The Paleoenvironments of Early Hominins in the Omo Shungura Formation (Plio-Pleistocene, Ethiopia): Synthesizing Multiple Lines of Evidence Using Phylogenetic Ecomorphology

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Ever since Darwin claimed that expanding savannas were the driving force behind humanity's divergence from other apes, our understanding of human evolution has been inextricably linked to the environmental context in which our ancestors evolved. This dissertation explores various aspects of the use of one method of paleoenvironmental reconstruction -- bovid ecomorphology -- and provides new data on paleoenvironmental conditions in the Omo Shungura Formation (Plio-Pleistocene, Ethiopia).

Chapter 2 uses phylogenetic simulations to explore the performance of Discriminant Function Analysis (DFA) on simulated ecomorphological data containing phylogenetic signal. DFA is shown to "over-perform" in situations in which predicted and predictor variables both contain phylogenetic signal. Phylogenetic Generalized Least Squares (PGLS) is shown to be a very useful technique for explicitly testing functional hypotheses in ecomorphology while controlling for phylogenetic signal and body size.

Chapter 3 presents a functional analysis of the bovid astragalus, which is one of the most commonly preserved bones in the fossil record. Several functional hypotheses linking habitat-specific locomotor performance with the morphology of the astragalus are tested using PGLS. Strong support is found for three of these hypotheses. Thus, the

astragalus is shown to be a useful ecomorphological predictor element, a point that is confirmed by the DFA analyses in Chapter 4.

Chapter 5 provides new paleoenvironmental data on the Omo Shungura Formation based on habitat reconstructions from astragalar ecomorphology in addition to dietary reconstructions based on dental mesowear. Astragalar data point to a major environmental shift beginning ~2.58 Ma, which is later in time compared with some prior habitat reconstructions using different methods. Furthermore, astragalar data show environmental fluctuations of similar magnitude later in the sequence. Mesowear data on the Shungura Tragelaphini do not offer evidence for any significant grazing adaptation, in spite of relatively high carbon isotope signatures reported based on studies of tooth enamel. These data raise questions regarding the diet of fossil Tragalephini.