

Monitoring the early Holocene Nile Valley biological diversity: a comparison of different 3D geometric morphometrics approaches on the enamel-dentine junction.

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There is an ongoing debate regarding population dynamics along the Nile Valley from Egypt to Sudan at the beginning of the Holocene. Previous studies on outer dental morphology (i.e., non-metric traits, crown measurements), dental tissue proportions, and enamel thickness distribution patterns revealed marked morphological diversity among early to middle Holocene populations. To understand further this reported variation and its implications (i.e. *in-situ* evolution or biological discontinuity), we now explore enamel-dentine junction (EDJ) shape with two 3D geometric morphometric methods: a landmark-based analysis and surface deformation. Both were applied to samples of UM1s ($n=40$) and UM2s ($n=42$) from Late Paleolithic to Neolithic sites in the middle Nile Valley (Sudan). Principal component analyses show clear morphological variation among sites and periods. The landmark-based analysis highlights notable inter-sample diversity with variation in position of the dentine horns (especially the hypocone), and shape and position of the cervical line. The surface deformation method yields a similar signal, plus substantial variation in morphological complexity of the occlusal basin and lateral aspects of the EDJ surface. Surface deformation therefore appears to better identify EDJ variation that, in turn, provides improved estimates of affinities among samples. Altogether, these results suggest that a substantial morphological shift in the EDJ shape of both UM1s and UM2s occurred between the last foragers and the first food-

producers from our sample. Considering the morphological stability and phylogenetic signal of the EDJ shape, we suggest that these results highlight significant biological discontinuity at the dawn of the Neolithic transition in the Nile Valley.

Funding: CNRS-INEE; French government; French National Research Agency; Czech Science Foundation; Faculty of Arts of Charles University; Ministry of Culture of the Czech Republic; National Science Centre – Poland.