

CT scan data for the original holotype of *Hamadasuchus rebouli* Buffetaut 1994

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Abstract

The holotype of *Hamadasuchus rebouli* Buffetaut 1994 from the Kem Kem beds of Morocco (Late Albian – Cenomanian) consists of a left dentary which is limited, fragmentary and reconstructed in some areas. To aid in assessing if the original diagnosis can be considered as valid, the specimen was CT scanned for the first time. This is especially important to resolve the taxonomic status of certain specimens that have been assigned to *Hamadasuchus rebouli* since then. The reconstructed structures in this contribution are in agreement with the original description, notably in terms of alveolar count; thus the original diagnosis of this taxon remains valid and some specimens are not referable to *H. rebouli* anymore.

Keywords: Crocodylomorpha, CT scan, *Hamadasuchus*, Kem Kem, Morocco

Submitted:09/01/2024, published online:06/02/2024. <https://doi.org/10.18563/journal.m3.222>

Inv nr.	Description
MDE C001#1402	Dentary and teeth
MDE C001#1403	Toothmarks

Table 1. List of models of *Hamadasuchus rebouli*. Collection: Muséum des Dinosaures, Espéraza.

INTRODUCTION

Hamadasuchus rebouli is a peirosaurid originally described in Buffetaut (1994) from the ‘Hamada du Guir’ in the Kem Kem group, Morocco (Late Albian – Cenomanian, Ibrahim *et al.*, 2020) on the basis of a fragmentary left dentary. Since then, numerous more complete specimens have been discovered from Morocco and Algeria, bringing more information about this poorly known genus, which is endemic to Africa (Rauhut & López-Arbarelo, 2005; Larsson & Sues, 2007; Cavin *et al.*, 2010; Ibrahim *et al.*, 2020; Nicholl *et al.*, 2021; Pochat-Cottilloux *et al.*, 2023a, b). However, the holotype of this taxon, although described in detail in the original publication, is fragmentary and artificially reconstructed in some parts. Our goal here, using CT scan methods for the first time on this specimen, is to assess if the structures described in the original diagnosis can be relied on and be used to assign other recently reported specimens to the same taxon. This is especially important because the diagnosis of this taxon essentially relies on this fragment of a mandibular specimen, and taxonomic debate about the belonging of other specimens depends on certain mandibular characters and alveolar counts (for a full review, see Pochat-Cottilloux *et al.*, 2023a).

METHODS

The holotype of *H. rebouli* is deposited in the collection of the Muséum des Dinosaures Espéraza, France, and is named after

the original collector, Roland Reboul. It was CT scanned in May 2022 at the Laboratoire Mateis (INSA Lyon, Villeurbanne, France) to reconstruct the different structures of which it is composed. We used the DTHE (Double Tomographe Haute Energie) X-ray computed tomograph platform (RX Solutions). Scanning parameters were set to 280 kV tube voltage and 225 μ A current, a 1 mm copper filter was also used at the source exit. The acquisition was made with a voxel size of 40 μ m and 2348 projections. Avizo Lite (version 9.5.0) was used for surfaces segmentation and reconstruction and Blender (version 2.91.2) for post-processing of the surfaces (smoothing). The 3D print surfaces of the toothmarks were obtained by segmenting the counter-impression of those marks on the external surface of the dentary. Processed surfaces are available as part of this publication.

RESULTS

As described in Buffetaut (1994), the holotype does indeed present 15 alveoli, and seven of them are enclosed in the dentary part of the mandibular symphysis (Fig. 1, table 1 and table 2). The anterior reconstructed part mentioned in the original publication is damaged but the posterior part of the third alveolus can be seen, as well as a preserved part of the corresponding tooth (Fig. 1E, F & H). This alveolus is far smaller than the one posterior to it (supposedly the 4th), so we can assess with confidence that the 4th alveolus described originally is indeed the 4th alveolus, interpreting the original alveolar count as correct. At the level of the eighth alveolus, the specimen is badly damaged, the dentary is almost entirely missing and the 9th alveolus is also missing, although the corresponding tooth is preserved in the surrounding matrix (Fig. 1E, F & H). However, the four large teeth behind this area are clearly corresponding to

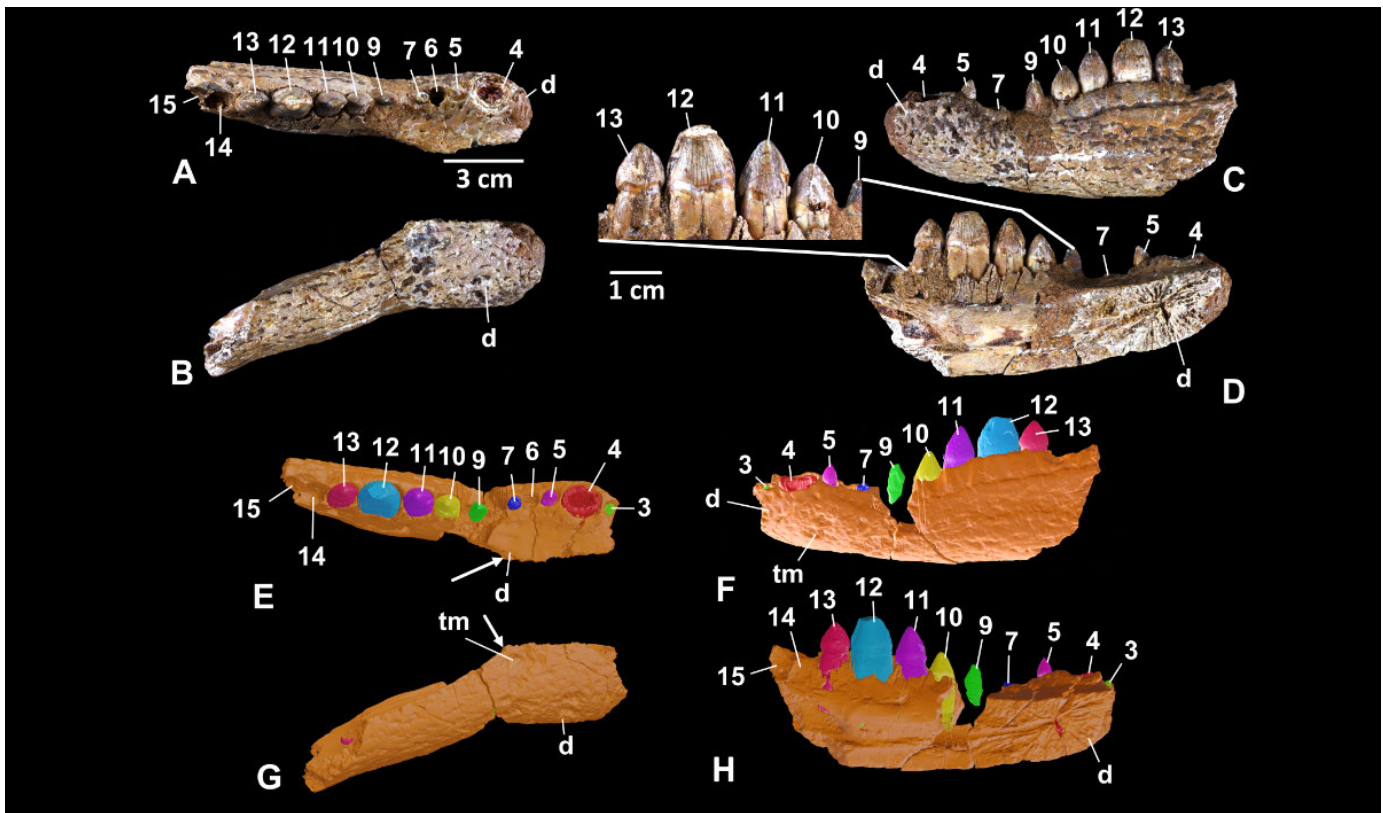


Figure 1. MDEC001, holotype of *Hamadasuchus rebouli*. Pictures of the specimen in dorsal (A), ventral (B), lateral (C) and medial (D) views. 3D reconstruction in dorsal (E), lateral (F), ventral (G) and medial (H) views. d: dentary, tm: tooth mark (counterprint in Fig. 2), numbers correspond to the associated tooth and/or alveolus. The arrows correspond to the extent of the dentary symphysis.

Alveolus position	Labio-lingual	Mesio-distal
d3	5.4	?
d4	9.5	9.5
d5	5	4.7
d6	4.9	?
d7	4	?
d8	?	?
d9	?	?
d10	6.6	8.4
d11	8.6	8.3
d12	10	10.3
d13	8.1	8.1

Table 2. Labiolingual and mesiodistal measurements of each mandibular alveolus of *Hamadasuchus rebouli* (MDE C001, in mm). Collection : Musée de Dinosaures, Espéraza

the teeth number 10 to 13 (see also table 2). A replacement tooth was segmented ventrally to the 12th tooth, which indicates that *Hamadasuchus* had similar tooth replacement mechanisms as in extant crocodylians. Posteriorly, only the anterior part of the 15th alveolus is preserved. We found no evidence of the splenial bone preserved in this specimen, as originally described. As a result, the characters used in the original diagnosis proposed by Buffetaut (1994) remain valid.

DISCUSSION

As discussed in Pochat-Cottilloux *et al.* (2023a), using ontogenetic series of extant specimens as a reference, the number of alveoli completely involved in the dentary part of the mandibular symphysis does not vary ontogenetically. As a result, we confirm here that the specimens ROM 49282 (Larsson & Sues, 2007) and NMC 41784 (Ibrahim *et al.*, 2020) cannot be attributed to *H. rebouli* confidently because they only have five alveoli completely involved in the dentary part of the mandibular symphysis rather than seven. The taxonomic status of specimens erroneously referred to as *H. rebouli* will have to be specified in future studies, namely pending a complete description and reassessment of BSPG 2005 I 83 (Rauhut & López-Arabarello, 2005). Indeed, it is the only fossil known referred to as *Hamadasuchus* where the mandible is linked to the skull and would thus allow to link cranial characters to the diagnosis of *H. rebouli* (or create a new species of *Hamadasuchus*). On the lateral side of the holotype, especially in its anteriormost part (Fig. 1F, G & Fig. 2), some deformations can be seen that could correspond to tooth marks. Those marks are a few millimetres long, quite deep (also a few millimetres) and come in pairs. They could correspond to the teeth either of the small notosuchian *Lavocatchampsia sigogneaurussellae* (Martin & De Lapparent De Broin, 2016) that is contemporary to *Hamadasuchus* in the Kem Kem fauna or tiny mammals that could represent the first direct evidence of the presence of those organisms in this Cenomanian

fauna.

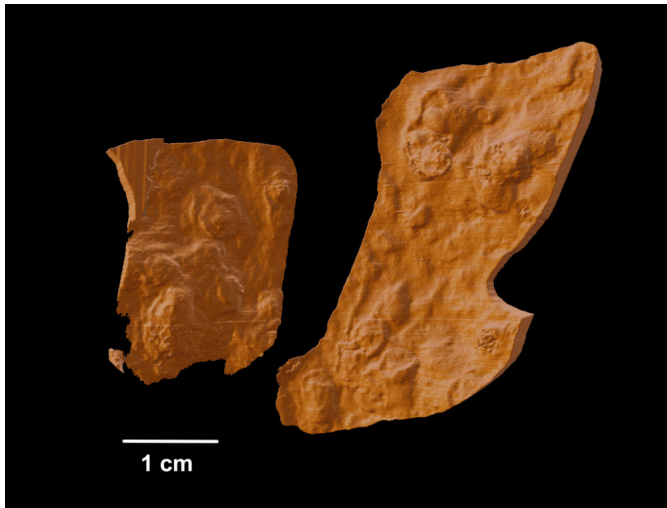


Figure 2. 3D reconstruction of the counterprints of toothmarks on MDEC001, holotype of *Hamadasuchus rebouli*

ACKNOWLEDGEMENTS

This work was supported by the Agence Nationale de la Recherche (SEBEK project no. ANR-19-CE31-0006-01 to JEM). We thank Jean Leloeuff (Musée des Dinosaures, Espéraza) for the loan of the specimen and Ivan Kuzmin (Saint Petersburg State University), Renaud Lebrun (Université de Montpellier) and Jorgo Ristevski (University of Queensland) for insightful comments that greatly improved the quality of this manuscript.

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