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Patterns of larval development in Cretaceous pipid frogs

Zbyněk Roček and Eduard Van Dijk
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A developmental series of nearly 250 tadpoles of *Shomronella jordanica* from the Early Cretaceous (Hauterivian) of the Shomron (Samaria) region of central Israel, a small collection (12) of *Thoraciliacus rostriceps* tadpoles from the Early Cretaceous (Aptian) of Makhtesh Ramon, Israel, and 13 tadpoles from the Late Cretaceous (Campanian/Maastrichtian boundary) of Stompoor, Marydale, South Africa were studied. These were compared with published data on the development of Paleogene (Middle Eocene-Early Oligocene) pipids from Patagonia, and with normal development of the contemporary pipid frog *Xenopus*. The comparisons of the developmental series of the Cretaceous and contemporary pipid frogs provided data on changes in the developmental pattern, namely of the degree of ossification and other developmental events. In general, it seems that ossification has become considerably delayed in the course of pipid evolution, whereas most anatomical features typical for free living pipid larvae were well established as early as in the Early Cretaceous. Comparisons with the developmental series of specimens from the Late Oligocene Palaeobatrachidae (closely related to the Pipidae) from Bechlejovice near Děčín, Czech Republic revealed that some morphological differences between the two families might be explained by their developmental mode (e.g., formation of the opisthocoelous vertebral centrum in *Shomronella*). The uncinate process on three anterior pairs of ribs in *Shomronella* is the character retained in primitive anurans, and indicates close phylogenetic relations of early pipoids to discoglossoids.

Key words: Anura, Pipidae, larval development, Cretaceous, Oligocene, Israel, South Africa.

Zbyněk Roček Rocek@gli.cas.cz Laboratory of Palaeobiology, Geological Institute, Academy of Sciences, Rozvojová 135, CZ-165 00 Prague 6, Czech Republic and Department of Zoology, Charles University, CZ-128 44 Prague 2, Czech Republic;
Eduard Van Dijk Eddie@vandijks.com Department of Plant and Animal Biology, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa.


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