Z. Säugetierkunde **65** (2000) 64 © 2000 Urban & Fischer Verlag

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Buchbesprechung

THEWISSEN, J. G. M. (ed.) (1998): **The Emergence of Whales. Evolutionary Patterns in the Origin of Cetacea**. In: Advances in Vertebrate Paleobiology. New York, London: Plenum Press. Hardcover, 477 pp., numerous illustrations and tables. US \$ 115.–, British £ 74.75. ISBN 0-306-45853-5

In his preface the editor mentions that research "in whale origins is now in an explosive phase, with a cascade of discoveries adding to our understanding of the evolutionary pattern and a suite of new techniques being applied to address new questions. The objective of this volume is to provide a snap-shot of this explosion". The reader can only acknowledge with admiration that much more than just a snapshot is presented in the 16 chapters of this book, which are authored by 24 contributors.

The first two chapters present paleontological overviews, introducing fossil species from the early, middle (WILLIAMS), and late Eocene (UHEN). In the following chapter the phylogenetic affinities of cetaceans, as published in previous studies, are depicted in a large number of phylogenetic trees (GATESY). In addition, phylogentic studies of DNA nucleotide position suggest Cetacea to be nested within the Artiodactyla and they support a sister-group relationship between Cetacea and Hippopota-midae. The "relative absurdity" (GATESY) of the molecular results as compared with contradicting morphological characters, cannot yet be resolved, but it is a characteristic asset of this remarkable book that discrepancies are clearly addressed and not avoided! In the fourth chapter, which is based on molecular studies, MILINKOVITCH et al. consider Cetaceans as "highly derived artiodactyls".

Returning to the more "classical" paleontological studies, O'LEARY produces evidence of a Mesonychia plus Cetacea clade. As a result of morphological studies dealing with cranial blood vessels, GEISLER and LUO come to the conclusion that the monophyletic order Artiodactyla "does not include Cetacea". After chapters dealing with fossil cetaceans from the middle Eocene of India (BAJPAI and THEWISSEN) and with the postcranial osteology of the middle Eocene genus *Georgiacetus* from North America (HULBERT), the following chapter, authored by LUO, discusses homology and transformation of ectotympanic structures in Cetacea. In a fascinating section by FISH biomechanical properties of the origin of cetacean flukes are presented. The evolutionary sequence by which flukes arose will remain speculative until impressions of flukes early in their evolution are found. BUCHHOLTZ informs the reader that it is highly probable that undulatory movements changed from the feet to the terminal fluke, which is coincident with dorsoventrally compressed posterior tail vertebra.

The twelfth chapter, authored by MADAR, deals with highly variable structural adaptations of long bones in Archaeocetes. The variability in thickness of the cortex and the "trabecular infill" outline a progressively increasing dependence on aquatic habitats. In the following stimulating chapter PABST et al. present the well-based hypothesis that features of the cetacean reproductive tract are paedomorphic, i.e., that they represent arrested embryonic characters that are retained and specialized in the adult. The following parameters are considered as paedomorphies: intra-abdominal testes, vestiges of the pelvic girdle, plexus of the spermatic and ovarian arteries, and duplicated Venae cavae.

Investigations of oxygen and carbon isotope composition in teeth and bone of Cetacea (RoE et al.) allowed to study terrestrial to marine transition, especially of early cetaceans. After a rapid transition the first fully marine cetaceans appeared in the middle Eocene. This change of habitat is coincident with changes in osmoregulatory physiology and in the types of diet. The palaeobiological perspectives of the origin of whales is dicussed by GINGERCH under consideration of the following parameters: body size, trophic specialisation, specialisations of the middle ear, hydrodynamic streamlining, and hindlimb reduction, as well as encephalisation. The author hypothesizes that trophic dental changes represent the first step in transition from land to sea, auditory changes happening next, and locomotor adaptations to a fully aquatic lifestyle followed.

In a final chapter, THEWISSEN discusses the "evolutionary turmoil during the invasion of oceans" as an important aspect of cetacean origin and sums up the findings presented in this remarkable book. He considers cetacean origins as one of the best documented examples of major morphological change in the fossil record. The reviewer is deeply impressed by the wealth of information on evolutionary patterns and the multitude of viewpoints from which the emergence of whales is presented, discussed, and interpreted. Certainly, this publication is not only informative reading for cetologists, but for mammalogists in general!

P. LANGER, Gießen

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Zeitschrift/Journal: <u>Mammalian Biology (früher Zeitschrift für</u> <u>Säugetierkunde)</u>

Jahr/Year: 2000

Band/Volume: 65

Autor(en)/Author(s): Anonymous

Artikel/Article: Buchbesprechung 64