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EVOLUTIONARY BIOLOGY OF THE BIVALVIA

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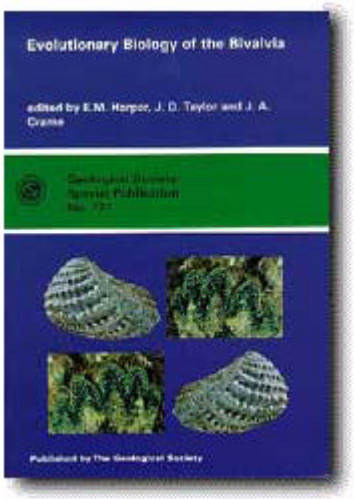
Edited by E.M. Harper, J.D. Taylor, and J.A. Crame
Geological Society Special Publication 177
The Geological Society, London, 2000, 494 p,
ISBN 1-86239-076-2, $165.00 (list price); $73.00/$98.00 (GSL/AAPG member prices).

Evolutionary Biology of the Bivalvia is a fascinating collection of 32 well written papers, selected from those presented at the international conference on the Biology and Evolution of the Bivalvia, held in Cambridge, England, September 1999.

The following quote from the preface best summarizes the scope and intent of the book.

> The long history of both zoological and palaeontological research on the bivalves has revealed a startling degree of convergence and parallel evolution which has hampered the interpretation of their evolutionary history. However new discoveries and developments make it timely for a new concerted effort to integrate zoological and palaeontological techniques to improve comprehension of the evolutionary history of the class.

The editors provide an excellent overview, setting the context for and summarizing the 31 papers that follow. Systematic relationships within the class are examined from the highest to lowest ranks and new insights into the evolutionary radiation of the class from its first appearance in the Cambrian to the present are documented and discussed.



Not surprisingly, there is a strong emphasis on cladistic analysis of data sets derived from a wide range of morphologic and/or molecular studies. Consistent with the aims of the editors, the papers in this volume include a diverse range of techniques to gather these data sets. An exceptionally wide range of techniques is used including study of 18S rDNA, cytochrome c oxidase subunit I DNA (COI), skeletal morphology, shell structure, sperm ultrastructure, functional anatomy of gill structures, pallial eyes, digestive systems, ligament growth patterns, larval shell characters, and Fourier shape analysis.

Re-examination of a number of the accepted familial and suprafamilial taxa has shown them to be diphyletic or polyphyletic. For example, Harper et al. exam-

ine the Anomalodesmata using cladistic analysis of both hard and soft part morphologic characters and show the carnivorous members of the subclass to be strongly diphyletic. They also concluded that convergence in the subclass is so strong that extinct groups are unlikely to be placed in reliable systematic positions based on skeletal morphologic characters. Bogan and Hoeh examined the cemented unionoid family Etheriidae using COI DNA and concluded that it is diphyletic, recognizing two groups that are readily accommodated within the Families Mycetopodidae and Unionidae. This is probably not such a surprising result considering the number of bivalve families that have independently evolved cemented forms. However, there had been considerable disagreement among earlier researchers regarding the monophyletic nature of this “family”. Healy et al. concluded that the Mytiloidea should probably be removed from the Pteriomorphia based on a study of sperm ultrastructure. Even more surprising was their discovery that the Arcoidea and Limopsoidea, generally assumed to be closely related and grouped together in the Arcoida, differ markedly in these characters. Using the same technique Keys and Healy provided support for recent work which has relegated the giant clams to a monophyletic subfamily (Tridacninae) of the Cardiidae.

Crampton and Maxwell present an analysis of the extinct crassatellid genus Spissatella using Fourier shape analysis, a method of quantifying the shape of “landmark-poor bivalve outlines” (p.421). They found with this particular genus that ontogenetic change in outline shape within individual specimens was far greater than that of the genus over a period of 20 million years and that different species show strong evolutionary convergence in this character during ontogeny. This is a useful technique to apply to genera and species-groups where outline shape is likely to be of significant systematic value, but is masked by intraspecific and ontogenetic variation e.g. Retroceramus, which contains complexes of species of local and regional biostratigraphic value in the Middle and Upper Jurassic.

Amongst the remaining papers in the volume are three on biodiversity and taxonomic diversity gradients of marine bivalves. Crame discusses the modern global bivalve diversity pattern, latitudinal and longitudinal gradients. He makes particular comment on the exceptional high diversity of the Australian and tropical Southeast Asian regions concluding that this is due to mixing of faunas following the collision of Australia with Asia in the Neogene. Jablonski et al. analyze and discuss the latitudinal bivalve diversity gradient of the eastern Pacific comparing that of the class as a whole with subsets based on systematic and trophic groups. They also document diversity gradients and ratios of infaunal and epifaunal taxa, comparing them with data from Jurassic and Cretaceous bivalves, noting significant change over time, which they concluded was due to the differential diversification the two groups and climate change. Mikkelsen and Bieler’s survey of the Marine bivalves of the Florida Keys presents an obvious warning for those studying regional and global diversity patterns, namely that of the integrity and completeness of the data sets upon which they have based their studies. Using three data sources, original collection, existing museum collections, and a literature survey, they doubled the list assembled by the only other survey of the area. They concluded that simply reviewing the traditional literature was the least effective method for generating species lists, as less than half of their list could have been

obtained from this source, whilst surveying museum collections was most effective.

A number of papers in this book introduce new taxa, including new species, new genera and numerous new suprageneric taxa. This is particularly the case with Cope's critical review of early bivalve phylogeny. Despite the large number of new (and presumably important) suprageneric taxa introduced in the volume, no comprehensive tabular summary of the classification of the Bivalvia is presented. The exception being Carter et al. who present a partial classification scheme for the class covering their discourse on early bivalve evolution. Sure, there is considerable dissension among researchers over various parts of the classification scheme, but these could be indicated and conflict outlined with supporting notes or comments. It could never be more than a summary of the current state of knowledge, but that is all such classification schemes can ever be. Not presenting a revised classification scheme is a serious flaw.

The book is clearly aimed at malacologists and molluscan paleontologists and would be an extremely worthwhile addition to their personal or institutional libraries (ours already has purchased it).

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