botulism* would be of interest to people working with waterfowl, since it deals with the disease in these birds as well as in farm animals and includes a discussion of the ecology and distribution of the organisms. The chapter on the genus *Yersinia* contains brief descriptions of the epidemiology of *Y. pestis* and *Y. pseudotuberculosis* in wildlife of North America. There is also, surprising-

ly, a chapter on *Shigella* spp., of concern to those who deal with primates. The chapter on mycobacteria, which is one of the most disappointing in the book, lists oryxes and tapirs among the animals susceptible to tuberculosis, but fails to mention such epidemiologically important species as the English badger or New Zealand's brush-tail opossum, and the armadillo receives only passing mention as a host of *Mycobacterium leprae*. Nevertheless, most of the bacteria

dealt with here do affect wild as well as domestic animals, and in spite of its shortcomings, anyone who is interested in bacterial diseases of wildlife may well find the book worth purchasing.

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