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## Project Gallery

# Kanyimangin: the Early to Middle Pleistocene Transition in the south-west of the Turkana Basin

Aurélien Mounier<sup>1,2,\*</sup>, Fredrick Kyalo Manthi<sup>3</sup>, Marjolein D. Bosch<sup>4,2</sup>, Sol Sánchez-Dehesa Galán<sup>5,6,7</sup>, Cécile Chapon-Sao<sup>1</sup>, Hema Achyuthan<sup>8</sup>, Jean-Jacques Bahain<sup>1</sup>, Camille Daujeard<sup>1</sup>, Anne Delagnes<sup>9</sup>, Justus Erus Edung<sup>3</sup>, Christophe Falguères<sup>1</sup>, Robert A. Foley<sup>10,2</sup>, Hugo Hautavoine<sup>1</sup>, Gunther Noens<sup>11</sup>, Emmanuelle Stoetzel<sup>1</sup>, Olivier Tombret<sup>1</sup>, Joyce Waithira<sup>12</sup>, Ann Van Baelen<sup>13</sup>, Juan Marín<sup>14</sup>, Céline Vidal<sup>15</sup> & Marta Mirazón Lahr<sup>9,2</sup>

<sup>1</sup> HNHP-UMR7194, MNHN/CNRS/UPVD, Musée de l'Homme, Paris, France

<sup>2</sup> Turkana Basin Institute, Nairobi, Kenya

<sup>3</sup> National Museums of Kenya, Nairobi, Kenya

<sup>4</sup> Austrian Archaeological Institute – Prehistory, Austrian Academy of Sciences, Vienna, Austria

<sup>5</sup> Temps-UMR8068 CNRS/UP1/UPN, Nanterre, France

<sup>6</sup> Institute of Archaeology, Tel Aviv University, Israel

<sup>7</sup> Centre de Recherches Français à Jérusalem, Israel

<sup>8</sup> Department of Geology, Anna University, Chennai, India

<sup>9</sup> UMR5199-PACEA, CNRS/Université de Bordeaux, France

<sup>10</sup> LCHES, Department of Archaeology, University of Cambridge, UK

<sup>11</sup> Independent Researcher, Leuven, Belgium

<sup>12</sup> Department of History and Archaeology, University of Nairobi, Kenya

<sup>13</sup> Academic and Historical Heritage Office, KU Leuven, Belgium

<sup>14</sup> Departamento de Prehistoria y Arqueología, UNED, Madrid, Spain

<sup>15</sup> Fitzwilliam College, Department of Geography, University of Cambridge, UK

\* Author for correspondence ✉ [aurelien.mounier@mnhn.fr](mailto:aurelien.mounier@mnhn.fr)

The Early to Middle Pleistocene Transition (EMPT) is characterised by major environmental changes and evolutionary innovations within the genus *Homo* but the scarcity of the African EMPT fossil and archaeological records obscures its palaeoecological context. Here, we present archaeological and faunal evidence from a newly excavated West-Turkana EMPT site—Kanyimangin.

Keywords: Kenya, Early to Middle Pleistocene, lithic artefacts, geochronological analyses

## Introduction

One of the stumbling blocks to understanding the evolutionary history of the genus *Homo* concerns the impact of the Early to Middle Pleistocene Transition (EMPT) (1.2–0.75Ma) on hominin populations. This period witnessed a shift in glacial cycle duration (from *c.* 41ka to *c.* 100ka) and amplitude (extreme thermal intensity) (Head & Gibbard 2005),

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leading to marked climate change. Concomitantly, cultural and biological innovations appear within the hominin lineage. Mode-2 technology and its typical Acheulean handaxes, which emerged earlier (*c.* 1.75Ma, Lepre *et al.* 2011), become more complex in design and diverse in areas of use, spreading to new regions of Africa and Eurasia at *c.* 1Ma (Pappu *et al.* 2011; Gallotti & Mussi 2017). These technological changes may reflect diversification of hominin populations in the Early/Middle Pleistocene (Macchiarelli *et al.* 2004). Only three East African sites have yielded well-preserved EMPT hominin fossils—Olorgesailie (Potts *et al.* 2004); Bouri (Gilbert & Asfaw 2008); and Buia (Macchiarelli *et al.* 2004)—and there is no consensus regarding their interpretation within an integrated framework for human evolution.

Two major questions relate to EMPT hominin evolution: (1) what role did the environment play in prompting behavioural and biological changes; and (2) what factors shaped the diversity seen in the archaeological and fossil records during this period. Characterising these aspects is essential to deciphering whether different techno-cultural groups and hominin species existed at the time, and how those differences can be interpreted in a phylogenetic framework. The scarcity of EMPT sites in Africa prevents researchers from addressing these questions, making the discovery and description of new sites a priority.

The present project aims to identify and excavate EMPT sites in the south-west Turkana Basin (Kenya). This article introduces a new site currently under investigation: Kanyimangin.

## Geology

Kanyimangin is located east of the Kerio fault, within the Kalabata River circular anomaly (Figure 1), where thick sedimentary deposits are present but limited in the north by later Quaternary deposits, reflecting lake level fluctuations. The sediments are dissected by diverging reverse faults, suspected to be older than 3.7Ma (Vétel *et al.* 2004).

Correlations between the layers of 10 geological trenches (GT) (Figure 2) at the site revealed around 15m of sedimentation history preserved by five sandstones (SS1–SS5) that form, west to east, successive tilted ridges in the landscape (approximately 14°W, Figure 2). To the west is a massive ridge formed by an archaeologically sterile pebble conglomerate. Below, without identified contact but on top of SS1, is a stratigraphic layer of laminated silts and sands (GT1) with a palaeosol forming its upper part, where faunal remains (carnivore, suid and microfauna) were found. Further east, the sediments preserved between SS2 and SS4 consist of fine, finely laminated but not very cohesive, silts and sands, forming an archaeologically sterile erosional surface. SS5 can be tracked from GT10 (north) to GT6 (south) (Figure 2), where archaeological and faunal remains are found in stratigraphic context.

Palaeomagnetic analyses indicate a reverse magnetozone for sediments from GT1 (PalKY-2, above SS1), and a normal magnetozone for sediments from GT2 (PalKY-5.2, below SS2) (Figure 2).

## Archaeology

Archaeological surveys (2017–22) at Kanyimangin yielded 344 lithic artefacts, mostly discovered on erosional surface accumulations. In June 2022, an archaeological trench (AT4)

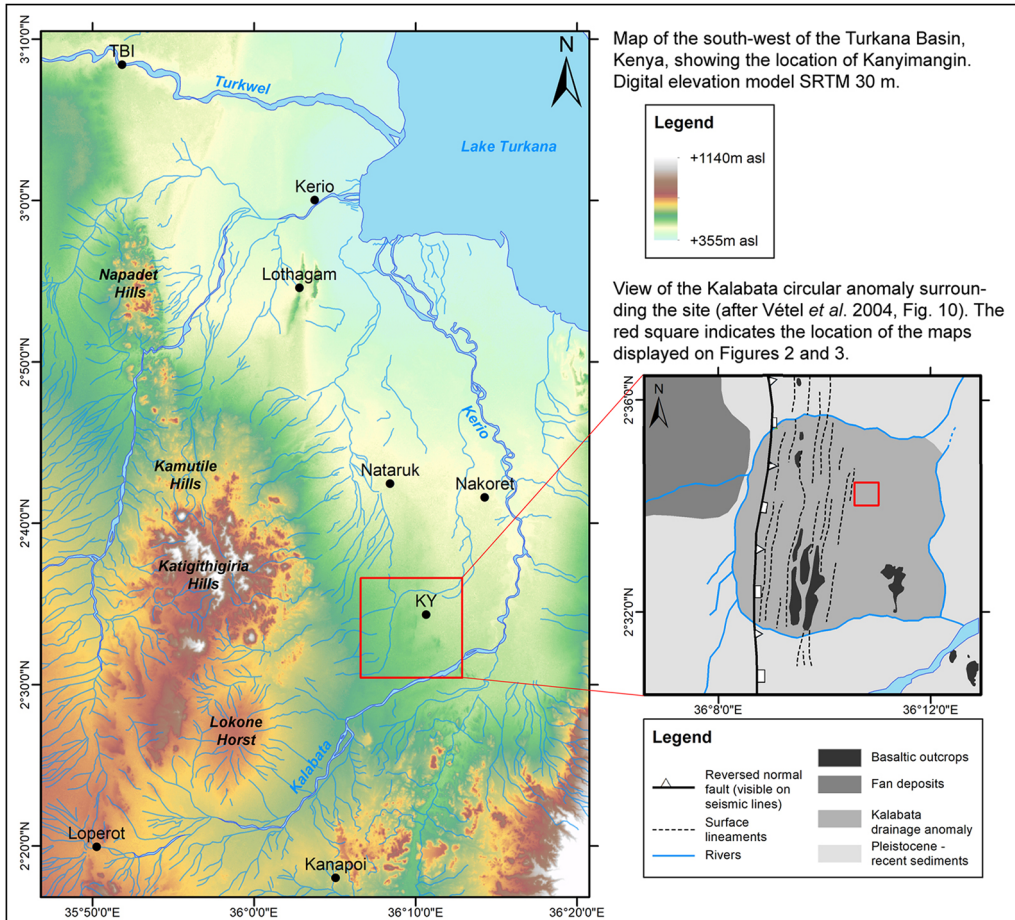


Figure 1. Location of Kanyimangin (figure by Aurélien Mounier and Ann Van Baelen).

(Figures 2 & 3) was excavated following discovery of fresh lithic artefacts on the sloping surface of a plateau in the northern part of the site. Seven square metres were excavated to a depth of 0.5m; archaeological material was found in sandy sediments and in pockets of brown-reddish silts surrounded by pieces of sandstone belonging to SS5. Sixty-two lithic artefacts were piece-plotted and five fossil fragments were recovered from the sieve (mesh size 2mm).

The excavated and surface artefacts display similar technological characteristics (Figure 4). Cores with simple debitage methods (unipolar and convergent), discoidal cores and different types of handaxes are consistent with an Early/Middle Pleistocene occupation of the site (e.g. Gallotti & Mussi 2017), although the presence of Levallois cores and flakes with platform preparation could indicate more recent occupational phases.

## Palaeontology

The faunal assemblage recovered at Kanyimangin is composed of 2155 bone fragments representing 212 individual specimens from over 20 taxa (Figure 5). Aquatic and terrestrial taxa

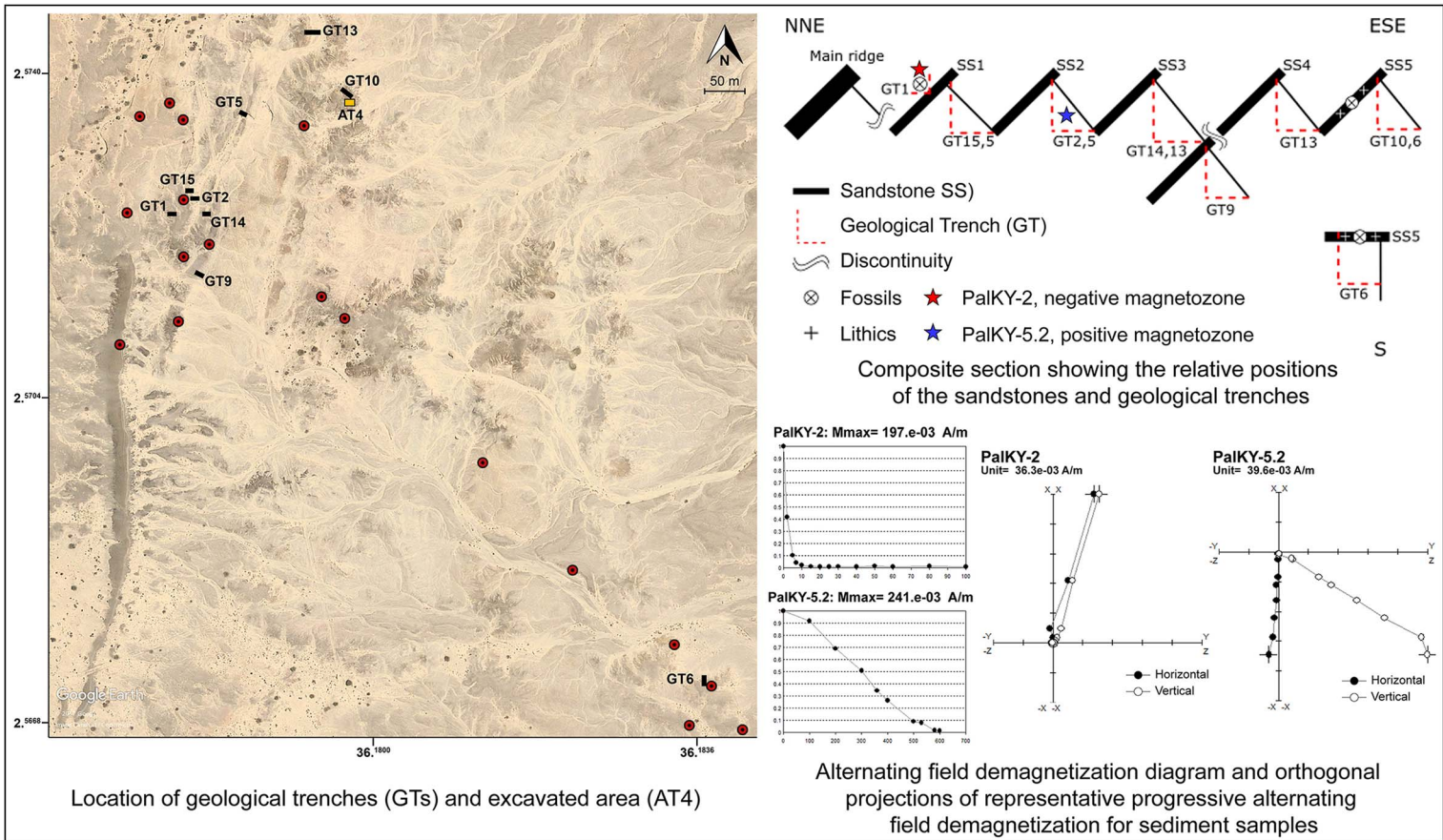


Figure 2. Map of Kanyimangin and geochronological analyses results (figure by Céline Vidal, Cécile Chapon-Sao and Aurélien Mounier).

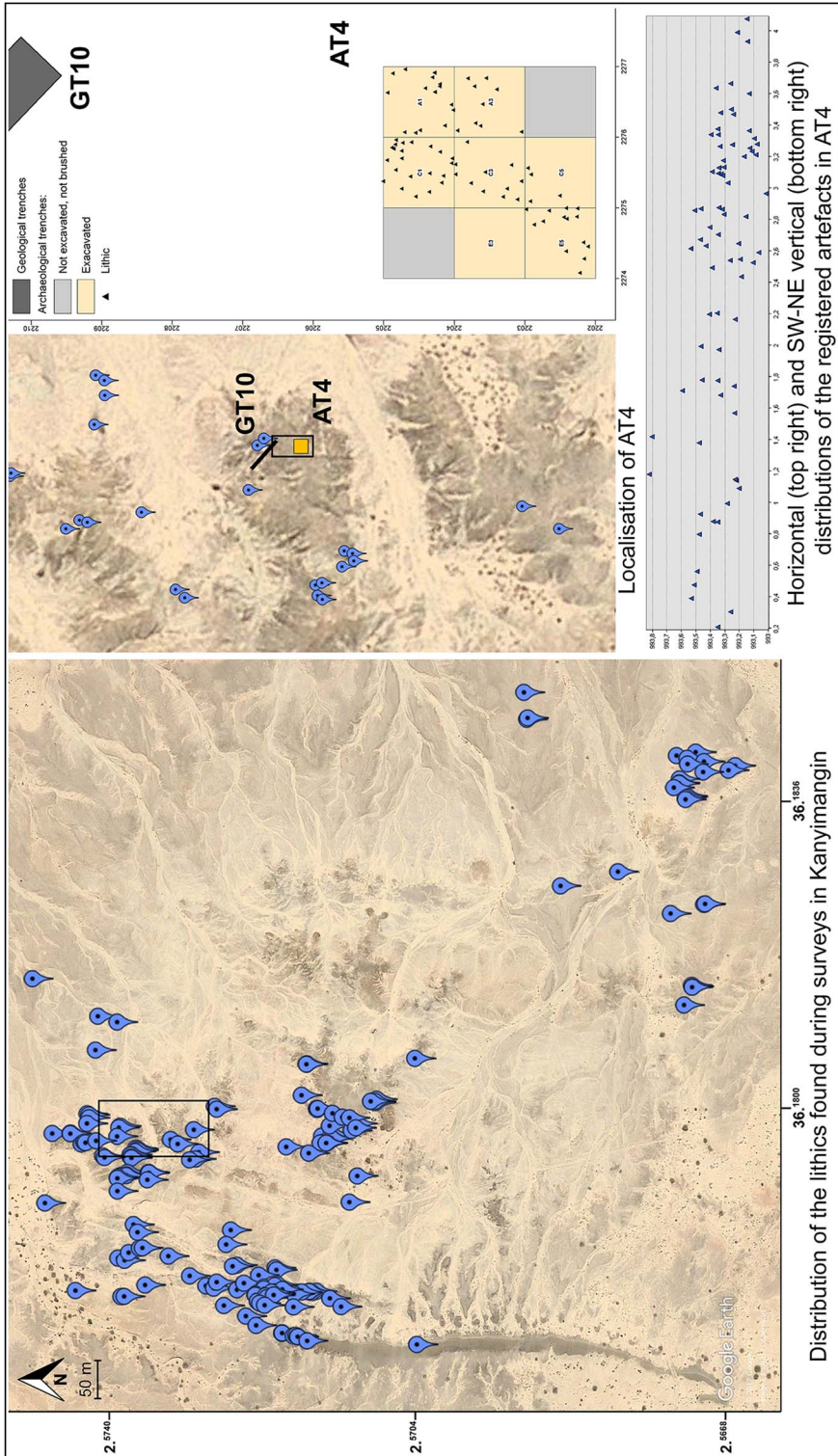


Figure 3. Lithic artefacts distribution (figure by Aurélien Mounier and Ann Van Baelen and Sol Sánchez-Dehesa Galán).

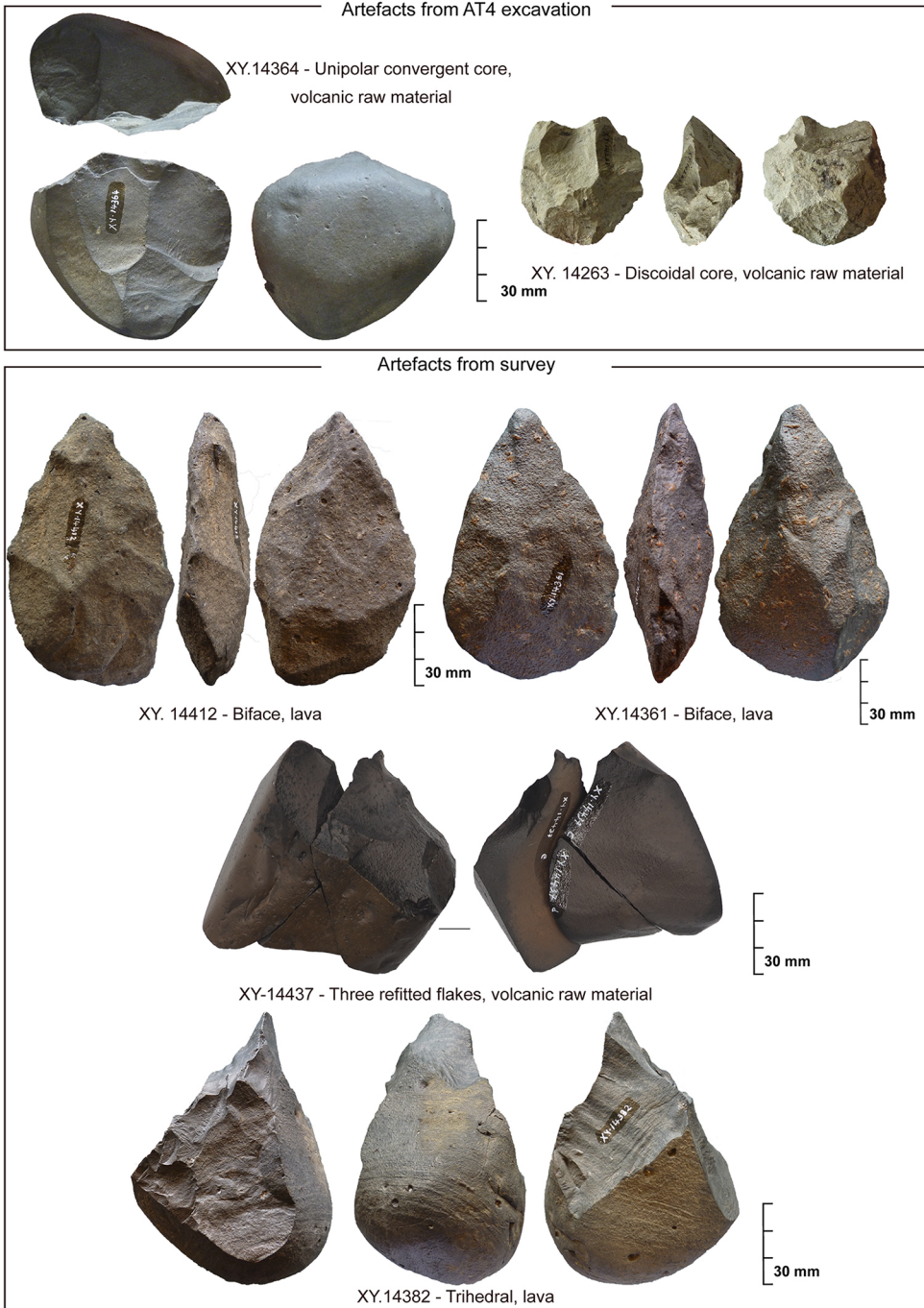


Figure 4. A selection of lithic artefacts from Kanyimangin (figure by Aurélien Mounier and Sol Sánchez-Dehesa Galán).

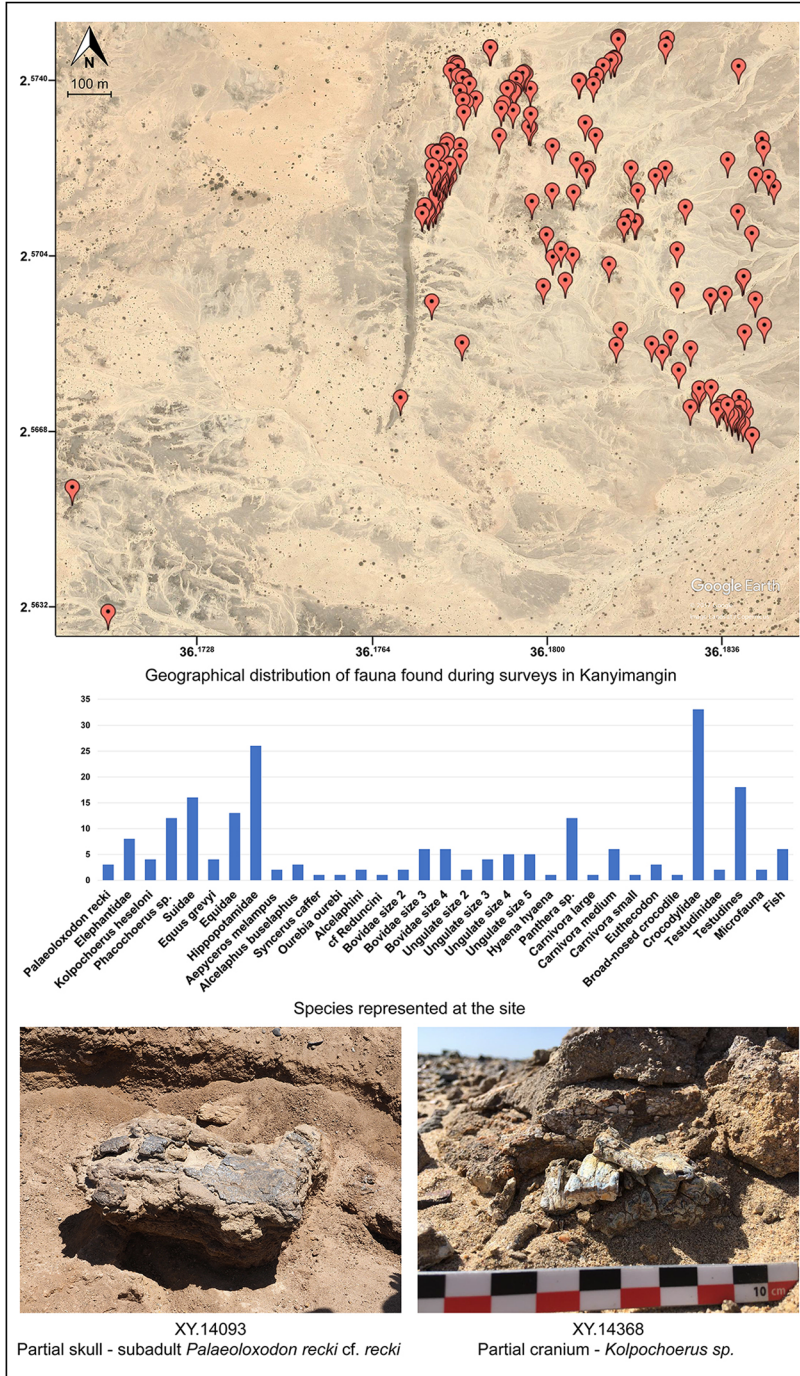


Figure 5. Fauna: geographical and specific distributions. In situ specimens (figure by Marjolein D. Bosch and Aurélien Mounier).





Figure 6. Fossil fauna recovered from Kanyimangin (figure by Aurélien Mounier).

were identified using the National Museums of Kenya collections and included extinct elephants (*Palaeoloxodon recki* cf. *recki*), pigs (*Kolpochoerus heseloni*) and crocodiles (narrow snouted *Euthecodon brumpti*), big cats (*Panthera* sp.), *Hyaena*, zebra (*Equus grevyi*), Rhinocerotidae, *Hippopotamus* sp., warthog (*Phacochoerus* sp.), buffalo (*Syncerus caffer*), oribi (*Ourebia ourebi*), impala (*Aepyceros melampus*), hartebeest (*Alcelaphus buselaphus*), turtles/tortoises, snakes, fish and amphibians. While most of the assemblage was recovered during palaeontological survey, individuals preserving multiple elements were recovered through excavation in the areas surrounding two GTs: GT1 in the north, in the sediments lying on top of SS1, and GT6 in the south, in a layer including SS5 (Figures 5 & 6).

## Conclusion

The dating of Kanyimangin is based on the patterned palaeomagnetic sequence of the site's sediments in the context of a maximum biochronological age of elements of the fauna found within these. Geochronologically, the site preserves a sequence of a normal (SS2) followed by a reverse (GT1) magnetozone, which could represent the transition at the end of the Olduvai (c. 1.778Ma), Cobb Mountain (c. 1.173Ma) or Jaramillo (c. 0.988Ma) subchrons of the Matuyama chron (Horng *et al.* 2002). First appearance datums of *Palaeoloxodon recki* cf. *recki* (Beden 1979), *Phacochoerus* sp. (Souron 2012) and *Alcelaphus buselaphus* (Kingdon & Hoffmann 2013) are younger than the Olduvai subchron and their presence at the site makes Kanyimangin one of the few sites in East Africa known to date from the critical period, 1.2–0.75Ma. As further archaeological works unfold, Kanyimangin archaeological and palaeontological assemblages offer new opportunities to address questions about the EMPT impact on the behavioural and biological evolution of the genus *Homo* in Africa.

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## References

- BEDEN, M. 1979. *Les éléphants (Loxodonta et Elephas) d'Afrique orientale: systématique, phylogénie, intérêt biochronologique*. Poitiers: Université de Poitiers.
- GALLOTTI, R. & M. MUSSI. 2017. Two Acheuleans, two humankinds: from 1.5 to 0.85Ma at Melka Kunture (Upper Awash, Ethiopian highlands). *Journal of Anthropological Sciences* 95: 137–81.
- GILBERT, W.H. & B. ASFAW. 2008. *Homo erectus. Pleistocene evidence from the Middle Awash, Ethiopia*. Berkeley (CA): University of California Press.
- HEAD, M.J. & P.L. GIBBARD. 2005. Early-Middle Pleistocene Transition: the land-ocean evidence. *Geological Society of London* 247: 1–18.

- <https://doi.org/10.1144/GSL.SP.2005.247.01.01>
- HORNG, C.-S., M.-Y. LEE, H. PÄLIKE, K.-Y. WEI, W.-T. LIANG, Y. IIZUKA & M. TORII. 2002. Astronomically calibrated ages for geomagnetic reversals within the Matuyama chron. *Earth, Planets and Space* 54: 679–90. <https://doi.org/10.1186/BF03351719>
- KINGDON, J. & M. HOFFMANN (ed.). 2013. *Mammals of Africa: pigs, hippopotamuses, chevrotain, giraffes, deer and bovids* (Volume VI). London: Bloomsbury. <https://doi.org/10.5040/9781472926968>
- LEPRE, C.J., H. ROCHE, D.V. KENT, S. HARMAND, R.L. QUINN, J.-P. BRUGAL, P.-J. TEXIER, A. LENOBLE & C.S. FEIBEL. 2011. An earlier origin for the Acheulian. *Nature* 477: 82–5. <https://doi.org/10.1038/nature10372>
- MACCHIARELLI, R., L. BONDIOLI, M. CHECH, A. COPPA, I. FIORE, R. RUSSOM, F. VECCHI, Y. LIBSEKAL & L. ROOK. 2004. The late early Pleistocene human remains from Buia, Danakil Depression, Eritrea. *Rivista Italiana di Paleontologia e Stratigrafia* 110: 133–44.
- PAPPU, S., Y. GUNNELL, K. AKHILESH, R. BRAUCHER, M. TAIEB, F. DEMORY & N. THOUVENY. 2011. Early Pleistocene presence of Acheulian hominins in South India. *Science* 331: 1596–99. <https://doi.org/10.1126/science.1200183>
- POTTS, R., A.K. BEHRENSMEYER, A.L. DEINO, P. DITCHFIELD & J. CLARK. 2004. Small Mid-Pleistocene hominin associated with East African Acheulean technology. *Science* 305: 75–8. <https://doi.org/10.1126/science.1097661>
- SOURON, A. 2012. *Histoire évolutive du genre Kolpochoerus (Cetartiodactyla: Suidae) au Plio-Pléistocène en Afrique orientale*. Poitiers: Université de Poitiers.
- VÉTEL, W., B. LE GALL & T.C. JOHNSON. 2004. Recent tectonics in the Turkana Rift (North Kenya): an integrated approach from drainage network, satellite imagery and reflection seismic analyses. *Basin Research* 16: 165–81. <https://doi.org/10.1046/j.1365-2117.2003.00227.x>