

## Book Reviews

### Zoological Catalogue of Australia Vol. 33 Echinodermata

F.W.E Rowe & J. Gates

CSIRO 1995  
Price: US \$74.95

The *Zoological Catalogue of Australia* is a remarkable series of some 90 volumes, each covering a specific animal group and citing by name and original reference all species known from Australia. This series aims to serve as a directory to the most recent information available on each species in the Australian fauna.

The volume covering the Echinodermata is an impressive compilation of almost two centuries of taxonomic endeavour, combined with references to recent biological and ecological studies.

The last comprehensive listing of the Australian echinoderms (H.L. Clark 1946) recorded 788 extant species and over 100 fossil species. In comparison the present catalogue of the Echinodermata lists 105 families and 1154 extant species. This expansion of knowledge reflects not only the greater research activities of local and international echinoderm specialists, but also the use of SCUBA and other new technology to make collections from previously inaccessible habitats. In the introductory chapter, a historical review highlights the extensive contribution of H.L. Clark to the taxonomy, zoogeography and origin of tropical Australian echinoderms, as well as presenting references to the reviews of more recent workers. Although fossil species are not recorded in this volume the editors list a number of pertinent references to the Australian fossil echinoderms. Also contained within this introductory chapter are references to recent reviews on the 'Crown of Thorns' phenomenon.

A brief introduction to each class details characteristic features and provides a number of references to the biology and ecology of the class. In the main body of the catalogue the information presented for each species includes: synonymy, literature citation, location and status of the type material and type locality for each name, a brief summary of geographical distribution and ecological attributes, and important references on biological aspects.

No new taxa are described in the volume, but a number of new combinations, new synonyms and new status assignments are proposed.

Detailed notes explain the basic format, museum acronyms and abbreviations used in the Catalogue and a map showing the Australian coastal zones is provided. The format is user-friendly and consistent throughout the volume.

Nomenclature in the Catalogue adheres to the provisions stated in the *International Code of Zoological Nomenclature* (1985). The authors clearly indicate that all names appear in their current legitimate form, which may differ from that in their original presentations.

Although the value of this Catalogue may appear to be limited to echinoderm systematists, the wealth of references contained in the volume provides leads into the echinoderm literature of value to marine biologists and echinoderm specialists.

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### A Natural History of Inhaca Island, Mozambique

Edited by Margaret Kalk

Published by Witwatersrand University Press, 1995  
3rd Edition  
365 pages  
Price: R120.00

This book is the culmination of sixty years of work on Inhaca Island and represents a monumental effort by Professor Kalk. The forewords, by Professor J.P.F. Sellschop of the University of the Witwatersrand and Professor Dr N. Matos of the Universidade Eduardo Mondlane, Maputo, document the history of the respective universities' association with the island and pay tribute to the many people who have collaborated in scientific studies on the island.

The book is divided into four parts. The first part deals with the environmental setting of the island and focuses on the oceanography of the area and the geology of the island. Part two looks at life on the shore line and, after an initial introduction to the more general ecological features of the shores, provides a detailed look at a range of different ecosystems including sandy shores, rocky shores, coral reefs and sea grass meadows. Part three investigates terrestrial life on the island and gives the reader an overview of the vegetation as well as the amphibian, reptilian, avian and mammalian life found on the island. Part three also includes sections on the invertebrates, primarily insects and non-marine molluscs. The future of the island is discussed in part four, where the conservation and development of the island are explored.

The change in emphasis in the book, from a focus on anatomy and classification (in the first two editions) to the more integrated ecological approach found in the latest edition, reflects some of the change in the general biological approach which has occurred over the last few decades. This ecological approach is aptly captured in the title of the book, for it is, without a doubt, a 'Natural History' of the island with emphasis placed on the behavioural and physiological adaptations of many of the animals and plants to their environments.

The lists of identification guides available to assist with the identification of fauna and flora on the island are useful, as the keys to species identification have been deliberately omitted from this edition. The omission of the Appendices is a great pity, as they are referred to quite extensively in the text and would have provided very useful species lists. However,

these lists are, according to the Preface, available from the Department of Zoology, University of the Witwatersrand.

The illustrations are to be commended, many of the line drawings being of a very high standard. However, some of the maps and line drawings are rather outdated and difficult to interpret, if one is unfamiliar with the area or animal depicted. The diagrams of the terrestrial vegetation, insects and non-marine molluscs are particularly clear. While the colour plates are an excellent addition to the new edition, a few incorrect captions do detract from the overall good impression. The soft coral *Dendronephthya* is identified as the hard coral *Dendrophyllia* while the hard coral *Tubastrea* is referred to as *Acropora*. The bird named as a spotted eagle owl is, in fact, the much less common barred owl. A few spelling mistakes have also crept into the captions of the colour plates and into the text; however, in a synthesis of this size, mistakes like these are probably inevitable.

The similarity of environments and associated fauna and flora on the north-eastern coast of South Africa as well as the Bazaruto Archipelago and Inhaca Island make the book an interesting guide for biology students working in any of these areas. The opening up of Mozambique to both tourists and biologists will help to ensure that this book is as widely used as the previous editions. Although the book will probably not be used as a scientific reference text and may be a little advanced for most non-biologists, it will certainly keep many interested naturalists intrigued and fascinated for many hours. The book is written in a clear and interesting manner, and is easy to read. We enjoyed reading the book and, as so often happens when reading a natural history book instead of a drier scientific text, were left with a feeling of awe and wonder of nature, a feeling which all biologists could rekindle from time to time.

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## Mechanics and Physiology of Animal Swimming

Editors: Linda Maddock, Quentin Bone & Jeremy M.V. Rayner

Cambridge University Press 1994  
250 pages  
Price: \$55

This symposium volume is based on a joint Marine Biological Association of the U.K. and Society for Experimental Biology meeting held in Plymouth, England, in April 1991. It is a compendium of diverse topics on several aquatic animal groups written by 34 authors from six countries in 13 chapters. Topics include the functional morphology and physiology of swimming in bacteria and protists; the same (with coverage on neurology and mechanics) in pelagic fishes,

squid and lamprey; swimming in Mesozoic reptiles; buoyancy control in aquatic tetrapods; underwater 'flight' in penguins; and energy conservation through formation swimming in ducks.

Hoar *et al.* (Chapter 3) detail the role of fins in competition between fishes and squid, and we learn that cephalopod jet propulsion is far less efficient than fin locomotion because forward momentum is produced all the time using fins. Direct evidence to suggest that undulatory fins in cephalopods are less efficient than those in, say, tetraodontiform fishes, is limited, however. Lift generation and buoyancy are the key here, and we discover that some oceanic cephalopods are really aquatic 'fliers'; some ommastrephid squid have long been known to even launch themselves through the air.

Paul Webb's chapter, 'The biology of fish swimming' forms a cornerstone of this book. We see how effective swimming is studied using gaits, defined by the fin propulsion type, kinematics, muscle type and locomotory behaviour. The factors defining gaits are interestingly illustrated with an external body-plan diagram of selected fishes showing the classification of propulsors. Basic locomotory types are defined and cogently described, as is ontogenetic expression in the range of gaits.

Chapters 5–8 discuss physiological and mechanical aspects of swimming in fishes. Graham *et al.* (Chapter 5) review the physiology of swimming in tuna and sharks and describe a high-speed, portable water tunnel respirometer that provided their observations on shark heart mechanics and the factors influencing tuna metabolic rates and swimming kinematics. The mechanics and physiology of fish muscular systems are discussed in detail in Chapters 6–8.

Swimming capabilities and mechanics in higher vertebrates are covered in the remaining four chapters. These include an interesting review of Mesozoic reptile locomotion that reconstructs swimming performance on the basis of speed as a function of body length and estimates of hydrodynamism and metabolic rate. One conclusion is that ichthyosaurs and mosasaurs were fast-moving attack predators, whereas plesiosauroids were slower, ambush attackers. Still, none of these reptiles compare in body-length speed or metabolic efficiency with penguins (Chapter 12), whose swimming mechanics and anatomy is described in detail.

The book is visually well laid out, though some line drawings in several chapters could have been more skillfully rendered. It is clearly geared for morphologists and mechanical physiologists working with aquatic animals, but will be of interest to colleagues who work with their terrestrial counterparts too. It is generally technical and rigorous and could serve as a welcome supplemental text in relevant graduate school courses.

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## Chironomids: From Genes to Ecosystems

Edited by Peter Cranston

CSIRO, Australia 1995  
482 pages  
Price: US \$120

This book comprises 46 papers delivered at the 12th International Chironomid Symposium in Canberra, Australia, January 1994. Delegates attended from all continents, except Africa, and their papers give an excellent idea of the research being carried out on this important group of aquatic insects.

Richard Johnson, Uppsala, in his Thienemann lecture, gives a detailed review of the indicator concept in freshwater biomonitoring, not confining himself to the chironomids; he gives a history of the concept in Europe, both in running and standing water systems, but uses the extensive and detailed work on European lakes to illustrate his points. Anyone interested in estimates of indicator variability and predictive modelling should read his paper.

The work on genetics is built on the long history of cytotoxic work on the genus *Chironomus*, based on the giant, polytene chromosomes of the salivary glands of the larvae. This genus is very difficult to differentiate on adult morphology but workers are now finding that some taxa comprise multiple, karyologically distinct species. Other genetic problems are also dealt with.

A large number of papers deal with the effects of various forms of pollution on chironomid species and communities; some deal with larval deformities produced by micropollutants and pesticides, but of interest to South African workers will be the section on biological monitoring. Ruse and Wilson, National Rivers Authority, UK, report on the long-term assessment of water and sediment quality of the River Thames using chironomid pupal skins (exuviae). This work has been made possible by the detailed taxonomic work of British entomologists and the extensive knowledge of the ecological requirements of the various species built up over many years. Canadian workers show that sometimes both larvae and pupal exuviae are needed for the purposes of water quality monitoring. Monitoring studies are also reported from Iceland and Australia.

The support given to this symposium by Australian government agencies arises from the perceived importance of chironomid research in Australia: there is a special section in the book on Austral studies with papers from Australia, New Zealand and one from Brazil, but none from South Africa!

Papers on 'Chironomidae and humans' deal with chironomid larvae as pests in rice paddies and enclosed water supplies and the impact of human-induced flow perturbations on communities of a stream.

There is a large section on chironomid ecology and behaviour, with studies from Japan, Europe and the USA. Lindgaard and Brodersen, Copenhagen, tie the distribution of Chironomidae into the river continuum concept which is leading to many projects by river biologists throughout the world at present. It is pleasing to see that they include early studies by Dr Marjorie Scott in South Africa in their review. Dr Scott may be interested in a paper of chironomid larvae as

ectoparasites on caddis pupae in Japan.

The largest section is that on chironomid morphology and systematics, namely 12 papers. Some of the workers have been in this field for many years but it is pleasing to see some new names appearing. In spite of international 'hype' on biodiversity and treaties being signed, this type of research is grossly underfinanced for most biological groups and is not even recognized by some financing agencies.

This book is very well produced. All references are consolidated into one section and a very detailed index to topics and scientific names is provided. This handsome volume is obtainable from CSIRO Publications, P.O.Box 89 (314 Albert Street), East Melbourne, Victoria 3002, Australia.

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## Ecology and Morphology of Copepods

Edited by F.D. Ferrari and B.P. Bradley

Kluwer Academic Publishers, Dordrecht, The Netherlands, 1994  
530 pages  
Reprinted from *Hydrobiologia*, Vols 292/293 (1994)  
Price: £195

ISBN 0-7923-3225-3

This book represents the proceedings of the 5th International Conference on Copepoda, held at the University of Maryland in Baltimore, USA, from 6–13 June 1993, under the auspices of the World Association of Copepodologists. The conference provided an opportunity for some 170 copepodologists from 35 countries around the world to exchange ideas on recent developments in copepod research since the previous conference, which was held in Karuizawa, Japan, in 1990. Of the 148 papers that were presented at the conference, a total of 65 contributions are published in this book. These are distributed over various aquatic systems including marine (35 papers), freshwater (13), hypo- and hyper-saline systems such as mangrove prop root habitats, estuaries, coastal lagoons and salt marshes (12), and cave environments (2), while the remaining three, more general papers, bear no reference to any specific habitat.

Copepods are the most plentiful Metazoa on earth, outnumbering the insects which have more species but fewer individuals. This forms the central theme of the paper by Prof. A.G. Humes who estimates that, while the number of individual copepods would be of the order of trillions, approximately 11 500 copepod species have been described to date. This number, he speculates, might only represent a mere 15% of the actual (or hypothetical?) grand total of species, which will keep copepodologists busy for a considerable time describing the other 63 500 or so species. As expected, considerable emphasis was placed on taxonomic and morphological studies during the conference, resulting in 15 and 8 published

papers, respectively. Not less than 11 new species are described in this volume, which, along with a number of re-descriptions and new records, shows this field of copepod research to be very much alive. Apart from papers describing various morphological aspects of free-living copepods, a few deal with the specialized structures of copepods parasitic on marine fishes, and species associated with invertebrate hosts such as Ascidiacea and Bivalvia. These species, the basic structure of which is often drastically modified by the imposed demands of a parasitic or commensal way of life, represent almost one third of all known copepods.

The majority of contributions in this book cover a host of ecological aspects of copepod research. They are classified under the following broad headings: Feeding and Reproduction (10 papers), Distributions in Time and Space (20), and Environmental Relationships (11). It would be impractical to mention each and every one of the research topics presented here. Therefore, I will touch on only a very few specific aspects which, according to my biased opinion, will interest most other ecologically-minded copepodologists.

Selected papers under the heading 'Feeding and Reproduction' deal with the relative roles of herbivory and heterotrophic feeding in the egg production of omnivorous copepods, a re-evaluation of the gut fluorescence method for examining pigment budgets of herbivorous copepods, trophodynamic interactions between copepods and toxic cyanobacteria blooms, physiological rate measurements of Antarctic species, and the role of sex pheromones in mate recognition and sexual attraction of conspecifics. The first evidence for chemical mediation of diapause induction is published here. One paper speculates that the production of diapausal eggs, with the potential for long-term (years to decades) dormancy, forms a critical part of the dynamics of coexistence of competing species.

A number of 'Temporal and Spatial Distributions' papers incorporate studies of diel, seasonal and decadal fluctuations of behavioural patterns, rate processes, species diversity and community structure. Other studies are concerned with small-to large-scale distribution patterns of species and the effects of natural and anthropogenic environmental perturbations, hydrological structure, frontal systems, to name but a few. One study highlights the usefulness of large-scale distribution patterns of continental copepods in recommendations pertinent to conservation strategies of endemic wetland invertebrates. Finally, some papers examine behavioural traits and physiological and morphological adaptations that certain copepods have evolved to maximize individual survival, optimize reproductive success, and ultimately perpetuate the species.

The section on 'Environmental Relationships' perhaps offers the most interesting variety of contributions, dealing with interactions between copepods and their hydrobiological resources. These include effects of environmental stress on protein synthesis, influences of trace metal pollution on copepod photobehaviour in industrialized and urbanized coastal and estuarine waters, relationships between growth rate and temperature and food, effects of developmental changes in copepods on their escape responses to visual predators, amongst others. The use of copepods in the control of mosquitoes, which are vectors of epidemic dengue or yellow

fever, is also discussed in a few papers, illustrating the shift that has taken place from using stable insecticides (e.g. DDT) to environmentally more friendly, yet effective and inexpensive biological control. Two papers also touch on the consequences of eutrophication and water column stratification and mixing processes on copepod community structure, thereby highlighting the implications for higher trophic levels. Unfortunately, unlike the proceedings of the previous conference held in Japan, there are no papers devoted to the important role that copepods have been shown to play in fisheries.

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## Restoration of Endangered Species. Conceptual Issues, Planning and Implementation

Edited by M.L. Bowles & C. J. Whelan

Cambridge University Press, 1994

394 pages

Price: (hardback) £35.00 (US \$49.95)

ISBN 0 521 41863 1

This book arose from a 1990 symposium on the Recovery and Restoration of Endangered Plants and Animals, organized for the Second Annual Conference of the Society for Ecological Restoration. Historically, attempts to re-establish ecosystems or species have not been well planned or monitored and this volume gathers together the results of some ongoing restoration projects which have been intensively studied. The 14 papers present valuable empirical information on the biological and experimental procedures involved in ecological restoration, and also seek to address the inevitable political and bureaucratic problems inherent in these often controversial projects.

The book is divided into four sections: Conceptual Issues in Restoration Ecology (five chapters); Restoration Planning (four chapters); Implemented Restorations (four chapters); and Synthesis and Future Directions (one chapter). The coverage of topics reflects the emphasis of restoration projects in North America (all contributors are based in the US or Canada): eight of the chapters deal with various aspects of rare plant restoration while three papers cover mammals. Although the coverage of taxa is narrow, the information has relevance to many diverse projects with similar aims. For example, Fenster & Dudash's discussion of genetic considerations for plant restoration has many points applicable to animal taxa. Many endangered plant and animal populations alike are small and isolated and the problems of genetic bottlenecks and inbreeding depression are common to both. The authors consider solutions to these problems and examine the implications of the sometimes radical steps restoration projects must take to overcome them. Their emphasis on the

value of experimental studies to assess the outcome of mixing different gene pools as a recovery tool should be considered by all workers faced with these problems. Lacy's paper (Chapter 3) on managing genetic diversity in captive populations of animals further highlights the dangers of reduced genetic variability in isolated populations. He illustrates how selection for characteristics suited to the captive environment can result in inadequate genetic variation if the population is returned to the wild. His recommendations for managing this problem in zoos have applications to re-established wild populations which are, invariably, also small and isolated.

Many of the chapters illustrate the experimental nature of restoration projects. One of the main difficulties facing attempts at restoration is that the recovery potential of many species is often unknown. Gogan & Cochrane (Chapter 9) discuss the early results of translocation of woodland caribou around Lake Superior and elucidate some of the recovery problems the species has experienced such as low reproductive rates, high predation pressure and exposure to disease. Projects such as this contribute to our knowledge of the ecological requirements of species, knowledge which enhances subsequent recovery attempts. A number of authors recommend the experimental use of ecologically similar species. For example, Louda (Chapter 5) notes that the long-term ecological data available for Platte's thistle can be put to good use in recovery attempts of the threatened Pitcher's thistle. Similarly, trial releases of Siberian polecats preceded the release of black-footed ferrets to test reintroduction strategies and the effect of supplemental feeding on animals (Clark, Chapter 11). These studies illustrated the role of prey abun-

dance and predation pressure in polecat survival, information which was incorporated into the later release of ferrets.

One of the main drawbacks to the book is its wholly North American perspective. Workers in developing countries may find many of the recommendations not feasible or inapplicable. As Brown (Chapter 14) points out, the demands of human society may determine if restoration projects succeed and nowhere is this more valid than in the Third World, where pressure for land profoundly limits the opportunities for ecological restoration. Ironically, it is developing countries that harbour the majority of threatened ecosystems and experience the highest rate of extinctions. Restoration attempts in these areas face different pressures and restorationists are often forced to find a more practical justification for their work where the restoration ethic clashes with the subsistence lifestyles of humans.

The ongoing nature of work in this field means that in most cases, the final answers are not yet available: perhaps they never will be. Loope & Medeiros' paper on the problems of plant recovery in the wake of devastating biological invasions in Hawaii (Chapter 6) illustrates the complexity of repairing damaged ecosystems and emphasizes the degree to which restoration ecology is still in its infancy. The book does not attempt to provide all the answers but it contributes a great deal to the process and restorationists will find it a valuable tool for their work.

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