ABSTRACT

Mandibular Variation in early *Homo* from Dmanisi, Georgia

by

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The Plio-Pleistocene locality of Dmanisi, Georgia, has produced an abundant hominid fossil sample, including four mandibular specimens. These fossils are noteworthy for their outstanding preservation within confined sedimentary deposits and the large range of variation they present. Included within this mandibular sample are two subadult and two adult mandibles; including one of the smallest Lower Pleistocene mandibles assigned to *Homo*, one of the largest assigned to *Homo*, and the earliest known edentulous hominid mandible. This dissertation attempts to describe and test explanatory hypotheses for the mandibular variation.

The anatomy of the Dmanisi sample is systematically described and compared with other Plio-Pleistocene hominid mandibles. Within the Dmanisi sample, a combination of similarities and differences are found. The mandibles share several distinctive characters to the exclusion of other Plio-Pleistocene hominid samples, including features of the lateral corpus, medial corpus, anterior symphysis, dental arcade, and foramina. Most notable among the characters that differ within the sample are the

overall difference in size, especially noteworthy in aspects of corpus and ramus height, and the size of the posterior teeth.

The morphology of the Dmanisi specimens, together with their context, suggest an appropriate null hypothesis is that the variation in the sample is the result of a process of sampling different age and different sex individuals from a single evolutionary group. Specifically, the large D2600 mandible is proposed to be an adult male, the small edentulous D3900 mandible an adult female, and the remaining two mandibles, D211 and D2735, subadult females.

This hypothesis is tested through a series of comparative analyses with extant humans and great apes using a random resampling procedure. This procedure is designed to directly address the likelihood of observing the pairwise differences found within the Dmanisi sample (i.e. male/female, adult/subadult) relative to known comparative models of variation while operating within the constraints posed by a small sample size. The results of these analyses suggest that the Dmanisi variation is greater than expected based on a model of sampling different age and different sex individuals using a low dimorphism, human or chimpanzee comparative model. In particular, the differences seen in corpus height and posterior tooth size within the Dmanisi group are exceptional relative to these comparative models. However, the results are consistent with a high dimorphism model of intraspecific variation found in gorillas.

An alternative hypothesis that the variation is the result of mixed-taxa sample is also quantitatively examined. Building on the previous analysis, a novel nested re-sampling procedure is developed to test whether or not the magnitude or profile of variation observed in the Dmanisi sample are consistent with that of a mixed-taxa sample.

For each of three possible mixed-taxa pairings (Human-Chimpanzee, Human-Gorilla, Chimpanzee-Gorilla) and three underlying comparative models (Human, Chimpanzee, and Gorilla), this procedure generates a distribution of the expected number of significant trait differences and a distribution of which traits are expected to differ. These simulated distributions allow for a test of whether the observed Dmanisi pattern of variation is consistent with an expected mixed-taxa sample. The results of this analysis suggest the pattern of variation seen in the Dmanisi sample does not likely represent a mixed-taxa sample.

Taken together, these results and the observed anatomy of the Dmanisi mandibular sample support the notion of single hominid taxon at Dmanisi, but one with greater variation than could be reasonably sampled from either extant humans or chimpanzees. This conclusion is reinforced when comparisons are made between the observed range of variation in the Dmanisi sample and that of *Australopithecus boisei*, a penecontemporaneous hominid with a high level of dimorphism. The impact of this conclusion for Dmanisi and for the broader issue of early *Homo* evolution are considered.