

Hominin Environments in the East African Pliocene: An Assessment of the Faunal Evidence

René Bobé, Zeresenay Alemseged, and Anna K. Behrensmeyer (eds.)

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In a recent article on the environmental context of human evolution, Kingston (2007) points out that understanding hominin paleoenvironments is essential to interpreting behavior and ecology, but that just acknowledging the need to do so is “trivial relative to operationalizing the endeavor” (p. 20; emphasis added). Fortunately, a recent volume, *Hominin Environments in the East African Pliocene: An Assessment of the Faunal Evidence*, signals a significant step forward in ongoing efforts to “operationalize” paleoenvironmental interpretations for some of the earliest human ancestors. This volume’s origin lies in a special symposium that the editors organized for the 2003 annual meeting of the American Association of Physical Anthropologists in Tempe, Arizona. The editors expanded upon the dialogue they launched in Tempe with a workshop at the Smithsonian Institution in Washington, D.C., in May 2004. The volume reviewed here represents the collected formal contributions of many participants in the symposium and/or the intensive multi-day workshop that followed.

This tome is a timely and welcome contribution to the hominin paleoenvironmental literature, one of its primary objectives being to report the latest in faunal-based techniques for interpreting the environmental contexts of human evolution in Pliocene East Africa. More importantly, though, many of the contributors to the volume use new data and/or fresh analytical approaches to old data to address questions that have long plagued paleoanthropologists. Beyond just answering “old” questions, however, this volume demonstrates an increased sophistication in the questions themselves, as well as better resolution in the answers provided by the faunal data. Many of the chapters explicitly recognize the limitations of the fossil record and express an appreciation of bias in preservation, collection, or analysis of paleoecological data, especially in regards to issues of temporal or spatial scale. Although each contribution is unique, all attempt to better define the adaptive conditions and selective pressures that propelled human evolutionary change throughout East Africa during the Pliocene.

One important wholesale contribution this volume makes is the application of new data to address longstanding questions of paleoanthropological interest. In this regard, Frost’s chapter relating patterns of species turnover in cercopithecoid monkeys throughout Plio-Pleistocene Africa is particularly noteworthy. He addresses questions regarding the mode and tempo of macroevolutionary change in Africa in relation to seemingly coincident global climatic shifts. His analysis looks at the first and last appearances

of a variety of cercopithecoid taxa with a conservative approach that restricts analyses to specimens identified by a single observer ensuring that his final results are robust and compelling. Generally, his findings suggest temporal incongruity between species turnover and widely recognized global climatic events, whether the level of analysis is at the basinal, regional, or continental scales.

In a similar vein, Lewis and Werdelin approach the age-old issue of the nature and timing of hominin admission to the African carnivore guild from an alternate perspective—that of the carnivores encroached upon by early human meat-eaters. They utilize aspects of paleo-carnivoran anatomy and ecology to infer with which species early hominins were mostly likely to have been in spatial and competitive proximity. In so doing, they are able to arrive at some suggestions about the nature of the initial hominin entrée into regular meat consumption. Namely, they suggest that early hominin meat-eaters would have needed to acquire both effective anti-predator and anti-kleptoparasitism tactics in order to successfully compete for carcasses on the Pliocene East African landscape. They also note that, while early hominin meat-eating (using the earliest archeological record as the first evidence of such) does not initially seem to have an effect on carnivoran populations, there is a distinct decrease in the number of carnivoran species after 1.8 Ma. Although they are unable to determine whether the loss of carnivore taxa is attributable to direct competition with *Homo ergaster*, climatic shifts, or changes in the distribution and abundance of prey species, their discussion is thought provoking and likely to inspire the formation of new hypotheses of hominin meat acquisition strategies. Undoubtedly, their insights will provide the basis for a number of future paleoanthropological discussions.

In addition to addressing broad questions of pattern in hominin evolution, many contributors to this volume use new data and analyses to reinterpret the paleoenvironmental setting(s) of long known hominin sites at more local scales. Reed’s work on modern Serengeti micromammals recovered from owl pellets and the application of associated ecological data to Bed I at Olduvai Gorge in Tanzania, is one such offering. His findings indicate that in modern ecosystems owl prey species vary predictably in relative abundance across a landscape with relationship to microhabitat. He is then able to apply these findings to Olduvai data to test the hypothesis that a faunal shift between Middle and Upper Bed I is the result of a biased accumulating agent. Reed’s analyses suggest that the Olduvai fossil micromammal faunas reflect a real drying trend from Middle

to Upper Bed I times rather than skewed environmental interpretations biased by owl prey selection.

Another fossil locality of longstanding paleoanthropological and paleoecological interest is Laetoli in Tanzania, which is afforded two valuable contributions in this volume. The paleoenvironments represented at Laetoli have long been subject to debate, in part due to a history of contradictory interpretations using different faunal indicators. The chapter by Su and Harrison is notable in this context. A system of covariables is used to assign the Laetoli fauna to habitat types comparable to modern ecosystems and other fossil localities. One of the most important findings of the study is that fossil faunal assemblages, in general, differ greatly from modern animal communities. Nevertheless, Su and Harrison are able to use their faunal data to infer grassland to open woodland environments for Pliocene Laetoli. Musiba *et al.* also examine Laetoli fauna, but they endeavor to explore issues of taphonomy and geological context that can confound paleoecological interpretations. Although they do find some evidence of biologic and geologic taphonomic bias in the Locality 8 and 9 assemblages that they studied, they are still able to interpret the paleoenvironment as representative of a spectrum of grassy woodland settings.

Another important class of research presented provides fresh perspectives on older data sets. One new way researchers are approaching faunal data is with comprehensive databases. Bobé *et al.* use a particularly complete dataset of bovids (N=8,213 specimens) from the Hadar and Turkana Basins to evaluate patterns of species turnover throughout the Pliocene. Their study is unique in its inclusiveness and their results illustrate some inherent challenges in paleoenvironmental interpretation. While they are able to ferret out some general trends throughout the region, they also note marked differences within basins that are more likely attributable to local environmental perturbations than to global or continental scale climatic shifts. Cooke takes a fresh look at suid variability through time and space and reports significant species shifts at 2.7–2.8 Ma and, to a lesser extent, at 1.6–1.8 Ma. He further notes a general increase in hypsodonty coincident with these shifts likely reflecting increased exploitation of drier and harsher habitats. Finally, Sandrock *et al.* provide a new treatment of the enigmatic, yet important, Chiwondo deposits of Malawi. Although their analyses indicate some taphonomic biasing of the assemblage, their results are intriguing and suggest that attention directed at fossil-bearing sediments further afield from those commonly studied has significant potential to address questions of paleoanthropological relevance.

Importantly, there are several chapters that serve as cautionary tales for practitioners of hominin paleoecology. Those contributed by Behrensmeyer *et al.*, Alemseged *et al.*, Eck, and Potts all offer practical suggestions on how to proceed in hominin paleoecology research. The Eck and

Alemseged *et al.* papers both examine the fossil collection processes that resulted in the Shungura Formation assemblages from southern Ethiopia. They examine the fidelity of the paleoecological data generated by the alternate collection strategies of independent French and American research teams and conclude that, while discrepancies exist between the two collections, some of the differences are attributable to true disparity in fossil abundances in the two collection areas. Furthermore, although both papers acknowledge that collection strategy may confound analyses, this potential bias does not render paleoecological analysis uninterpretable. Similarly, Behrensmeyer *et al.* remind researchers to be perpetually vigilant of the potential effects of taphonomic bias on fossil assemblages and resultant paleoenvironmental interpretations. In addition, both Behrensmeyer *et al.* and Potts fervently stress the importance of asking questions that are relevant and answerable, making sure that data collected scale appropriately to the research questions at hand.

Hominin Environments in the East African Pliocene pulls together a large and thorough body of the most recent paleoenvironmental research in the field. With a variety of research methods applied to an assortment of East African fossil taxa and localities it is one-stop-shopping for students of hominin paleoecology. That, unfortunately, brings me to the volume's one drawback—the price. At \$129, this book may be prohibitively expensive for those who might benefit from it most—graduate students. Particularly, if I may nit-pick for a moment, because the Springer series from which it is drawn is somewhat “no frills” in terms of print style. There are no color plates or photographs. Of course, one would not necessarily expect color photos or illustrations in a research driven publication, but for the price some color graphs would have been nice. From a cost/benefit perspective though, the value of the volume's content far outweighs the expense, making it a must-have for students and senior researchers alike. Certainly, the book's expense parallels the hard work of the volume's editors and contributors, who are all to be commended for their efforts.

It now seems that a seminal question put to the field some years ago, “Why study paleoecology?” (Hill 1981) may have a clearer answer—because better understanding the paleoenvironmental record associated with early hominins will inform us about our lineage's evolutionary history. The volume signifies an important step forward in hominin paleoenvironmental research and certainly foreshadows a promising body of work yet to come from a bright and enthusiastic group of researchers.

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