

Book Reviews

Mammals of Malawi An annotated check list and atlas

W.F.H. Ansell and R.J. Dowsett

The Trendine Press, Zennor, St Ives, Cornwall, 1988
170 pages text plus 53 pages of maps
Price: U.K. £12

This is an uncommonly interesting and well-written book. To those who know the senior author this would not be surprising: he, like Jonathan Kingdon and the late Reay Smithers, loves mammals as animals — one suspects some even as friends! — and not just as objects for scientific curiosity. This is not a book primarily for the taxonomist, but then Ansell and Dowsett are not taxonomists; rather it provides — extremely well in my opinion — an up to date account of the mammals occurring in Malawi as the stated objective in the introduction reads. I feel the strength of this book lies in especially Ansell's many years of living with mammals in central Africa, and his extensive knowledge of their habitats, habits and geographical distribution both within and outside the study area. In addition, his intimate knowledge of the people involved, present and past, with Malawian mammals afforded him a rare insight into possible mistakes in identity of species, and misallocations of collecting sites. This would patently have been impossible for anyone not so familiar with this topic and area as Ansell. Factually, therefore, this book provides a great deal of useful and detailed information; in conjunction with a friendly writing style this makes for an eminently readable volume.

The Introduction is a model of its kind. A single general paragraph states why the book was written: to provide an up to date account of the mammals in the geographic gap between the areas covered by Kingdon's volumes (1971–82) on the mammals of East Africa, and those by Smithers (1983) and Meester, Dippenaar, Rautenbach & Baker (1986) for southern Africa. Other areas also recently afforded attention are Mozambique (Smithers & Tello 1976), Zambia (Ansell 1978) and Zimbabwe (Smithers & Wilson 1979). With the present volume the only notable gap south of the East Africa–Zaire line would therefore be Angola; Hill & Carter's (1941) work is now sadly out of date. The general paragraph is followed by sections on the physical features and population of Malawi (including a short mention of the effect of the tsetse fly and rinderpest on indigenous mammals); zoogeography, wherein mention is made of species occurring in both forest and savanna, in forest (especially montane forest), and the eastern forest element; systematics; and sources of records,

primarily museum material and from published accounts, but also records that resulted from a request in Nyala. Then follows a section on 'Text for the Systematic List' which serves to explain the arrangement of the text in the systematic list: heading; synonymy; specimens (a list of museums known to house specimens of that particular species); other records; indefinite (records that cannot be allocated to a particular square in the distribution maps); rejected locality or locality correction (if any); extralimital occurrence; habitat and habits; general, and taxonomy. Before the extensive list of acknowledgements is reached 'species mapping' briefly explains the plotting of distribution records on the maps, while a brief paragraph explains the rejected species and possible additions to the species list. These first nine pages therefore introduce the main text and also serve as explanatory notes on the format followed.

A three-page section describes the mammal habitats of Malawi. A classification of the vegetation types is given (forest, woodland, thicket, grassland, swamp, lakes and rivers, rocks and man-made habitats) and then these are briefly discussed, while the distribution of these vegetation types in Malawi is very briefly dealt with.

Finally, before what can be regarded as the main section of the book — the systematic account — is reached, the conservation of Malawian mammals is described. Especially valuable here for the prospective visitor to Malawi are brief accounts of the national parks and game reserves — location, size, vegetation and major mammal species present.

The major portion of the book — some 105 pages — is devoted to the systematic account. In the main, the arrangement of Meester *et al.* (1986) is followed; where this is departed from brief reasons are usually given. However, this is not the case for the use or non-use of subfamilial or subgeneric names. Brief introductions are given to some orders, families, subfamilies or even genera, but not all. For each genus the author, reference and type species with its locality are given; where applicable also synonyms (e.g. for *Pipistrellus*). For each species the layout of the text follows the arrangement explained in the introduction: name, author, reference, and type locality are given. Then follows the list of museums having specimens; extralimital records (if any); habitat and habits; general observations, and in most cases taxonomy. Common names are given where applicable.

Explanatory paragraphs, sentences or footnotes are liberally scattered throughout the text. They relieve the strict sequence of the presentation of facts, and alleviate any possible dullness that might have crept in. Personally I found these notes extremely useful, and they certainly add a very human touch to the text; some readers, however, might find them distracting. These notes cover problematical species (e.g. *Crocidura mariquensis*); localities with incorrect co-ordinates; species incorrectly recorded from Malawi (e.g. *Rhinolophus capensis*); species that could occur in Malawi, but not yet collected; and miscellaneous historical notes, sometimes correcting previously erroneous accounts.

This is not a taxonomic review and the authors wisely do not attempt to resolve taxonomic problems; they do, however, recognize such problems and allude to them. Some 188 species are listed (including the introduced *Rattus rattus*) while the 180 distribution maps at the end of the book document known localities. These maps are individually numbered (but not the pages) and only in a few cases do species share a map: *Otomys typus*, *O. denti* and *O. anchietae*, as well as *Rhabdomys pumilio* and *Arvicanthis* being examples.

Some more obvious departures from the usage of Meester *et al.* (1986) are the acceptance of *Hydrictis* as a full genus, and not a subgenus of *Lutra*; the recognition of *Nycticeinops* as a full genus separate from *Nycticeius*; the retention of *Cercopithecus pygerythrus* and *C. albogularis* instead of *C. aethiops* and *C. mitis* respectively (although *C. aethiops* and *C. mitis* are retained as superspecies). Differences in spelling noted are e.g. *Rhinolophus hildebranti* (not *R. hildebrantii*) and *Myotis bocagii* instead of *M. bocagei* as in Meester *et al.* (1986). In the absence of electrophoretic studies on *Mastomys*, the *M. natalensis* is treated as a species complex.

The species accounts are followed by a 19 page annotated gazetteer, with type localities indicated; and the localities collected at by particular collectors or expeditions. Then follow the references, index of genera, species and subspecies, index of English names, and finally maps of the administrative regions and districts; relief; drainage; rainfall; maximum temperature; minimum temperature; vegetation; National Parks and Game Reserves; and the distribution maps.

The amount of information contained in this somewhat small volume is amazing. Even more amazing is how interesting a normally dull checklist has been made. As stated above this no doubt stems from the long association of Ansell with Malawian mammals, and his, and his co-author's, fondness for them. I have pleasure in recommending this comprehensive, well-researched and factually correct book to anyone interested in central African mammals.

J.A.J. NEL

Department of Zoology, University of Stellenbosch,
Stellenbosch

Frugivores and seed dispersal

Alejandro Estrada & Theodore H. Fleming (Editors)

Dr W. Junk Publishers, Dordrecht 1986
392 pp.

This book is the fifteenth volume in the Tasks for Vegetation Science series and the first one to deal with a partly zoological theme, namely seed dispersal by animals. The book is the product of a symposium workshop held at the Los Tuxtlas Biological Station,

Veracruz, Mexico, in June 1985.

The book contains 28 contributions divided into four main parts. Each part has an introduction summarizing the main themes of its contributions. Owing to the venue of the symposium the book is heavily biased towards the Americas with only one specific European contribution (Snow & Snow) and one review paper by Herrera. In the whole book only one reference to South African work appears.

Part 1 deals with plant strategies. The most thought-stimulating chapter of the book is Herrera's review on the question why vertebrate-dispersed plants do not behave the way they should. He points out that many of the previous co-evolutionary strategy theories are far too simplistic and that seed dispersal mechanisms are far more complicated than just 'specialized' or 'generalized'. The idea that frugivory mutualism involves one-on-one co-evolution between plants and animals is downplayed. This interaction can be counteracted in many ways by various pressures including non-legitimate frugivores, pollination and breeding systems, seed germination requirements (especially in tropical forest gaps), and the stochastic nature of the availability of 'safe sites'. This theme is corroborated by many chapters in this book.

Wheelwright indicates that fruit ripening rather than fruit characteristics may have a major influence on frugivore food choice. He points out that the role of fruit characteristics has been over-emphasized in the past. It is with pleasure that I read his call for more simple but long-term phenological studies which can even be carried out in one's backyard. Densley *et al.* discuss the role of spatial aspects (both between and within shrubs and trees) of fruit displays. Stiles & White cover the influence of season, nutrients and vegetation structure on seed deposition patterns. Wilson & Hoppes tested and disproved the hypothesis that autumn leaf colour has an influence on fruit advertising. They found that infructescence traits offer reliable cues of fruit availability to frugivores. Finally Vázquez-Yanes & Orozco-Segovia discuss the influence of the time seeds remain in the gut on seed coat photosensitivity and, hence on light-controlled dormancy.

Part 2 deals with our zoologists' principal interest, namely frugivore strategies. It includes two papers on brown capuchin and howling monkeys, respectively. Jansen *et al.* show that capuchin foraging behaviour is more sensitive to plant population parameters than to fruit characteristics. They suggest that fruit choice in primates may differ from that in birds. Several papers indicate that prolonged temporal availability appears to strongly influence fruit choice in howling monkeys (Estrada & Coates-Estrada) and phyllostomid bats (Fleming, Charles-Dominique). Both latter authors illustrate the important role bats play in secondary plant succession by feeding selectively on fruit of pioneer plant species. The Estradas furthermore point out the contribution of dung beetles to dispersal success of large, monkey-excreted seeds by lessening the risk of post-dispersal predation. Both Fleming and Charles-Dominique discuss the differences between birds, bats and monkeys in their feeding strategy. The next two

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papers describe experimental work on birds. In a very elegant and illuminating series of experiments Moermond *et al.* show the influence of morphology and a variety of other factors on fruit choice. Their results indicate that at least two groups of birds exist regarding morphology and foraging behaviour: birds that routinely pluck fruits on the wing and birds that perch on branches or on infructescences while harvesting fruit. Level points out that different families of tropical frugivorous birds handle fruits and seeds very differently. Unfortunately both papers lack in verification from field studies. It is known that foraging behaviour and related aspects can differ substantially between experimental and wild birds of the same species. In the only Palaearctic contribution the 'founders' of current seed dispersal studies, David & Barbara Snow, to whom this book has rightly been dedicated, suggest that predation risk has had a stronger influence on avian sociality and fruit-eating behaviour than has the accessibility and handling characteristics of fruit. They hypothesize that temperate seeds are less well defended against avian consumers than are tropical seeds. Interestingly they consider mistletoes to be the most likely plants for long term fruit defense. It has also been suggested that tinkerbirds in Southern Africa defend their mistletoe resources (my own work).

Part 3 (the longest) deals with the consequences of seed dispersal. Papers in this section discuss the post-dispersal fate of seeds. Several papers point out the difficulty in measuring the role played by seed dispersal in determining the reproductive success of plants. In the absence of actual data on dispersal success, Horwitz & Schemke and Murray resort to computer modelling in an attempt to discern the adaptive significance of different dispersal strategies. The danger of a modelling approach combined with generalization, is shown by the fact that both papers suggest rather conflicting tendencies. The former authors' simulation indicates that selection favours short distance dispersal to safe sites rather than long distance dispersal. Murray's simulation confirms the widely held idea that dispersal away from parent plants (i.e. long distance dispersal) increases their reproductive success. Depending on the situations both tendencies can, of course, be found. Herthaus shows that pre-dispersal seed predation, rather than ant dispersal, has the greatest effect on spatial variation in seed production in an ant-dispersed herb. Stapanian reviews thoroughly seed dispersal by birds and squirrels in deciduous North American forests. Dirzo & Dominguez review the interaction between dispersal and post-dispersal seed predation. They point out the importance of studying seed dispersal in a broad life history framework and that the ecological consequences of seed dispersal need to be studied as well. Hamrick & Loveless, in a very interesting paper, consider the genetic consequences of seed dispersal. Their data indicate that compared with the effect of pollination mechanisms, seed dispersal mechanisms do not strongly influence the genetic structure of populations. Both Jansen and Hallwacks discuss the post-dispersal fate of particular kinds of seeds in tropical dry forest. Jansen, in an experimental study, proposes that the different seed

shadows produced by different species of large mammals are likely to be differentially thinned and trimmed by terrestrial granivorous rodents. Hallwacks found that agoutis move seeds from zones of high mortality to areas of lower mortality risk. Gonzales-Espinosa & Quintana-Asencio document the variety of ways in which frugivorous birds and mammals, and granivorous rodents and ants can influence the survival of *Opuntia* seeds. Their data emphasize the difficulty that exists in classifying the impact of frugivores and seed predators on plants as being beneficial or harmful.

The fourth, and last, part deals with the community aspects of frugivory and seed dispersal. A common theme that runs through papers by Platt & Herman, Martinez-Ramos & Alvarez-Bullya and Brokaw is the role played by dispersal mechanisms in determining the spacing patterns of juvenile plants. Platt & Herman show that post-dispersal factors that influence juvenile growth and survival override differences in dispersal methods in determining dispersion patterns. Martinez-Ramos & Alvarez-Bullya show that recently dispersed seeds are more likely to produce waves of new recruits than are seeds from the soil seed bank. Brokaw's findings indicate that a close degree of coupling does not exist between the timing of dispersal, gap formation, and seedling emergence. Garwood similarly points out that seedling survival is only loosely correlated with time of germination. Foster *et al.*'s study shows that dispersal mode can significantly influence plant community composition along a successional sere along a river bank. The differential roles of wind, bats, birds and non-volent mammals in this succession is shown. The last, but not least, paper by Terborgh is the only one in which the conservation implications of these studies is explicitly pointed out. He suggests that a handful of 'keystone resource' species support most of the frugivore biomass during the wet-dry season transition in lowland Peruvian forest. Extinction of these species would lead to a drastic reduction in frugivore carrying capacity of these forests and could even lead to frugivore extinction. The keystone concept has also still to be touched on in our country.

It is difficult to make exceptions with such thorough contributions but personally I found the papers by Herrera, Moermond *et al.* and Terborgh the most stimulating ones. The most important value of the book is that it shows the highly complicated nature of dispersal mechanisms, the inadequacy of current theoretical frameworks in this regard and a host of new avenues for research. It is aimed both at botanists and zoologists (and even geneticists) working in this field. Despite its heavy American bias it is a must for every seed dispersal ecologist, and is, therefore, highly recommended.

S.K.B. GODSCHALK

Logistics Division (Section Environmental Services), South African Defence Force, Pretoria

Seasonal Adaptations of Insects (1986)

Maurice J. Tauber, Catherine A. Tauber and Sinzo Masaki

Oxford University Press
411 pages

There has recently been a renewed interest in insect life history. This is evidenced by the book edited by Brown & Hodek (1983) on Diapause and Life Cycle Strategies in Insects and more recently one edited by Taylor & Karban (1986) on The Evolution of Insect Life Cycles. There is certainly room for another. Seasonal Adaptations of Insects is a 'state of the art' book. It is both a synthesis and critical review. The authors have organized their book into five main parts. These include the following; aseasonal and seasonal changes, then types of changes, especially diapause, but also dormancy, migration and polyphenism. They then discuss mechanisms through which environmental and genetic factors influence seasonal changes. The evolutionary implications of these follow. Finally they end the book with a chapter on seasonality and insect pest management. Throughout the book the authors mention that the emphasis for future research should include evolutionary and ecological approaches to insect life histories.

The book is divided into 10 chapters and has a comprehensive 73 page reference list at the end. An outstanding feature is the summary at the end of each section and at the end of each chapter. This helps make the book very readable.

The emphasis for discussion in each chapter comes from studies done on insect species that are either pest species or usually of economic importance. North American and European insects feature. However, this should not deter the South African scientist. The wealth of information contained in this book and its comprehensive coverage will make it a book worth having both by those in basic as well as applied entomology.

Chapters 3 and 4 deal with diapause and are extremely well written. They stress that diapause is not simply a cessation of events but has as its primary function the timing of several different types of physiological, biochemical, behavioural and morphological changes. These are positive features of the insects' life history, and not restricted merely to protecting the insect from adverse conditions. The information on diapause is often of a contradictory nature and the authors handle such diverse data so as not to confuse the reader.

Environmental regulation of seasonal cycles (Chapter 5) involves photoperiod and temperature as well as other factors. The discussion on diet was found to be of interest.

One of the most intriguing chapters in the book is the one which deals with special cases (Chapter 6). These are the parasitoids, social insects, tropical insects, arctic and desert insects. Of special interest are the phenological problems which deserts present to insects.

However, the lack of information is evident as the authors cover the topic in about three pages. Certainly the long-term studies being conducted in the Namib desert on the life history patterns of the Tenebrionids will contribute much to our understanding of the mechanisms and evolutionary history of seasonal adaptations in this environment. The role of diapause and the function of environmental cues in regulating desert insect seasonal cycles have not been delineated. This is a field to be investigated on our own doorstep.

The figures in the book, although few, are a salient feature; as are the tables. Some figures represent the ideas of several workers and all are innovative. A good example is the model that the authors propose for multiple pathways in the evolution of insect diapause.

The authors have written a book that goes beyond clarity and comprehensive coverage of the subject. Throughout, they have suggested both the direction and focus for future research. This book will long be a must for workers in the field and a source of inspiration for those getting started in the field of insect seasonality.

E. McClain

Department of Physiology, University of the Witwatersrand Medical School, Johannesburg

Biology of Copepods

Edited by G.A. Boxshall and H.K. Schminke

Developments in Hydrobiology 47
Kluwer Academic Publishers, 1988
Price: U.K. £123

This hefty 639 page volume documents the proceedings of the Third International Conference on Copepoda, which was held at the British Museum of Natural History in London between 10–14 August 1987. About half of the 73 papers presented in the book deal with the central theme of the meeting — the biology of marine planktonic copepods. Three of the seven separate sections focus on topical areas of research within this theme, each of which formed the basis of a special symposium at the conference. These are: Rate Processes in Field Populations of Planktonic Copepods; The Taxonomy and Biology of *Calanus* and Oceanic and Deep Sea Copepods. A further 22 miscellaneous papers make up a fourth section, entitled simply Marine Plankton.

Although renowned for their dominance of marine planktonic communities, copepods exhibit a wide range of other lifestyles and flourish in freshwater, benthic, interstitial and cave habitats, as well as partaking in a variety of symbiotic associations with invertebrates, and particularly with fish. These themes form the basis of the last three sections of the book, which deal with Freshwater Copepods, Harpacticoid Copepods (which

are benthic forms) and Parasitic and Associated Copepods.

Since it comprises a wide variety of separate specialized research papers this is not a volume for the casual reader. It nevertheless provides a unique and up to date picture of our current understanding of the biology of the Copepoda, which are reputedly the most abundant metazoans on the planet Earth. As such it will surely be considered an essential reference volume on the bookshelf of the specialist copepod researcher, despite its daunting price of well over R500. Those with a more peripheral interest in this group are advised to go elsewhere, while specialist researchers may do better to locate the particular papers which they require in volumes 167 and 168 of the journal *Hydrobiologia* from which this proceedings volume is reprinted.

C.L. GRIFFITHS

Zoology Department, University of Cape Town, Cape Town

Stimulus–Secretion Coupling in Neuroendocrine Systems

Edited by D. Ganten, D. Pfaff and B. Pickering

Current Topics in Neuroendocrinology Vol. 9

Springer-Verlag, 1988

256 pp.

Price: U.S. \$108

A fundamental mechanism in the functioning of neuroendocrine systems is stimulus–secretion coupling — the translation of electrical activity of the neurones into the release of precise quantities of neurosecretory product. Control of secretory events has been studied extensively in other physiological systems, and for excitable cells it is well established that an increase in internal calcium concentration is the triggering event in exocytosis of secretory granules. This volume is the first to treat stimulus–secretion coupling in an exclusively neuroendocrine context. It provides authoritative reviews in a field which is expanding rapidly as a result of recent technical advances in biochemistry, biophysics and molecular biology. Most of the papers cited were published in the 1980s, and the 1987 literature is included.

The best-studied mammalian peptidergic neurones are the magnocellular neurones of the rat hypothalamus, secreting oxytocin and vasopressin: these form the subject of the first three chapters, including a particularly clear account by Poulain & Theodosis of the coupling of electrical activity and hormone release. The only other vertebrate neurosecretory cell type discussed is the pancreatic B cell. It was surprising to find almost half of this book devoted to invertebrate neuroendocrine systems. Although the neurohypophysis is a favourite mammalian model, its small terminals (2 μm) are not suitable

for intracellular recording and thus stimulus–secretion coupling cannot be studied at the level of a single neurone. In contrast, the X-organ – sinus gland system of certain crabs has terminals up to 30 μm , permitting precise electrophysiological characterization of secretory events. Cooke and his colleagues at the University of Hawaii have made remarkable progress in understanding peptide neurosecretion with this preparation.

The long chapter by Thorpe & Duve on insect neuropeptides was disappointing. Although useful in summarizing current knowledge of the biochemistry of insect peptides, especially those chemically related to vertebrate peptides, it contains no more than a few lines about stimulus–secretion coupling and scarcely belongs in this volume. Yet it is conceivable that the brain – corpora cardiaca system of an appropriate insect could yield an experimental preparation as fruitful as the crab X-organ – sinus gland. Both are analogous to the vertebrate hypothalamic–neurohypophysial system.

A review volume of this nature needs a preface to link eight diverse chapters and provide some perspective: its omission implies that the book is aimed only at specialists in the field. A further complaint is the price of U.S. \$108 (which apparently becomes an astronomical R380 if the book is ordered in South Africa). There is currently a clear trend in scientific publishing towards the production of more specialized and more expensive books, which sell correspondingly fewer copies.

SUE NICOLSON

Department of Zoology, University of Cape Town, Cape Town

How Brain-like is the Spinal Cord?

Uwe Windhorst

Springer-Verlag, Berlin, 1988

Price: DM198

334 pp

The 15th publication in the 'Studies of Brain Function' series brings together a comprehensive collection of theories and experimental data dealing with interacting neural assemblies of the spinal cord. Following in the same vein as other publications in the series, such as M. Abeles's 'Local Cortical Circuits' this book is consistent with the concept that the nervous system is essentially a statistical machine. Much of the work centres around high-powered statistics, some of which would probably be more comfortable in the hands of the mathematically inclined. As a whole the work moves away from single neurone schemes and enters the conceptual whirlpool of the workings of large assemblies of neurones. The complexities of the issues are emphasized throughout, which is to say, that this is not the 'beginners guide to neurophysiology'.

The book covers a variety of topics organized around

the central theme of spinal cord neuronal functioning. In Chapter 1 there is a discussion of correlations between neuronal discharge patterns in supraspinal centres, particularly the cortex. As well as reviewing some neuronal assembly correlation theory, the first chapter establishes the terms of reference for the book. The following chapters present an argument that the spinal cord uses an information processing system of equal complexity as that found in 'higher centres'. Chapter 2 covers theories, hypotheses and experimental data concerning correlations between α , β and γ motoneurons. Although no general theory is presented, both the origins and consequences of the correlations are reviewed.

Chapter 3 is titled 'Tremor states' and deals with networks of neurones which play a role in physiological tremor. In this chapter the correlation patterns of the conventional stretch reflex are presented, as well as the feedback systems acting on the reflex. Chapter 4 reviews spinal recurrent circuitry and proprioceptive feedback integrating these mechanisms into a parameter adaptive motor control system. The importance of these mechanisms in the control of posture and movement is discussed. The final chapter deals with problems in spinal cord physiology such as which variables need to be controlled and which measured. The complexity of the spinal cord is emphasized and pertinent problems identified. The author has also identified areas which need further research and clarification.

Although the question asked in the title of the book is not answered *per se*, the book does succeed in outlining the similarities between spinal cord mechanisms and supraspinal mechanisms. To the person directly involved in neuronal signal analysis or computer modelling the book will probably serve as a stimulant of new ideas and further research. The depth of the concepts and the degree of background knowledge required may limit the appeal of the work to the broader scientific community. The book does, however, leave one regarding the spinal cord and our means of analysis thereof, in an entirely different light.

STEVEN CARTMELL

Brain Function Research Unit, Department of Medical Physiology, University of the Witwatersrand, Johannesburg

Complex Interactions in Lake Communities

Edited by S.R. Carpenter

Springer-Verlag, New York 1988

283 pp.

Price: DM128

As a result of certain negative perceptions of contemporary American limnology among scientific

practitioners and administrators, a workshop was organized to stimulate limnological creativity and innovativeness in aquatic community ecology, and to improve the standing and funding competitiveness of limnology within the National Science Foundation. This workshop was held at the University of Notre Dame, USA, in 1987, and the present multi-authored volume reports on the proceedings of that meeting.

The sixteen chapters of the resulting book are arranged into five sections which follow the introduction: 'Patterns and surprises in lake food webs' (Chapters 2-4); 'Microbial links to the classical food web' (5-6); 'Multiple causality and temporal pattern in lake ecosystems' (7-8); 'Reports from group discussions' (9-14); and 'Synthesis' (15-16). The first two sections reveal the primary focus of the volume — aquatic, and specifically lake food webs. Seven of the chapters explicitly incorporate the phrase 'food webs' in their titles, while this topic is implicit in several others. The book focuses on the structure of food webs, food web interactions, controlling factors, and the analysis of complex interactions which collectively determine food web structures and dynamics.

The title of the volume begs the obvious question: what are 'complex interactions'? Being aware of the complexity and multivariate structure, functioning, and regulation of aquatic ecosystems, I wondered what fundamental personal deficiency was reflected by my seeming ignorance of this term. A variety of definitions and interpretations emerged as I progressed through the volume. Carpenter & Kitchell (p. 2) introduce complex interactions as those resulting from 'multiple pathways linking organisms and/or abiotic resources such as nutrients or detritus.' Neill (p. 31) defines 'complex or indirect interactions' as 'sequences of biotic interactions that functionally link components (species, size classes, functional groups, trophic levels, etc.) in a community.' (Notwithstanding recent serious criticisms which have been levelled at the trophic level concept, and its rejection by Cousins (1985) as being not merely flawed but fundamentally erroneous, the term is retained in this volume, although its shortcomings are implicitly recognized in several chapters: perhaps ecologists will never be able to dispense with this terminological tradition). The final chapter (Kitchen *et al.*, p. 263) describes 'what we now call complex interactions...' as encompassing 'several of the major advances in aquatic ecology', viz. Lindeman's trophic-dynamic concept; Hutchinson's multidimensional niche; size selective predation and the size efficiency hypothesis (correctly accredited to Hrbacek and co-workers as well as the more usual partisan American reference to Brooks & Dodson); the keystone predator concept; optimal foraging theory; the microbial loop; the ontogenetic niche; ...and trophic cascades. And these indeed provide the backbone of the volume, the coverage of which is correspondingly broad. I was relieved that my training and experience weren't totally deficient. The adjectival categorization of this vast nexus as 'complex' is indeed appropriate, if not generally familiar.

The 13 principal chapters average nearly 20 pages in

length. Most are dual or multi-authored, and all are self-contained with reference lists. Some describe specific studies, or hang heavily upon particular case studies. Others are effectively review papers, even though the book as a whole does not attempt to serve this purpose. Writing styles obviously vary from chapter to chapter, but consistency in quality has been achieved. The structure of the volume results in considerable repetition: several of the group discussion reports reiterate information provided in earlier chapters. However, the resulting independence afforded the report chapters (which in some ways serve a 'brain-storming' function) far outweighs the disadvantages of overlap and duplication.

Many prominent limnologists have contributed to the volume, but authorship is strongly dominated by American contributors (39 of 49). Five Scandinavian, four Canadian and one German contributor constitute the balance. The reasons for this national bias are obvious in respect of the venue and objectives of the workshop. Nonetheless, it is unfortunate that the coverage of more chapters is not more truly representative of this international science, although to have attempted this would have undoubtedly lengthened the book.

On the whole, the volume is well-produced. I encountered several minor errors, inconsistencies and omissions. The foreword is referred to as the preface on p. 1; Harris 1986 on p. 3 is not cited in the reference list; Oksanen 1987 on p. 59 is referenced as 1988; Stockner 1988 on p. 72 is not referenced; text (p. 73) and Table 5.1 cite slightly different maximum grazing mortalities; Porter and Porter & Feig citations on p. 82 concatenate; parameter designations are inconsistent in text (p. 108) and Table 7.1; sentences concatenate on pp. 127 and 131; prefix 8 is omitted from the reference to Figure 8.1 on p. 132; suppressed is misspelt on p. 152; text on p. 213 refers to MOM whereas Figure 13.2 refers to MOMS; wording of third sentence on p. 217 and of line 16 on p. 223 is nonsensical; Murdoch & Bence 1987 (p. 265) is not referenced; Bruton is confused with Burton on pp. 270 and 278. These are mostly insignificant shortcomings and others undoubtedly exist; I did not systematically cross-check citations.

The figures are somewhat variable in quality and format, but are mostly adequate. Severe reduction limits the readability of some annotation, and obscures line (Figure 13.2B) or shade (Figure 7.4) discrimination. These are unfortunate but not serious deficiencies: readers can still interpret the figures correctly.

Discrepancies and inconsistencies are inevitable in a book of this nature: their absence might even be a negative indictment. Nevertheless, I had difficulty in reconciling the rejection of lake individuality (p. 275) with several earlier statements emphasizing the importance of lake diversity as a feature enhancing their amenability as study systems (p. 4).

In the words of the editor, the volume focusses on certain frontiers in aquatic ecology which encompass major unsolved problems and likely growth points for progress. He further suggests that if the book is not obsolete within 10 years, it will have failed in its purpose

as a 'prospectus for progress'. While one may share in his hopes for obsolescence, I am convinced that the volume will nonetheless stand as a benchmark contribution to aquatic ecology, and will be referred to repeatedly. Certainly my reading of the book raised serious questions about requirements for progress in the field. The saying 'More and more about less and less until eventually everything about nothing' was a recurrent thought image during my reading. And by 'nothing' in this context, I mean particularly microbes, rather than emptiness.

I thoroughly recommend this volume to practising limnologists and other aquatic ecologists. It undoubtedly qualifies as essential reading for postgraduate students with any leanings towards aquatic ecology, and indeed, ecology generally. It will also serve as a useful source of reference for less advanced courses, and senior undergraduates should be aware of the issues addressed by the volume even if the volume itself is rather specialized for their direct consumption. The volume is insightful, thought-provoking and stimulating, and offers the certainty that limnology can and will continue to contribute immeasurably to what must be the most important science — ecology. But clearly, to have continuing impact and viability, limnology will have to depend increasingly upon multi-disciplinary, co-operative ventures, and less on individual endeavours. Only time will tell what these implications hold for the future of limnology and aquatic ecology in our under-funded, short-staffed situation in southern Africa.

ROB HART

Department of Zoology & Entomology, University of Natal, Pietermaritzburg

Cell movement and cell behaviour

J.M. Lackie

Allen & Unwin, London
316 pp.

'It's alive — it's moving!'. So begins this very readable text on cell movement and cell behaviour. The author has a delightfully entertaining approach in presenting an overview of this very broad topic. Nevertheless, precision and clarity are not lost.

The book commences with an analogy between engine motors and a cell's motile 'machinery'. An account of the various molecular mechanisms employed in force generation follows which includes actin-myosin and tubulin-dynein 'motors' and a miscellany of other 'motors'. This is a useful introduction to the subject matter proper since so many motile systems are based on these mechanisms. The text then progresses to a discussion of locomotion, a term the author rightly retains since it unambiguously distinguishes translational movement from intrinsic movement. Locomotory

activities are divided into two categories: swimming and crawling. The first of these topics is essentially an analysis of undulating drive mechanisms. The second covers amoeboid and fibroblast movement. The final chapters deal with factors controlling and directing cell movement which should be of considerable value to those whose interests lie in movement-related phenomena such as morphogenesis and neoplastic invasion. Particularly neat is the analytical and more physical approach of the later chapters which are generally introduced with theoretical considerations.

The author's 'fondness for analogy' does not in my opinion add to the value of the book. It is the author's insight and honest treatment of this difficult subject which is most appealing. I found the lack of references in the text frustrating. Although fewer references may improve readability, the reader of this book, student or otherwise, is likely to be more advanced and therefore one would hope, to be in a position to need and use references! However, the author's stated objective is only to 'lead the reader into the right part of the primary literature'.

A short summary at the end of each chapter and a glossary of the jargon used are useful additions, especially for students. Illustrations are clear and instructive. There is a bibliography and an index.

Some subjects are not treated in as much depth as others, for example, axonal transport and stress fibres. But without producing a multi-volume series the author presents a detailed discussion of the major aspects of cell movement and behaviour with ease and expertise. This book will make exciting reading for the novice and an informative reference for others.

M. FRESCURA

Department of Zoology and Entomology, Rhodes University, Grahamstown

The Amphibians and Reptiles of Botswana

Ronald D. Auerbach

Mokwepa Consultants (privately printed) 1987. (Obtainable from the Botswana Book Centre, P.O. Box 91, Gaborone, Botswana)

295 pages, 19 colour plates with 132 pictures, numerous figures and maps

Price: 65 pula (approximately £21 sterling; U.S. \$33.15 plus postage).

Having recently been through the mill myself, I have a much better understanding (and hopefully more sympathy) for the tremendous amount of work involved in putting together a finished book. The sheer amount of labour involved in compiling a work of this magnitude is tremendous. For a single person to prepare a monographic survey of the Botswanan herpetofauna is feasible. It's hard work, but can be done. For the same person to

then also undertake the equally onerous tasks of editing, proof-reading, layout and picture selection, as well as arranging the finance for a private publication of this size, is simply frightening.

I therefore find myself torn in two with Ron Auerbach's latest book. On the one hand, I'm awed that he should contemplate such a task; on the other hand I'm saddened by the numerous, simple flaws that mar the finished product, and that could have so easily been corrected with better editing and proofing.

In terse summary the book comprises: a 22 page introduction that covers the history, classification, biology, ecology and traditional knowledge of the Botswanan herpetofauna, with additional notes on envenomation by snakes as well as invertebrates; a systematic treatment (179 pages) of all 194 reptiles and amphibians recorded from Botswana, or likely to be found there, with each species account consisting of major synonyms, common names, description, size, reproduction, diet, notes, distribution, ecological affinities, and recorded localities (including a spot map of the distribution in Botswana); a comprehensive 19 page bibliography; a 6 page gazetteer; a scientific index (16 pages); an index of common names (16 pages); and an 18 page key for identification based on colour. It is printed on glossy A4 paper, with a stitched binding and a stiff (but rather soft) cover.

The quality of the 19 colour plates varies from good to poor, and unfortunately too many suffer from poor depth-of-field. In addition, a number are either misidentified (Plate 7,2 — *Pelomedusa subrufa*), wrongly orientated (Plate 17,3 upside down; Plates 14,6 and 16,1 are on their sides), or bizarrely coloured owing to some mistake during colour separation (e.g. the red-bodied, green-tailed *Platysaurus guttatus* on Plate 12,2; and a magenta *Philothamnus semivariatus*, Plate 17,4). Many of the half-tone photographs lack contrast and thus impact. I'm confused why an illustration of *Atheris desaixi*, a Kenyan tree viper, should be included in an account of Botswanan herpetofauna, although personally I'm pleased to see any illustration of this poorly known species.

Evidence of poor proof-reading is shown in the tremendous number of spelling mistakes (e.g. inaccuracies, p. 1; *Archaeoptreyx*, p. 10; Tautara, p. 81; *Pycicephalus*, pl. 5; etc) and mistaken references (e.g. the paper by Haacke (1982) on the occurrence of *Bufo lemairii* in Botswana is given only as '(Haacke 198)' and is absent from the bibliography; the reference 'Jim, Gorman and Huey (1978)' (p. 106) is not listed in the bibliography, and I'm not sure what paper it should be. There is frequent confusion with the use and conventions applying to family and subfamily names: e.g. 'The Viperidae are generally divided into 3 families — the Viperinae, the Crotalinae (...) and the Azemiophinae ...' (p. 203). Family names end in -idae (cf. Family Pelomedusiinae, p. 273); are not written in italics (cf. *Pelomedusidae*, p. 71); and the common usage, e.g. viperids, is not capitalised (cf. both usage, p. 203). The correct ordinal name for shield reptiles is Chelonii not Testudines, which avoids the confusing sentence 'The

Pleurodeuran (*sic*) Testudines...’ (p.71).

Broadley’s (1981) review of *Kinixys* in south-eastern Africa, and thus his treatment of inland forms on the subcontinent as *K. belliana spekii*, is overlooked. Even thus, the treatment of *Kinixys belliana* as monotypic (p. 69) overlooks the well-defined race *K. b. nogueyi* from West Africa. The taxonomy of Botswanan *Pelusios* is also affected by the description of *P. subniger parietalis* from the Seychelles and the elevation of *P. bechuanicus upembae* to a full species leaves *P. bechuanicus* monotypic (Bour 1983).

The Zambezi soft-shelled turtle is not *Trionyx triunguis* (p. 66) but *Cycloderma frenatum*. On the subcontinent the Nile soft-shelled turtle (*T. triunguis*) is only found in the Cunene River, below the Ruacana Falls.

Auerbach correctly notes (p. 117) the current usage of two subfamilies in the family Cordylidae (ie. Gerrhosaurinae and Cordylinae), but then overlooks that *Gerrhosaurus* extends into western Africa. In addition the species account of *Cordylosaurus subtesselatus* (which, incidentally, has not been recorded within 120 km of the Namibian-Botswana border) falls in the Cordylinae not, as it should (despite the name), within the Gerrhosaurinae.

The gecko genus *Homopholis* is not endemic to southern Africa (p. 89); *H. boivini* occurs in Madagascar and *H. fasciata* in East Africa (Welch 1984; Visser 1988).

‘Size: Over 1142 mm may be obtained’ for *Agama hispida makarika* makes for an impressive agama! The first digit should obviously have been edited. Three skink subfamilies are present in Botswana (as is detailed in the text), making the comment that they are ‘likely to be found’ in Botswana (p. 102) redundant.

I question the correctness of including so many accounts of species not yet recorded from within Botswana (e.g. *Hildebrandti ornata*, *Zygaspis niger*, *Afroedura transvaalica*, *Scelotes limpopoensis*, *Gerrhosaurus major*, *Cordylosaurus subtesselatus*, *Lycodonmorphus rufulus*, *Lycophidion capense multimaculatum*, and *L. variegatum*; similarly the inclusion of the subspecies *Naja nigricollis woodi* and *N. n. nigricincta* in the book, but not the typical race *N. n. nigricollis*, which has been recorded from Caprivi, seems a bit perverse!). As it stands, the reader has to page through all of the species accounts to confirm which species have definitely

been recorded from Botswana. These accounts would have been best summarized in a separate appendix.

Although the 19-page bibliography is very comprehensive, its layout makes it horrendous to use. Author’s names are neither highlighted nor indented and a specific reference cannot be found quickly by scanning the pages. It also contains numerous articles that are not relevant to Botswanan herpetology.

Finally, the general layout of the book is, at times, sloppy. In the systematic index (p. 23–27) the indenting of specific names and choice of font sizes for the different categories, is poor. The two columns of figure captions on the plates run into each other, making them difficult to read. These are little, niggly aspects, but they detract from my own personal enjoyment of the book. Despite my pedantic ‘nit-picking’, however, I still have tremendous enthusiasm and respect for this massive study. It is just a bit like a harelip on the Mona Lisa; functionally usable, but aesthetically flawed.

As it has been privately printed, few copies of this useful regional monograph are available (only 1 000 were printed). It will thus soon go out of print. Despite its flaws, for anyone interested in the herpetology of southern Africa this book is a must.

WILLIAM R. BRANCH

Port Elizabeth Museum, Port Elizabeth

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