

## 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 taxonomic 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. Br  dley

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