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Book Review

The Evolution of Artiodactyls by D.R. Prothero & S.E. Foss (Editors). The Johns Hopkins University Press, Baltimore, MD, 2008. 375 pages. Hardback. ISBN 978-0-8018-8735-2. £80.00.

Including extant mammals ranging from pigs and peccaries to deer and antelope as well as an extensive fossil record stretching back some 55 million years to the beginning of the Eocene, Artiodactyla has long been recognized as a diverse group of terrestrial mammals. Its members are characterized by shared modifications of the tarsus, including an astragalus with both proximal and distal articulations – the 'double-pulley' astragalus. The axes of symmetry of their feet usually lie between the third and fourth digits and are reflected in an even number of functional digits and the 'cloven-hoofed' foot structure of many artiodactyls. Carl Buell's painting on the dust jacket of the volume gives both a taste of their diversity and highlights the relatively recent discovery that the ancestry of the Cetacea – whales, porpoises, and their kin – is to be found within the radiation of terrestrial artiodactyls.

The first three and last two chapters of the book present synthetic analyses of various aspects of the origin and evolution of artiodactyls and their evolutionary relationships with the cetaceans. Beginning about 50 years ago the hypothesis of close phylogenetic relationships between artiodactyls – specifically hippos – and cetaceans gained increasing support from molecular studies. In contrast, the first palaeontological evidence that primitive whales shared the apomorphic specialization of the tarsus of terrestrial artiodactyls was uncovered less than a decade ago. These discoveries led to lively discussions of phylogenetic relationships of cetaceans and terrestrial artiodactyls, with the emerging consensus that Cetacea is a clade nested well within Artiodactyla.

Following the introduction to the volume by its editors, in Chapter 2 Marcot presents a supermatrix analysis of molecular information drawn from extant terrestrial artiodactyls – the sister group relationship of hippos and whales is assumed – and explores areas of agreement and discord between analyses of phylogenetic relationships of lineages of terrestrial artiodactyls based on various combinations of molecular and morphological data. In the following chapter, Geisler, Theodor, Uhen, and Foss, deal directly with the phylogenetic relationships of cetaceans and terrestrial artiodactyls in a total evidence analysis that includes molecular, morphological, and stratigraphic evidence. Although supporting molecular studies indicating that among extant mammals hippos and cetaceans are closely related, their work reveals the complexity of this phylogenetic relationship when extinct, largely Eocene terrestrial artiodactyls are considered – an interpretation reinforced in many of the subsequent chapters. The search for the actual sister group of early fossil whales is just beginning.

Shifting to the back of the volume, in Chapter 23 Janis compares and contrasts the evolutionary histories of artiodactyls and perissodactyls – horses, tapirs and their kin – over the course of the Cenozoic with an emphasis on the palaeoecology of these groups. When they appear in the fossil record at the beginning of the Eocene perissodactyls were more diverse. Toward the end of the middle Eocene the diversity of artiodactyls increased and it remained the dominant group of terrestrial herbivores in the Northern Hemisphere over the rest of the Cenozoic. Janis' wide-ranging and thoughtful analysis considers the interplay of both biological factors – floral change, diet, and digestive physiology, for example – and physical influences – climate, atmospheric composition, and palaeogeography – in the evolutionary history of these groups. In the final chapter of the volume the editors, Prothero and Foss, present an historical summary of the effects of changing methods of analysis and continuing discoveries of fossils on knowledge of the evolution of artiodactyls and their reflection in the taxonomy of the group.

The intervening 19 chapters of the volume were written by a variety of authorities and are devoted to technical reviews of the currently recognized families of artiodactyls. Specialists will find a wealth of data and analyses in these chapters but probably will be disappointed by the lack of uniformity in coverage. Although some chapters emulate the style characteristic in recent reference works, for example Janis *et al.* (2008), with comprehensive lists of included taxa as well as stratigraphic and biogeographic data on their occurrences; others do not. On the other hand, the diversity in content of these chapters is of interest in that it mirrors the status of our knowledge

of the various families and points to many opportunities for future research.

The Evolution of Artiodactyls provides a valuable summary of the current status of knowledge of the evolution of artiodactyls and certainly will stand as an authoritative reference work for many years to come. Also, it clearly defines a starting line for future research and highlights many opportunities to contribute to our knowledge of the group. The editors most appropriately dedicate the volume to our colleagues Drs. Jeremy Hooker and Alan Gentry of the Natural History Museum, who have made many significant contributions to research on artiodactyls and assisted many other students of the group in their studies.

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REFERENCE

Janis CM, Gunnell GE & Uhen MD. 2008. *Evolution of Tertiary Mammals of North America, Volume 2: Small Mammals, Xenarthrans, and Marine Mammals*. Cambridge: Cambridge University Press.