Dataset

3D models related to the publication: Morphological study of the anterior dentition in Raoellidae (Mammalia, Artiodactyla), new insight on their dietary habits

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Abstract

The present 3D dataset contains 3D models of new material from the middle Eocene of the Upper Subathu Formation in the Kalakot area (India), documenting the anterior dentition of the raoellid *Indohyus indirae*. Raoellidae are closely related to stem cetaceans and bring crucial information to understand the earliest phase of land to water transition in Cetacea.

Keywords: Canine, CT scan, Incisor, *Indohyus*, Raptorial dentition

Submitted: 01/07/2024, published online: 20/01/2025. https://doi.org/10.18563/journal.m3.240

INTRODUCTION

Functional studies and descriptions of the raoellid dentition have mainly focused on cheek teeth, with very few references to incisors and canines in the literature. For the species *Indohyus indirae*, only a brief description of the anterior dentition is provided in Thewissen et al. (2020). The identification of isolated anterior teeth is therefore challenging due to the lack of available reference material. Recent fieldwork undertaken by one of us (M.W.) in the Kalakot region, Jammu and Kashmir, India, has yielded a significant number of raoellid remains, including fragmentary mandibles, maxillae, and numerous isolated teeth such as incisors and canines (Fig. 1-2; see also Table 1). These specimens were collected from the East Aiji-2 locality, specifically from a large block of hard siltstone. In Bouaziz et al. 2025, we describe the anterior dentition of *I. indirae,* the most abundant raoellid species from this site, and propose a complex of characters for identifying isolated incisors and canines. We also propose a 3D reconstruction of the occlusion pattern of the anterior dentition of this species (Fig. 1) and provide new insights into its diet and possible sexual dimorphism.

METHODS

The study sample consists of 34 specimens (including 17 with available 3D scans), including fragments of mandibles and maxillae, and isolated incisors and canines (Fig. 1-2, Table 1). All specimens are identified as *I. indirae* based on their dimensions and morphology, and are conserved in the paleontological laboratory of HNB Garhwal University (catalogue name GU/RJ). The 3D data acquisition was performed using the µCT scan facility of the Montpellier Resources Imagerie (MRI) platform at the University of Montpellier, employing a RX-Solution EasyTom 150 µCT scanner. The voxel size ranged from 23 to 32 microns. Virtual extractions of non-erupted permanent teeth were manually performed frame by frame using the pencil segmentation tool in Avizo 9.3 (Thermo Fisher Scientific), while isolated teeth were reconstructed with the software's automatic selection tool. The 3D reconstruction of the dental occlusion of *I. indirae* (Fig. 1) was carried out using MorphoDig 1.6.4 (Lebrun, 2018) based on composite materials. To obtain the complete anterior dental row, some specimens were mirrored using MorphoDigś mirror function. For precise tooth orientation, we used the partial mandible (GU/RJ/838, Fig. 2m-n) and specimens illustrated by Thewissen et al. (2020: Figs. 14.1 and 14.2, RR330, RR331, RR528, RR542, RR602) of *I. indirae*, as well as the premaxillary/maxillary (GU/RJ/157) of *Khirtharia inflata* (Orliac et al., 2024) as reference models. Additionally, we considered the position of wear facets indicating tooth-on-tooth contacts (sharp facets caused by attrition, Faith et al., 2011). This approach allowed us to create a reliable 3D model in terms of diastema size and tooth orientation (Fig. 1).

ACKNOWLEDGEMENTS

We would like to thank Anne-Lise Charruault from the ISEM in the Paleontological team for specimen preparation and casting, and Sarah Ivorra from the ISEM in the Dynamics of biodiversity, anthropo-ecology team for her precious help in photographing the material and Renaud Lebrun (ISEM, in the Paleontological team) for the access of scanning facilities (MRI platform member of the national infrastructure France-BioImaging supported by the French National Research Agency [ANR-10-INBS-04, ≪Investments for the future≫]. The research leading to these results received funding from the FYSSEN foundation, the Institut des Sciences de l'Évolution, Montpellier (ISEM, projet au sud), and the Royal Belgian Institute of Natural Sciences.

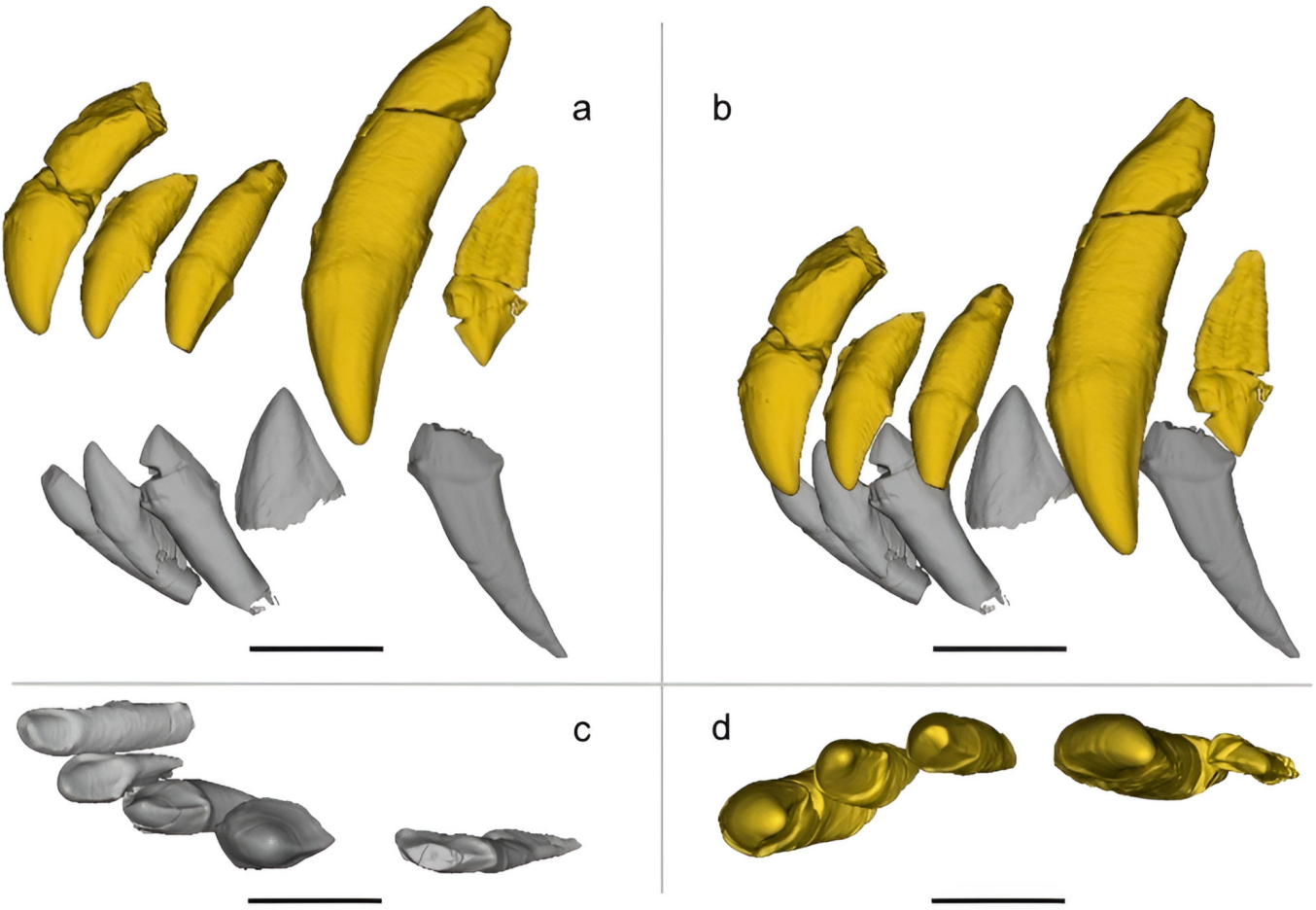

Figure 1. 3D composite reconstruction of the permanent anterior dentition of *Indohyus indirae*, based on the upper I1 (GU/RJ/57), upper I2 (GU/RJ/56), upper I3 (GU/RJ/26), upper canine (GU/RJ/457), upper P1 (GU/RJ/822), lower i1 (GU/RJ/32), lower i2 (GU/RJ/838), lower i3 (GU/RJ/838), lower canine (GU/RJ/838) and lower p1 (GU/RJ/842). a, 3D rendering model non-occluded; b, 3D rendering model in occlusion; c, 3D rendering model of the lower anterior dentition; d, 3D rendering of the upper anterior dentition. In labial view: a, b. In occlusal view: c, d. Scale bars = 1 cm.

ISSN: 2274-0422

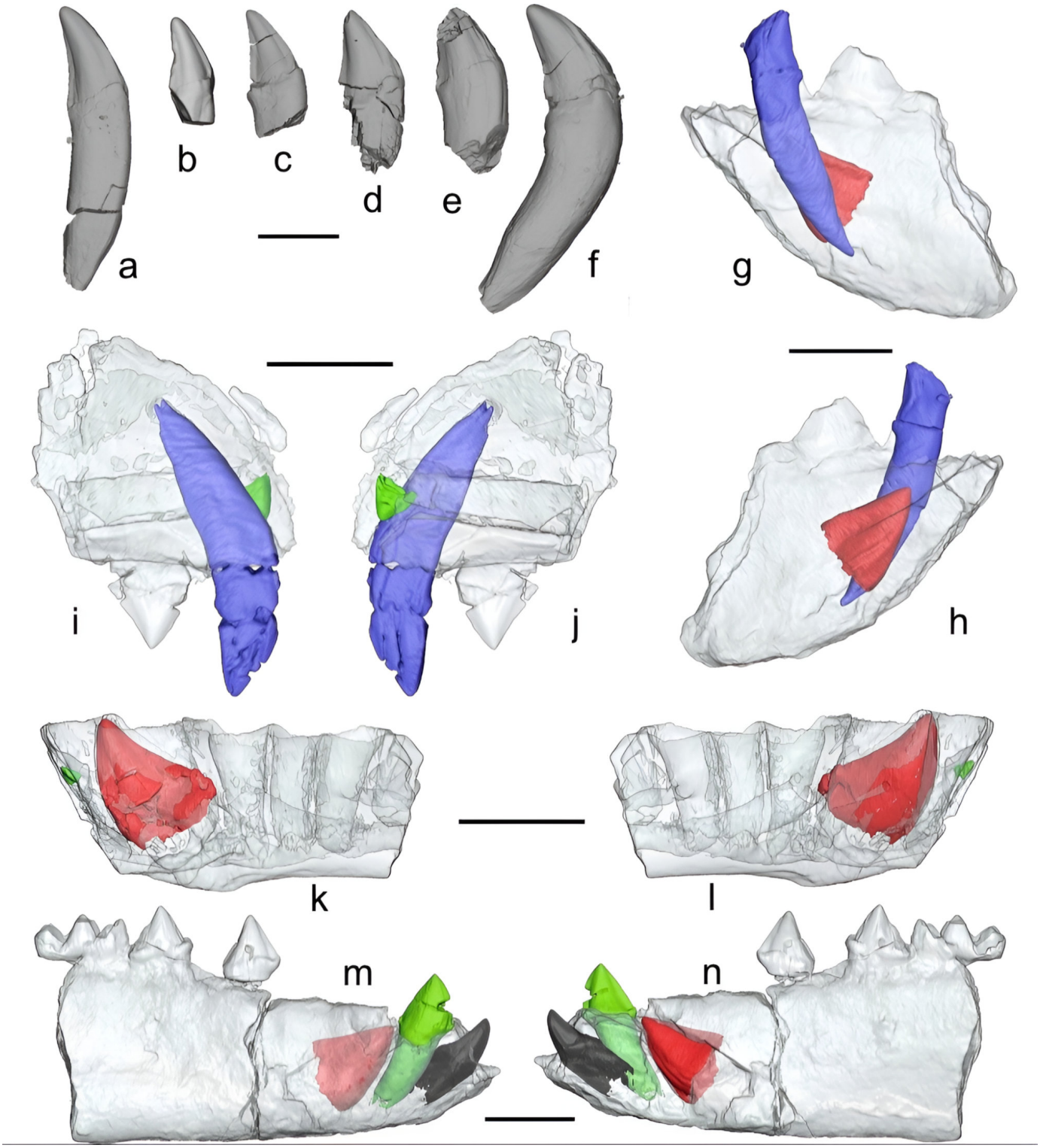

Figure 2. 3D models of mandibular, maxillary and permanent anterior teeth of *Indohyus indirae*. a-f, permanent upper canines; a, GU/RJ/457; b, GU/RJ/61; c, GU/RJ/846; d, GU/RJ/74; e, GU/RJ/63; f, GU/RJ/439. g-h, GU/RJ/842, left fragmentary mandible with the decidual lower canine and the permanent canine still growing. i-j, GU/RJ/822, right fragmentary maxillary with the decidual upper canine and a small bud of the I3. k-l, GU/RJ/824, right fragmentary mandible with the permanent canine still growing and a small part of the i3. m-n, GU/RJ/838, right fragmentary mandible with permanent i2, i3 and canine erupting. Only the anterior teeth are colored (i2 in black; i3 in green, canine in red and decidual canine in blue). Scale bars = 1 cm.

ISSN: 2274-0422

Inv nr.	Description
GU/RJ/31	Right i1
GU/RJ/32	Right i1
GU/RJ/16	Left I3
GU/RJ/23	Left I2
GU/RJ/25	Left I1
GU/RJ/26	Right I3
GU/RJ/57	Left I1
GU/RJ/61	Right upper canine
GU/RJ/63	Left upper canine
GU/RJ/74	Left upper canine
GU/RJ/439	Left upper canine
GU/RJ/457	Left upper canine
GU/RJ/846	Left upper canine
GU/RJ/822	Right fragmentary maxillary with decidual canine and I3
GU/RJ/824	Right fragmentary mandible with lower canine and small part of the i3
GU/RJ/838	Right fragmentary mandible with permanent i2, i3 and canine and small part of the root of the decidual i3
GU/RJ/842	Left fragmentary mandible with decidual and permanent canine
M3#1529	3D composite reconstruction of the anterior dentition of Indohyus indirae with GU/RJ/57 (I1), 56 (I2), 26 (I3), 457 (Upper canine), 822 (P1), 32 (i1), 838 (i2, i3 and lower canine) and 842 (p1)

Table 1. List of models of *Indohyus indirae*. Collection : Garhwal University, Rajouri collection, Srinagar, Uttarakhand, India.

be applied to all subsequent versions up to the Author Accepted Manuscript arising from this submission.

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