

3D models related to the publication: Neurovascular system and dental renewal in the rostrum of Spinosauridae: new descriptions and implications on non-olfactive snout sensitivity of dinosaurs

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Abstract

The present 3D Dataset contains the 3D models of three specimens of Spinosauridae: two *Cristatusaurus lapparenti* Taquet & Russell, 1998 (MNHN.F.GDF365 and MNHN.F.GDF366) and one *Spinosaurus maroccanus* Russell, 1996 (MNHN.F.SAM124). These specimens are analyzed and discussed in Pittet F. 2026. Neurovascular system and dental renewal in the rostrum of Spinosauridae: new descriptions and implications on non-olfactive snout sensitivity of dinosaurs, *Geodiversitas*.

Keywords: dental renewal, neurovascular, rostrum, sensitivity, Spinosauridae

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INTRODUCTION

The morphological analogy between the Spinosauridae and Crocodylians rostrum has been widely documented. More recently, the supposed existence in Spinosauridae of specialized sensory organs such as those encountered in Crocodylians (called ISOs for Integumentary Sensorial Organs) has been advanced by some authors. However, no complete representation of the neurovascular network in Spinosauridae rosette had yet been described and the association between dense neurovascular branching and skin sensitivity remained only a hypothesis. The amazing internal preservation of the premaxillae of *Cristatusaurus lapparenti* and *Spinosaurus maroccanus* (from the MNHN of Paris) finally gives us now a precise idea of the situation. We show by our tomographic results one of the best-preserved neurovascular complex discovered in a dinosaur and the very first complete in a Spinosauridae with the mature specimen of *Cristatusaurus lapparenti*. We found that the volume of the neurovascular system, the size of the foramina that coincides admirably with that of the underlying branches, and the complexity of the observed ramifications represent additional evidence supporting the hypothesis of a hypersensitivity of the rosette of these animals (Fig. 1). In addition, our results tend to show a particularly high rate of tooth replacement in Spinosauridae from a very young age (Fig. 2; see also table 1).

METHODS

CT scanning of fossil specimens MNHN.F.GDF365, MNHN.F.GDF366 and MNHN.F.SAM124 were performed at the X-ray Tomography Imagery Platform AST-RX (Accès Scientifique à la Tomographie par Rayons X) of the MNHN, using a GE Sensing and Inspection Technologies phoenix—x-ray v—tome—x L240-180 CT scanner. All the data were optimized (rotation, crop and contrast correction) with ImageJ v.1.51 (Schneider et al.

2012), resulting in 16 bits TIFF images stacks (see table 1). Segmentations of these datasets were completed at the 3D Imaging Facilities Lab of UMR 7207 CR2P (MNHN-CNRS-SU), using the Mimics Innovation Suite (v.20-22, Materialise), using the threshold selection and the “Multiple Slice Edit” segmentation tool.

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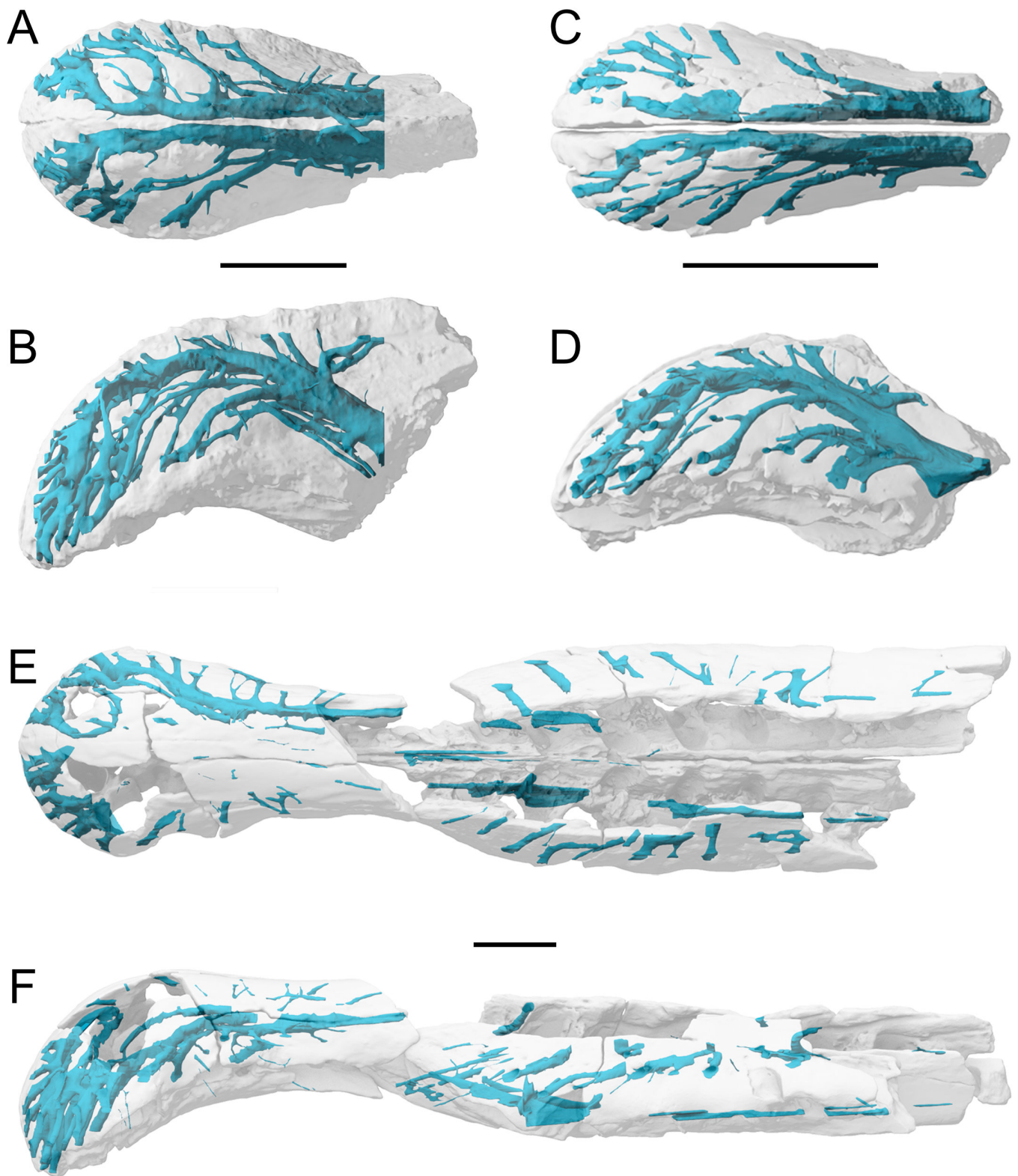


Figure 1. Neurovascular network of *Cristatusaurus lapparenti* and *Spinosaurus maroccanus* viewed by transparency. A and B, MNHN.F.GDF365 premaxillae of *Cristatusaurus lapparenti* in dorsal (A) and lateral (B) view. C and D, MNHN.F.GDF366 premaxillae of a young *Cristatusaurus lapparenti* in dorsal (C) and lateral (D) view. E and F, MNHN.F.SAM124 premaxillae and maxillae of *Spinosaurus maroccanus* in dorsal (E) and lateral (F) view. Scale bars = 5 cm.

Id.	Inv nr.	Taxon	Description	Voxel size (mm)	kV	μ A	Slice nr.
M3#1755	MNHN.F.GDF365	<i>Cristatusaurus lapparenti</i>	Right and left premaxillae	0.10599	185	450	1068
M3#1756	MNHN.F.SAM124	<i>Spinosaurus maroccanus</i>	Premaxillae and maxillae	0.1300 (mx); 0.1342 (pmx)	178 (mx); 185 (pmx)	425 (mx); 460 (pmx)	1699+1781 (mx); 1843 (pmx)
M3#1757	MNHN.F.GDF366	<i>Cristatusaurus lapparenti</i>	Right and left premaxillae	0.06263	155	350	965
M3#1758	MNHN.F.GDF366	<i>Cristatusaurus lapparenti</i>	Right maxilla portion	0.0596	150	300	1860

Table 1. List of models and scan parameters. Collection : Muséum National d'Histoire Naturelle, Paris, France.

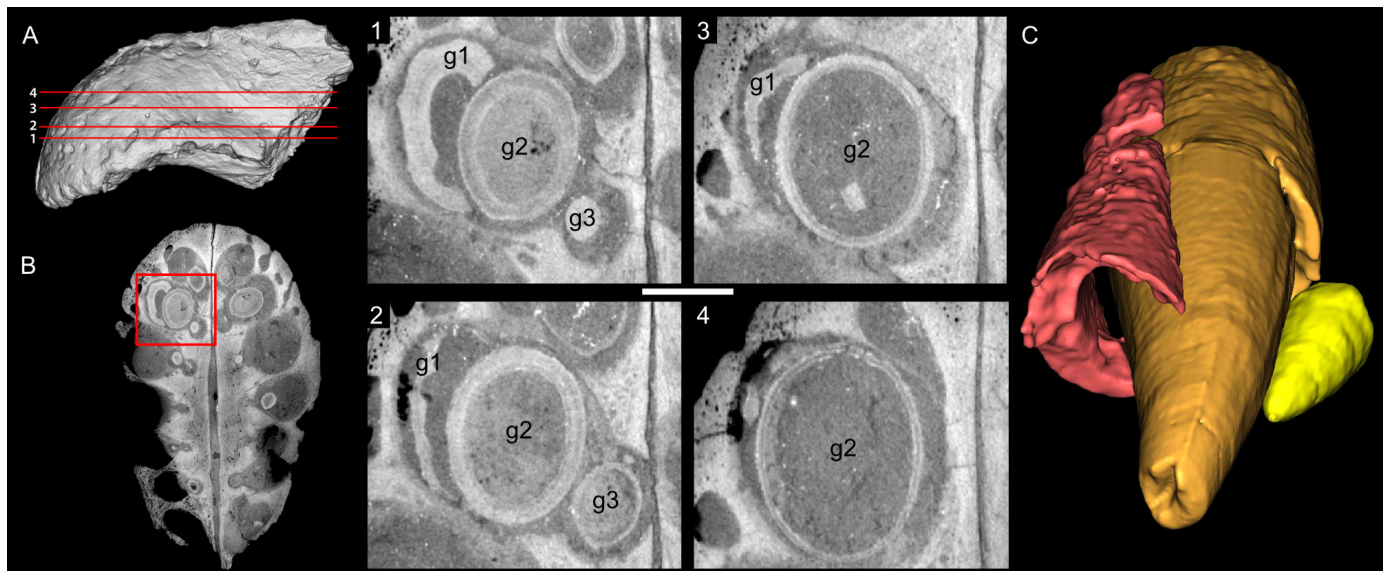


Figure 2. MNHN.F.GDF365, *Cristatusaurus lapparenti*. CT scans views of premaxillae. A, Left labial view showing location of each slice. B, Axial view with highlighting on the 2nd right alveolus showing three generations of teeth simultaneously (red square). 1 – 4, Axial slices through premaxillae, with number 1 occupying the most ventral position and number 4 the most dorsal (close to the tooth root). Abbreviations: g1, demineralized tooth; g2, main tooth; g3, replacement tooth in its crypt fused with alveolar cavity. C, 3-D rendering of the three generations of teeth of the 2nd right alveolus: tooth almost completely demineralized (red), main tooth (orange) and replacement tooth (yellow). Scale bar = 1 cm.