

A redescription of the early archosauromorph *Protorosaurus speneri* MEYER, 1832, and its phylogenetic relationships

by

ANNALISA GOTTMANN-QUESADA and P. MARTIN SANDER

With 30 text-figures and 4 tables

Summary

Having been described in 1710, the first specimen of *Protorosaurus speneri* is one of the first fossil reptiles ever described. The only major monograph of the species was published in 1856, based on the 25 specimens available at that time. However, the skull anatomy remained almost unknown. Although the monograph on *Protorosaurus* contains very detailed descriptions, many anatomical features of the postcranium remained unclear due to extreme crushing of most specimens. Recently discovered material, especially a complete skull, the first juvenile, and a less crushed almost complete skeleton, provided the incentive to revise the anatomy of *Protorosaurus*. The new material allows a reconstruction of the skull for the first time as well as that of several postcranial elements, e.g. a complete interclavicle and a complete pubis. Furthermore, several anatomical features e.g. the well developed humerus and the number and arrangement of tarsal elements, can be described in more detail. The first juvenile specimen of *Protorosaurus* provides new insights into the ontogeny of the pelvic region and the tarsal elements.

Protorosaurus is a member of the archosauromorph group Prolacertiformes, a group generally considered to be monophyletic. The anatomy of *Protorosaurus* will therefore be compared to that of other well known representatives of the group. The comparison shows that the skull anatomy of *Protorosaurus* closely resembles that of *Prolacerta broomi*, *Macrocnemus bassanii*, and *Pamelaria dolichotrachela*. The postcranium is similar to that of *Prolacerta broomi* and *Pamelaria dolichotrachela*.

Because the phylogenetic status and make-up of the Prolacertiformes is currently discussed controversially, a preliminary computer-aided, cladistic analysis is performed based on the dataset of the first author postulating a paraphyletic Prolacertiformes. Over 30% of the original codings were corrected for *Protorosaurus*, and the analysis was also modified with regard to the included taxa. The new analysis includes 17 taxa and 144 characters. *Protorosaurus* turns out to be a basal archosauromorph and the direct sister taxon of *Megalancosaurus*. The Prolacertiformes themselves are paraphyletic with *Prolacerta* and *Pamelaria* being more closely related to the Archosauriformes. The anatomical similarities between *Protorosaurus*, *Prolacerta* and *Pamelaria* must hence be interpreted as convergent. If *Megalancosaurus* is deleted from the analysis, *Protorosaurus* falls into an unresolved trichotomy with (*Tanystropheus* plus *Macrocnemus*), which becomes the direct sister taxon to the monophylum consisting of (*Pamelaria* plus *Prolacerta* plus (*Euparkeria* plus *Proterosuchus*)). Furthermore, in this case the Choristodera fall outside the Sauria.

Key words: *Protorosaurus* – Prolacertiformes – Upper Permian – Germany – skull osteology – phylogenetic analysis

Zusammenfassung

Die Erstbeschreibung von *Protorosaurus speneri* im Jahr 1710 macht ihn zu einem der ersten fossilen Reptilien, die überhaupt jemals beschrieben wurden. Die einzige größere Monographie der Art wurde 1856 veröffentlicht und basierte auf den 25 Exemplaren, die damals bekannt waren. Die Schädelanatomie blieb jedoch weitestgehend unbekannt. Obwohl die Monographie von *Protorosaurus* sehr detaillierte

Address of the authors: Dr. ANNALISA GOTTMANN-QUESADA, Steinmann Institute, Division of Paleontology, University of Bonn, Nussallee 8, D-53115 Bonn, Germany, e-mail: agottmann@gmx.de

Prof. Dr. P. MARTIN SANDER, Steinmann Institute, Division of Paleontology, University of Bonn, Nussallee 8, D-53115 Bonn, Germany, e-mail: martin.sander@uni-bonn.de

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