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S13 – Morphological evolution and extinction patterns of the Ammonoidea at the Permian-Triassic boundary of Iran

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The classical Permian-Triassic (P-Tr) boundary sections in the vicinity of Julfa (NW Iran) and in the Baghuk Mountain area (Central Iran) have high potential for the study of the end-Palaeozoic extinction event. The lithostratigraphic record of the P-Tr boundary beds in the Julfa area is rather uniform over a distance of 35 km. It comprises the *Paratirolites* Limestone (four meters of red nodular limestone), Boundary Clay (60-190 cm), and Elikah Formation (400 m gray platy limestones). Sections in the Aras Valley and at Kuh-e-Ali Bashi display very similar successions of latest Permian ammonoids. Sections in the vicinity of Abadeh in Central Iran show a similar succession and faunal composition.

Excellent correlation of the sections can be achieved and enables the detailed documentation of the demise of the Paleozoic faunas. The *Paratirolites* Limestone, the youngest Permian carbonate formation that represents about the upper half (appr. 1.2 Ma) of the Changhsingian stage, can be subdivided in terms of ammonoid biostratigraphy, complementing lithostratigraphic, carbonate microfacies, stable isotopes, and conodont data.

The unit can be subdivided into at least four clearly separable ammonoid zones, allowing discrimination into ~300,000 year intervals. The study region can therefore serve as a standard for the Tethyan development of the P-Tr boundary. A stepwise temporal development of the Late Permian ammonoid faunas is observed. In contrast to earlier studies, the *Paratirolites* Limestone is not uniform in its ammonoid faunas but shows some distinct patterns:

(1) The abundance of ammonoids decreases at the top of the *Paratirolites* Limestone; only the top part of this rock unit shows sometimes a mass occurrence of small ammonoids.

(2) A morphological development from simpler suture lines (with unserrated prongs of the external lobe) at the base of the *Paratirolites* Limestone towards more complex sutures with stronger frilled external lobes in the middle portion of the rock unit, and finally a rebound towards simpler suture lines (succession of the genera *Dzhulfites*, *Paratirolites*, and *Abichites*).

(3) A general simplification of the conch geometry from trapezoidal to compressed whorl cross sections.

(4) A smoothing of the shell ornament (loss of coarse sculpture such as ventrolateral nodes with a development to faint ribs).

(5) A conspicuous size decrease of the ammonoid conchs (from up to 200 mm diameter to 30 mm). This size reduction can be seen in the paratirolitid lineage (genera *Paratirolites* and *Abichites*) but also in the immigration of small-sized ammonoids such as *Neoaganides*.

The top of the *Paratirolites* limestone shows the extinction horizon with numerous small ammonoids with simplified suture lines. These data indicate that the evolution of the ammonoids has severely been affected already within the Changhsingian. The data demonstrate the complex morphological evolution of the latest Permian ammonoids prior to the mass extinction event.

S15 – Tooth replacement in Dicraeosauridae – Insights from CT images of *Dicraeosaurus hansemanni*

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Among Dicraeosauridae, tooth bearing elements are known exclusively from the Late Jurassic taxon *Dicraeosaurus hansemanni* of the Middle Dinosaur Member of the Tendaguru Formation (Tendaguru, Tanzania). The preserved material consists of three premaxillae, one maxilla, and one dentary, which all preserve complete rows of alveoli, but only few replacement teeth in situ. Based on the alveoli, the tooth count of *Dicraeosaurus hansemanni* can be reconstructed to 4 premaxillary, 12 maxillary, and 16 dentary teeth. The tooth bearing skull bones were investigated by computed tomography using an Aquilion CX (Toshiba) at the Leibniz Institute for Zoo- and Wildlife research, and the obtained data was edited using OsiriX (32 Bit Version 3.71).

In the premaxillae, a row of 4 to 5 replacement teeth in each alveolus is present. Interalveolar septa separate the rows of replacement teeth from each other, but open at the labial margin into an alveolar trough. In the maxilla, the rostralmost 4 alveoli have 4 replacement teeth, but their number decreases to 2 between the 6th and 9th alveolus and 1 between the 10th and 12th alveolus. The dentary shows 3 replacement teeth in each of the rostralmost 4-6 alveoli. The 7th to 11th alveoli bear two replacement teeth, and the 12th to caudalmost dentary alveolus bear each only one replacement tooth. The interalveolar septa of the maxilla and the dentary are complete, except for two overlapping replacement teeth.

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