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## Taxonomic reassessment of the Middle Pleistocene Baringo mandibles

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Two hominin mandibles (KNM-BK 67 and KNM-BK 8518), as well as some postcranial remains (KNM-BK 63–66) were found between 1966 and 1982 on the west of Lake Baringo, northern Kenya, in the Middle Pleistocene sediments deposited along the Kapthurin River [1–4]. The two mandibles KNM-BK 67 and KNM-BK 8518 were found in the K3 Member of the Kapthurin Formation, at the Leakey Hominid Site and MAS locality, respectively. The sediments that yielded the two hominin mandibles are estimated to 512–510 ka [5]. The corpus of KNM-BK 8518 is recognized as being more robust than that of KNM-BK 67, but they are reported to share similar morphological features of the teeth (multirooted premolars, molarized P4, M3 with seven cusps and larger than M2) and have been regarded as likely belonging to the same taxon [2–3]. Based on the small dimensions and morphology of the mandibles, teeth and post-cranial remains, they have been regarded as falling outside the known variation of australopiths, and attributed to *Homo* sp. indet. (aff. *erectus*) [2–3]. In this study, we evaluate the current taxonomic affiliation of the Baringo mandibles based on new analyses of the mandibular corpus, dental arcade and internal structures of the preserved teeth. We use microtomographic imaging to investigate the external and internal morphology of teeth and bone and to characterize their taxonomy.

We conducted geometric morphometric (GM) analyses of the shape of the mandibular symphysis and dental arcade, and of the enamel-dentine junction (EDJ) morphology of the teeth. The comparative sample differed for each analysis but included specimens from African, European and Asian sites representing *Australopithecus*, *Paranthropus*, and *Homo* (including early *Homo*, *Homo erectus* and Middle Pleistocene *Homo*). EDJ morphology of the M2 and M3 of KNM-BK 67 (not KNM-BK 8518 due to poor dental tissue contrast) was analyzed using 3D diffeomorphic surface matching, while the mandibular symphysis cross-section and the dental arcade shape in superior view were analyzed using 2D landmark-based GM. Group differences and taxonomic affinity of the Baringo mandibles were analyzed using principal component analyses, bgPCA, CVA, and the computation of typicality probabilities.

Results of the geometric analyses of the EDJ, symphysis and dental arcade shape show that both KNM-BK 67 and KNM-BK 8518 are unlikely to belong to *Homo* aff. *erectus*. The shape of the EDJ of the M2 and M3 of KNM-BK 8518 resembles those found in both *Paranthropus* and early *Homo*. They also present a protostylid morphology that is typical of australopiths, displaying a marked and extended protostylid in front of the protoconid and hypoconid. The symphysis of both KNM-BK 67 and KNM-BK 8518 exhibits a wide anteroposterior diameter, together with a thick and marked inferior transverse torus, as generally found in australopiths and early *Homo*. The dental arcade shape is more rounded than in *Australopithecus*, but more elongated than in *Homo erectus*. Our results present strong evidence that the taxonomic affiliation of the Baringo mandibles should be considered uncertain as should the other hominin post-cranial remains from Kapthurin. Their morphology is more consistent with material currently attributed to early *Homo* and even *Paranthropus* (acknowledging the small size of the teeth and mandibles relative to this genus). The presence of this robust gnathic and dental morphology is unexpected at ~500 ka and requires further investigation.

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