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# The late Pliocene prehistoric site of Masol (Northwestern India): new dating of the geological and paleontological context of cut marks and stone tools

Julien Gargani\*<sup>†1</sup>, Pierre Voinchet\*<sup>‡2</sup>, Anne Dambricourt-Malassé<sup>§3</sup>, Mukesh Singh<sup>¶4</sup>,  
Anne-Marie Moigne<sup>5</sup>, Cécile Chapon Sao<sup>6</sup>, Salah Abdessadok<sup>7</sup>, Alina Tudryn<sup>8</sup>,  
Dominique Cauche<sup>7</sup>, Baldev Karir<sup>4</sup>, and Surinder Pal<sup>4</sup>

<sup>1</sup>UMR 8148 CNRS (GEOPS) – Université Paris Sud - Paris XI, Centre National de la Recherche  
Scientifique - CNRS – Bat 509 rue du Belvédère 91405 Orsay, France

<sup>2</sup>UMR 7194 (HNHP) – Muséum National d’Histoire Naturelle (MNHN), Centre National de la  
Recherche Scientifique - CNRS – Département Homme et Environnement Institut de Paléontologie  
Humaine 1, rue René Panhard 75013 Paris, France

<sup>3</sup>UMR 7194 CNRS (HNHP) – Muséum National d’Histoire Naturelle (MNHN), Centre National de la  
Recherche Scientifique - CNRS – Département Homme et Environnement Institut de Paléontologie  
Humaine 1, rue René Panhard 75013 Paris, France

<sup>4</sup>Society for Archaeological and Anthropological Research (SAAR) – H 1448 Sector 22B Chandigarh  
160017, Inde

<sup>5</sup>UMR 7194 CNRS (HNHP) – Muséum National d’Histoire Naturelle (MNHN), Centre National de la  
Recherche Scientifique - CNRS – Département Homme et Environnement EPCC CERP Avenue Léon  
Jean Grégory - 66720 Tautavel, France

<sup>6</sup>UMR 7194 CNRS (HNHP) – Muséum National d’Histoire Naturelle (MNHN), Centre National de la  
Recherche Scientifique - CNRS – Département Homme et Environnement Musée de l’Homme 17, place  
du Trocadéro 75116 Paris, France

<sup>7</sup>UMR 7194 (HNHP) – Muséum National d’Histoire Naturelle (MNHN), Centre National de la  
Recherche Scientifique - CNRS – Département Homme et Environnement Institut de Paléontologie  
Humaine 1, rue René Panhard 75013 Paris, France

<sup>8</sup>UMR 8148 CNRS (GEOPS) – Université Paris Sud - Paris XI, Centre National de la Recherche  
Scientifique - CNRS – Bat 504 rue du Belvédère 91405 Orsay, France

## Résumé

The paleontological site Masol is located in the Himalayan foothills, north of Punjab (India), in the Chandigarh hills. The monsoon combined with tectonics have dug a 60-hectare inlier around a culmination of an anticline. Seasonal torrents release layers of silts

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\*Intervenant

<sup>†</sup>Auteur correspondant: julien.gargani@u-psud.fr

<sup>‡</sup>Auteur correspondant: pvoinch@mnhn.fr

<sup>§</sup>Auteur correspondant: anne.malasse@mnhn.fr

<sup>¶</sup>Auteur correspondant: saar.21@hotmail.com

and sands within an area rich in mammal and reptile fossils attributed to the late Pliocene (Sahni and Khan 1964, Badam 1973, Nanda 2013). Sahni and Khan have defined the Plio-Pleistocene boundary on sedimentary criteria (pebbles in sands). The torrents are drained by the rivulet Patiali Rao which flows into the Punjab plains. The magnetostratigraphy of its banks locates the fossiliferous layers below the Gauss-Matuyama Reversal ( $> 2.58$  Ma) (Ranga Rao 1993). The correspondence between the inversion and the pebbly sands had to be checked. Since 2009 our team surveys the fossiliferous layers ( $n = 1500$  fossils) and collected herbivore bones with cut and percussion marks made by sharp edges in quartzite (Palevol, 2016, 15: 279-452). Their spatial organisation and their trajectories in the sectors of ligament and tendon attachments, enable to reconstitute the manual gestures. Quartzite pebbles have been observed for the first time inside the fossiliferous silts. In 12 localities, fossils have been collected with lithic artefacts (choppers, flakes, hammers, anvils, cores) on surface in permanent erosion. The lithostratigraphic study records 170 meters of sedimentary deposits from the bed of the rivulet Patiali Rao up to the crest that corresponds to the suspected Plio-Pleistocene limit. The fossiliferous layers of 50 meter thickness are located in the lower part of the sequence. The new geological and faunal studies (lithology, mineralogy, granulometry, taxonomy, taphonomy) attest to the fluvio-marshy environments formed by Himalayan rivers flowing into the paleoplains. The layers have restored terrestrial and aquatic vertebrates (e.g. *Merycopotamus*, *Sivatherium*, *Bos*, *Hexaprotodon*, *Testudo atlas*) along with assemblages typical of the Late Pliocene (*Stegodon-Elephas* and *Hipparion-Equus*) and a weak representation of predators (crocodiles, hyenas, *Panthera*). New magnetostratigraphic analyses were firstly performed at the locality where the oldest butchery activities had taken place, close to where a chopper was extracted in stratigraphy for the first time in 2017, and secondly at the highest sequence on the crest. The polarity is normal, invalidating the suspected Plio-Pleistocene lithological boundary (Chapon Sao et al., in preparation). The geomagnetic reversal is pushed higher in the stratigraphy beyond the crest. The pebbly sands are being dated by Electron Spin Resonance (UMR 7194) and by cosmonucleids (at CEREGE by GEOPS). The cut marks and the first chopper *in situ* at Masol 1 are 140 meters below these sands, the result of the dating will be presented and the implications discussed.

**Mots-Clés:** Masol, prehistory, India, late Pliocene, dating, cosmonucleids, ESR