

## **Pneumaticity and soft-tissue reconstructions in the neck of diplodocid and dicraeosaurid sauropods**

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The axial soft-tissue system in the neck of Dicraeosauridae and Diplodocidae, including pneumatic diverticula, ligaments, and muscles, is reconstructed on the basis of phylogenetic and functional morphological comparisons with extant crocodylians and birds and compared with other soft-tissue reconstructions for sauropods. Bifurcation of the neural spines separated the paired supraspinal ligament into two sheets. A paired interspinal septum was attached to the cranial and caudal margins of the neural spines. The dorsal and the lateral portions of the cervical musculature must have been strongly segmented, whereas the laterocostal portion was divided with one myoseptum per vertebral segment. The hypaxial cervical muscle was most probably small and only poorly segmented. In Diplodocidae and Dicraeosauridae, the distribution of external pneumatic structures is similar, whereas only Diplodocidae possess intraosseous pneumatic structures. Supravertebral pneumatic diverticula are reconstructed for both groups, which, together with dorsal ligaments filled the gap between the metapophyses of bifurcate neural spines. Comparisons between the vertebrae of juvenile and adult diplodocids strongly indicate that pneumatisation proceeded from the supramedullary diverticula into the neural arch and the neural spine. The regular branching pattern of the pneumatic cavities as well as the vertical I-beam construction of the vertebral corpora is interpreted as a consequence of the biomechanical constraints of the vertebral corpora in diplodocids. These reconstructions form the ground for functional morphological considerations in Diplodocidae and Dicraeosauridae while addressing the possible mechanical consequences of pneumatic structures for the integrity of the support system of the neck.

**Key words:** Dinosauria, Diplodocidae; Dicraeosauridae, vertebral pneumaticity; cervical ligaments; cervical musculature; functional morphology; ontogeny; tomography

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