

Preface to Volume 4

MODERN amphibians were long used as models of an intermediate stage in evolution between obligatorily aquatic fish and fully terrestrial amniotes. In particular, their mode of reproduction, involving non-amniotic eggs and commonly an aquatic larval stage that metamorphoses into a more terrestrial adult, appeared to bridge the gap between the life histories of fish and those of reptiles, in which the eggs are laid on land and the young hatch out as miniature replicas of adults.

However, the modern amphibian orders are known no earlier than the Early Jurassic. A host of animals from the late Palaeozoic and early Mesozoic have been classified as amphibians, but they bear few skeletal or adaptive similarities with frogs, salamanders, or caecilians. They are as different from modern species as the Mesozoic dinosaurs and pterosaurs are from lizards and snakes. An entire, unexpected world exists among the early amphibians.

It is within the Late Devonian, more than 365 million years ago, that the actual transition occurred between fish and terrestrial vertebrates. Newly discovered material of osteolepiform fish and early amphibians, described in Chapter 2 by Jennifer Clack, provides a detailed look at one of the most significant transitions in the history of vertebrates. The Carboniferous and Early Permian were a time of major radiation, when animals with an amphibious mode of reproduction were the dominant terrestrial vertebrates. Chapters by Jennifer Clack and Robert Carroll, John Bolt and Eric Lombard, Tim Smithson, Michel Laurin, and Robert Holmes, cover the anatomy and way of life of the major groups. The Late Permian and Triassic labyrinthodonts, described by Anne Warren, exemplify a major radiation of secondarily aquatic lineages that survived the early diversification of amniotes, which have dominated terrestrial habitats since the end of the Palaeozoic. Jürgen Boy and Hans-Dieter Sues discuss the anatomy and phylogenetic position of an assemblage of larval and neotenic forms, collectively referred to as branchiosaurs, that demonstrate the manner of reproduction among the common groups of Palaeozoic amphibians.

In contrast with the rich fossil record of late Palaeozoic and early Mesozoic amphibian groups, there is still very little known about the origin of the modern orders. No species are known from the Palaeozoic that can be allied with certainty to frogs, salamanders, or caecilians, although individual features that are characteristic of one or the other of these orders are known among particular Palaeozoic genera. The nature of this problem is discussed in Chapter 11. The Mesozoic and Cenozoic fossil record of the modern orders and their putative ancestors is treated in Chapters 12–18 by Jean-Claude Rage, Zbyněk Roček, Andrew Milner, Robert Carroll, and Ana Marie Báez. J. Alan Holman completes the link to living amphibians by discussing the fossil record of Northern Hemisphere genera during the Pleistocene.

The purpose of this volume is to outline the current knowledge of the anatomy and time of occurrence of the major groups of amphibians from the Upper Devonian to the present, as learned from the fossil record. On the basis of this information, the individual authors attempt to reconstruct the ways of life and interrelationships of these various groups, as far as is now possible. This will provide a general history of amphibians over a period of more than 370 million years. The most important message is how extremely diverse have been the structures and ways of life of vertebrates with a reproductive pattern broadly comparable to those of living frogs, salamanders, and caecilians, which has been used to recognize all of these animals as members of a single assemblage, the Amphibia.

It is hoped that knowledge of the entire history of the Class Amphibia will provide an informative basis for comparing the nature and patterns of evolution exhibited by the surviving orders with the vast assemblage that once dominated the terrestrial and shallow water environments of the earth.

Montreal, Canada
Raleigh, North Carolina
January 2000

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