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A HOMINID METATARSAL FROM DMANISI (EASTERN GEORGIA)

*ABSTRACT: Anatomical description is presented for the hominid metatarsal III recovered form the Layer IV of Dmanisi (Eastern Georgia) in the 1977 field season. The specimen is illustrated and its measurements are given. It is concluded that it should be attributed to the same species as the Dmanisi mandible from the Layer V (*Homo ex gr. erectus*).*

KEY WORDS: Dmanisi Metatarsal III – Homo erectus – *Lower Pleistocene – Villanyan-Biharian*

INTRODUCTION

The biostratigraphy and dating of Dmanisi

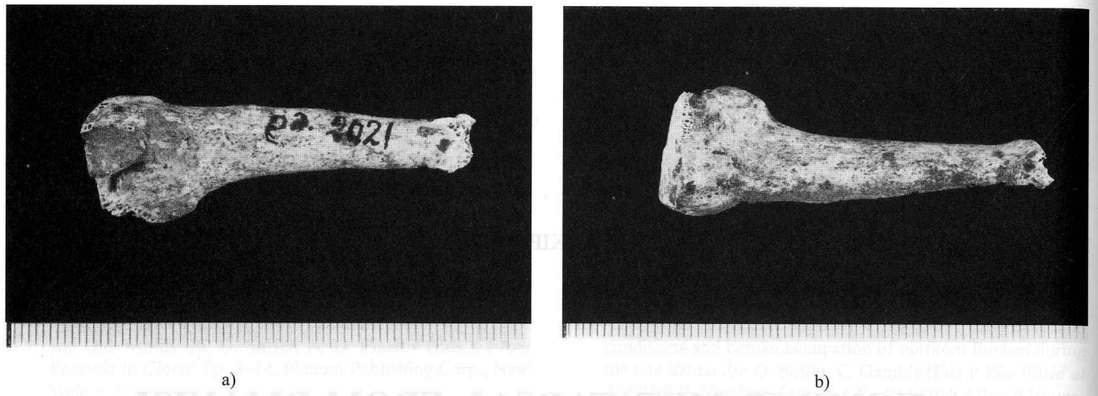
Dmanisi (Eastern Georgia) is the most ancient fossil hominid site yet found in western Eurasia. The Dmanisi hominid was accompanied by a faunal assemblage as well as by simple stone tools. As it has been reported previously by ourselves as well as by others, the Dmanisi skeletal and cultural remains date to the Lower Pleistocene. Chronometric dating of the lava flows directly underlying the fossil bearing deposits indicates an age of some 1.85 Myr (for detailed descriptions of the site, its dating, geology, recovered fauna and human remains see: Dzaparidze *et al.* 1991, Gabunia *et al.* 1992, 1996, Gabunia 1992, Gabunia, Vekua 1993, 1995a,b, Vekua 1995, Bräuer, Schults 1996, Gabunia *et al.* in print).

The Dmanisi mandible represents a somewhat isolated morphological type of *Homo erectus*: given its advanced traits and particularly the dental morphology it appears to be a fore-runner of both the late *Homo erectus* and the early archaic *Homo sapiens* (Gabunia 1992, Gabunia, Vekua 1993, 1995a,b, Vekua 1995).

The geological age of the Dmanisi fauna corresponds to an early phase of the Upper Villafranchian (Upper Villanyan or Lower Biharian, transition MN 17 to MN 18). Up to now the following species have been identified: *Erix* sp., *Natrix* sp., *Coluber najadum, Coluber robertmertensi, Elaphe* sp., *Testudo* cf. *graeca, Struthio dmanisensis, Ochotona* cf. *lagreli, Hypolagus brachygnathus, Apodemus dominans, Kowalskia* sp., *Cricetus* sp., *Mimomys ex gr. reidi, Mimomys* cf. *pliocaenicus, Parameriones* cf. *obeidiensis, Gerbillus* sp., *Marmota* sp., *Canis etruscus, Ursus etruscus, Martes* sp., *Megantereon megantereon, Homotherium crenatidens, Panthera gombaszoegensis, Pachycrocuta perrieri, Archidiskodon meridionalis, Equus stenonis, Dicerorhinus etruscus etruscus, Gazella borbonica, Soergelia* sp., *Dmanisibos georgicus, Cervus perrieri, Eucladocerus aff. senezensis, Cervidae* cf. *Arvernoceros, Dama nestii, Palaeotragus* sp., *Homo erectus.*

The faunal and paleobotanical evidence as well as the depositional nature of the site indicate that hominid occupation took place in a mosaic environment of the open steppe and gallery forests along the valleys.

Excavations conducted in Dmanisi in 1997 by the Centre for Archaeological Research, Georgia Academy of Sciences, and the Romisch-Germanisches Zentralmuzeum uncovered numerous vertebrate remains as well as an incomplete hominid metapodium. The hominid metapodium was found in sq. 64/59 of Layer IV, where we also found a mandible of *Canis etruscus*, a lower M3 and a radius of *Archidiskodon meridionalis*, an *Equus stenonis* metatarsal, a fragment of an antler and other



a) b)

FIGURE 1. Hominid matatarsal III from Dmanisi. a) lateral view, b) medial view.

postcranial remains of *Cervus perrieri*, a *Soergelia* sp. scapula, and fragments of *Testudo* cf. *graeca* carapace. The same level also produced a few flakes, one nucleus, and some flaked pebbles. In total, sq. 64/59 yielded 26 bones (including a hominid metatarsal), 21 of which have been identified to date.

THE DMANISI METATARSAL III

The new hominid bone from Dmanisi (D 2021) is a right mtt III whose distal end is broken off on the epicondylar level (*Figure 1*). Given that the break is jagged and shows a part of the spongy interior, the part that broke off included the epiphysis and a segment of the diaphysis. This indicates that we are not dealing with the removal of an unfused segment but with a broken metapodium that belonged to an adult individual. The remaining part of the bone is well preserved with minor damage present only on the ventro-lateral proximal end. The body of the metatarsal is slightly concave ventrally and frontally with an inclination to the left. The diaphysis is slightly flattened and medially curved (the angle of the curvature is of *ca* 20°). The corpus thins considerably distally, with the narrowest part found immediately before the epicondylar widening. It is oval in cross-section and latero-ventral in direction.

The dorsal surface is slightly convex and has rounded edges which are clearly visible, especially on the proximal end. In the middle part a medially oriented crest is seen. The ventral surface displays a blunted crest, which is more strangulated towards the dorsal edge, where it becomes keel-like. The lateral surface has a faint crest running towards the ventro-distal side where it joins the rounded ventral crest. The medial side of the metatarsal is slightly concave on the proximal part, a feature which disappears at mid shaft. The ridges of the dorsal and lateral sides of the bone's body most probably show attachment traces of the interosseous muscles. Their distinctiveness may serve as evidence that the bone belongs to an adult individual.

The cuneiform III articular surface is nearly flat, with a very faint ventro-dorsal concavity. It is moderately high and triangular in shape. The ventral edge of the surface is narrowed and features a rather steep medial dip. Its plantar surface is directed medio-distally.

The dorsal relief of the proximal end is well visible in a faint central convexity bounded on both sides by prominent tuberosities. The medial surface of this end has a very clear dorsal facet (facet length = 5.9 mm; width = 6.9 mm). The surface lacks a ventral facet. Its place is taken by a faint fossa which distally borders a well-developed ventral tubercle that, likely, served for the attachment of interosseous ligaments between the cuneiform III and mtt III. The lateral side of the proximal end has a rectangular dorsal facet (length = 7.9 mm, width = 8.3 mm). Since this end of the bone is damaged, we can say little about the ventral facet. However, a deep fossa – extending both ventrally and distally – abuts the dorsal facet ventrally, and it may therefore be presumed that the ventral facet was also either absent or only slightly developed.

MEASUREMENTS

The total length (though parts are missing) of the mtt. III is of 54.7 mm. The width at midshaft is 7.3 mm and 8.2 mm transversally. The width of the proximal end is 18.5 mm, transversally – 13.1 mm and the width at the epicondyles is of *ca* 6.5 mm. The transversal width at the latter point is *ca* 9.5 mm, and the angle of the bone's body bending is approximately 20°.

COMPARISONS AND COMMENTS

The Dmanisi mtt. III is quite similar to those of anatomically modern humans. At the same time, it also differs from them in some features. The significance of these differences is difficult to gauge, however. The total

absence of the ventral facet on the medial surface of the proximal end, for example, distinguishes the Dmanisi specimen from mtt. III of modern humans who usually possess this feature, albeit expressed to varying degree. Unfortunately, we know little about the development of this feature in fossil hominids. It is thus possible that its absence in the Dmanisi specimen reflects just one extreme in the variation range.

A complete reduction in the medial ventral facet is observed on the mtt. III of *Homo habilis* (Susman, Stern 1982), although it cannot be ascertained that its absence in OH 8 is characteristic for this taxon. This facet is also absent in ER 803 from Koobi-Fora (Harris, Isaac 1976) assigned to early *H. erectus* = 20 or *H. ergaster*. Its absence on this specimen, however, may be due to the damage to this end of the bone (Day, Leakey 1974). An examination of the medial surface of this bone suggests that, if the ventral facet was present, its form was likely very reduced in size and more like a thin stripe at the plantar edge of the proximal articular surface (Day, Leakey 1974). It should be noted that the Dmanisi mtt. III also lacks the tubercle used for inter-bones ligament attachment which is seen in ER 803. This feature is congruent with the total reduction of the ventral facet in the specimen. This trait may indicate that mtt. II and III were conjoined less firmly than mtt. III and IV. This conclusion is supported by the fact that the Dmanisi mtt. III contains well-developed facets used to articulate it with mtt. IV.

The traits noted above also distinguish the Dmanisi specimen from mtt. III of the Shanidar Neanderthal (Trinkaus 1983), as well as from a number of other later hominids. Our study of anatomically modern mtt. III from old cemeteries in Eastern Georgia (collections of the Mtskheta Expedition, Georgia Academy of Sciences), and other remains preserved at the Department of Anatomy, Tbilisi State University (No. 20519, No. 2669, etc.), as well as the collections of the Institute of Experimental Morphology, Academy of Sciences of Georgia, show a ubiquitous presence of both medial facets on the proximal ends of mtt. III (absent in only one out of 19 cases). In addition, the studied modern human mtt. III all show, at the same time, a more pronounced (compared with the Dmanisi specimen) rough surface separating these facets and serving as the attachment surface of the inter-bone ligaments.

The Dmanisi metatarsal has some further specific traits which, however, also do not distinguish it from those of other members of the genus *Homo*. These include its relatively small size, greater massiveness, as well as the pronounced development of the ventral tubercle on the proximal end. Given the length of the broken Dmanisi specimen (54.7 mm), the length of the whole bone could not have been much greater than 65.9 mm. This estimate is based on observations in 21 anatomically modern individuals. The length of their extra-epicondyral distal ends averages to some 0.17% of the total length of their mtt. III. This suggests that the same length in the Dmanisi specimen would have been of 11.2 mm. From this it follows that the Dmanisi diameter index at mid-diaphysis (–12.4 mm) was close in size to that of the Shanidar Neanderthal. Its width at mid-diphysis (11 mm) is very similar to the mean in the Shanidar specimen, too. Such a great massiveness is also observed in not only other Neanderthals (Bonch-Osmolovskij 1954, Trinkaus 1983, Aiello, Dean 1990), but also in younger Upper Paleolithic *Homo sapiens* (Khrisanfowa 1980).

In sum then, the dimensions and proportions of the Kenyan mtt. III (ER 803,1500,1823) (Dean, Leakey 1974) resemble those of the Dmanisi specimen. This similarity extends to the degree of curving (ER 803) as well as to the expression of facetting and ventral tubercles on the proximal end. Our sample dimensions are clearly small and data incomplete for a definitive evaluation of the systematic significance of these features. Nonetheless, it is clear that the Dmanisi specimen is relatively small in size, as is the Dmanisi mandible (Gabunia 1992,Gabunia, Vekua 1993). It is quite massive and twisted, and is more or less similar to mtt. III of African Plio-Pleistocene hominids.

Finally, given the estimated length of the Dmanisi mtt. III (*ca* 66 mm), a very approximate estimate can also be made of the Dmanisi hominid body height. Since the lengths of mtt. III in anatomically modern humans represent, on the average, 30% of the total foot length (Bonch-Osmolovskij 1954), and the latter some 15% of the body length (Khrisanfowa 1978), it is concluded that the Dmanisi individual was about 150 cm tall.

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