# New takes on old lakes

**Ancient Lakes: Biodiversity, Ecology and Evolution: Advances in Ecological Research Volume 31**

edited by A. Rossiter and H. Kawanabe. Academic Press, 2000, £89.38 hbk (xvii + 624 pages), ISBN 0 120 13931 6


Researchers working on questions related to the evolution of biodiversity in ancient lakes work at an enormous geographical range; investigate organisms as diverse as copepod crustaceans, haplochromine cichlid fishes and diatoms; and use techniques as varied as taphonomical inference and molecular phylogenetics. The 'field of ancient lakes', if there is such a science, has grown at an amazing rate over the past two decades, increasing our understanding of just how diverse these inland seas are. Although ancient lakes often exhibit unparalleled levels of biodiversity and astonishingly rich endemic faunas, it is becoming abundantly clear that the factors responsible for speciation and extinction in these lakes might be equally diverse.

Ancient freshwater lakes are a 'select group', comprising those 20 or so inland bodies of water that are over 100 000 years old. Most freshwater lakes are ephemeral and date from the last glaciation, only 20 000 years ago. As ancient lakes have histories as old as 30 million years, they have served an important ecological role, both preserving ancient lineages and providing uniquely stable environments in which many freshwater faunas have diversified – often extremely rapidly, as evidenced by the >1000 species of cichlids that are believed to be endemic to Lake Malawi. Although the histories of many of these lakes have been punctuated by periodic desiccation, their often extreme depth and biological stability has made them ideally suited to the preservation of freshwater animals. They harbor a remarkable diversity of endemic species and are exceptional laboratories for the study of evolution. Since the advent of molecular phylogenetic techniques about ten years ago, a resurgence of interest has led to fundamental new insights into the evolution of some of the species flocks that inhabit these lakes. Among these is that the Lake Victoria species flock of probably 300–500 cichlids can be traced back to a single ancestral lineage[1] that colonized the lake possibly as recently as only 14 000 years ago, indicating that speciation proceeded at an explosive rate[2]. Only in the last ten years have we learned that convergence in morphology, ecology and behavior among different species flocks has been rampant (reviewed in Ref. 3).

*Ancient Lakes* updates an earlier symposium volume[4], presenting both new research and syntheses of previously published results. It is a valuable reference for both students and researchers in aquatic biology and is particularly effective in communicating advances in the application of new methodologies to the study of ancient lakes, such as the use of taphonomical inference to reconstruct the history of long-lived environments and fine-scale morphology as a novel taxonomic character. This book, like the earlier symposium volume[4], highlights the fact that most research of ancient lakes has concentrated on a relatively small subset of these lakes – the East African Great Lakes and Lake Baikal in Russia. Although these have been especially important in illustrating the value of studying long-lived environments, the greatest contribution of this volume lies in new publications on lesser-known lakes, Lake Khubsugul (Mongolia), Lake Biwa (Japan) and Lake Titicaca (Peru). Expanding our knowledge on these lakes is key to our understanding of the impact of these basins on freshwater diversity in their surrounding regions. It also facilitates additional comparisons through which patterns of similar evolutionary trends and common underlying evolutionary mechanisms of diversification might emerge.

It is perhaps unfortunate that, in attempting to cover such a great diversity of research, this volume lacks a strong and unifying theme. This was a conscious decision on the part of the editors whom, having identified the problems inherent in collating such diverse topics into a single volume, have attempted instead to 'highlight the diversity and unique nature of ancient lake biotas'. Although the book succeeds in accomplishing this objective and will surely be an important reference text, the disjunct nature of many of these topics still detracts from its potential impact. Whereas the earlier symposium volume[4] constituted the first comprehensive summary of research on ancient lakes in the 50 years since Brooks's seminal monograph[5], this collection of contributions was clearly much more challenging to set apart, despite the rapid pace of research during the past five years.

Rossiter and Kawanabe stress that 'comparative studies of different faunal groups in different lakes might not be expected to be very productive'. Rather, they advocate the study of taxonomically similar faunas in different lakes, as has been done for the East African cichlids[5–7] or, using the diversity of organisms present within each environment to independently reconstruct the evolutionary history of ancient lakes, as has been successfully applied to the flora and fauna of Lake Baikal[8]. Perhaps, as the editors appear to suggest, we have reached a point where more focused comparisons of ancient lakes will do more to advance this burgeoning field than will additional comprehensive volumes. Despite these minor criticisms, this book is without parallel; it capably highlights the most recent advances in the field, and will be a valuable addition to the bookshelf of all those interested in biodiversity and diversification in freshwater systems.

**Axel Meyer***
**Anthony B. Wilson**
Dept of Biology, University of Konstanz, 78457 Konstanz, Germany.
*e-mail: alex.meyer@uni-konstanz.de

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