

Functional Diversity and Niche Partitioning in Fossil Bovids: Implications for Hominin Meat Access

Saranna Shevalier¹, Frances Forrest², David Braun³, Emmanuel Ndiema⁴

1.State University of New York, Oneonta, Department of Anthropology and Department of Biology 2. Department of Sociology and Anthropology, Fairfield University 3. Center for the Advanced Study of Human Paleobiology, George Washington University 4. Department of Earth Sciences, National Museums of Kenya, Nairobi, Kenya



Background:

Bovids (antelope, buffalo) are among the most common fossils found at Plio-Pleistocene sites, and their ecological traits provide insight into the environments hominins encountered (Vrba, E. S., 1980).

The significance of bovid remains as indicators of environment and predation patterns. In (Behrensmeyer, A. K., & Hill, A. P., 1988).

Sites:

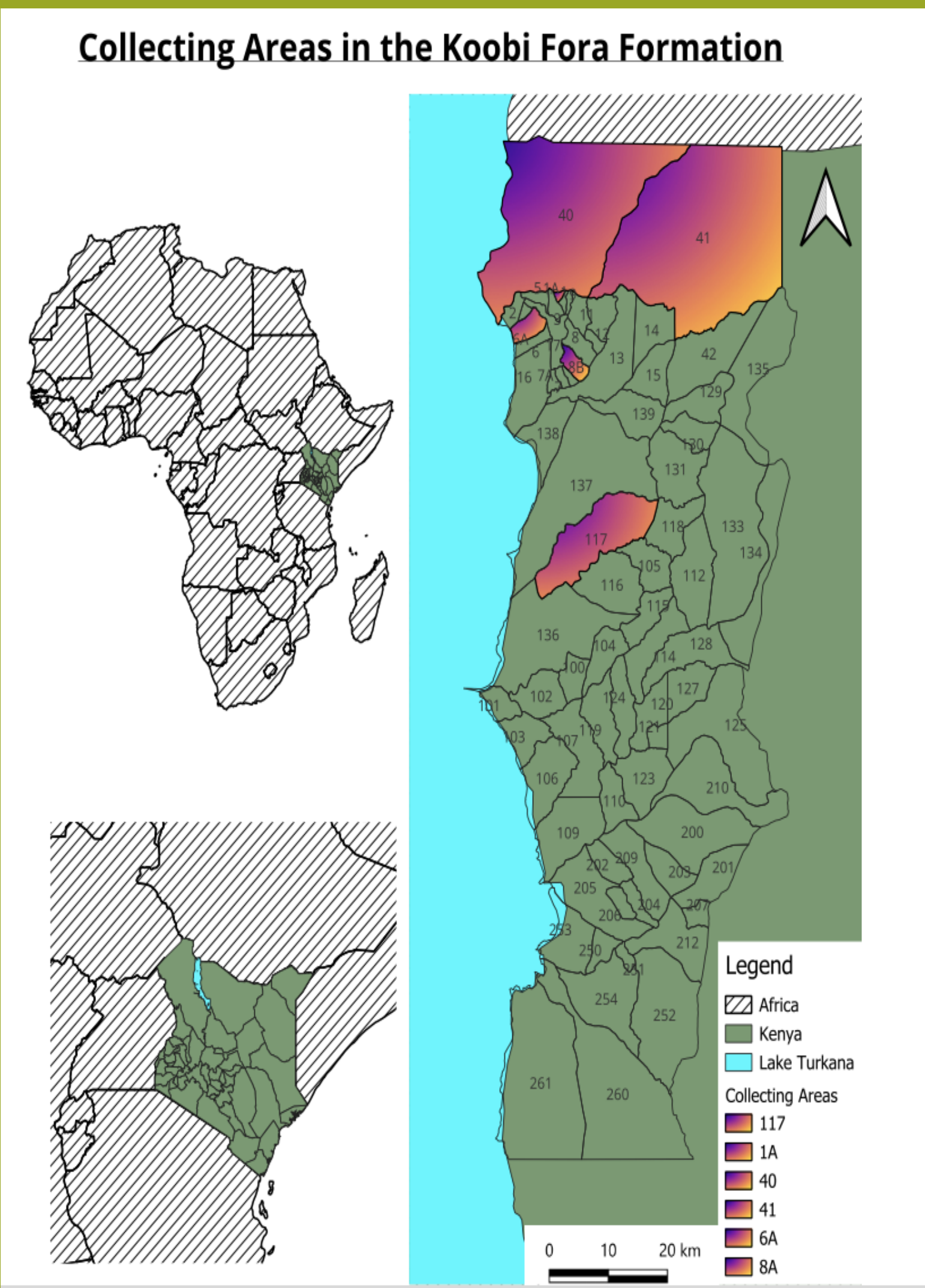


Figure 1: Map of collection areas in the Koobi Fora Formation, located in the Turkana Basin of Northern Kenya, East Africa.

Timeline and Ecosystems used for Analysis

Fossil Assemblages: Tulu Bor Member (~3.35 Ma), Upper Burgi Member (1.95 to 1.88 Ma), KBS Member (1.88-1.56 Ma), Okote Member (~1.5 Ma)
Modern Ecosystems: Etosha, Kruger, Serengeti

Results:

Table 1: Diversity metric values from R.

Ecosystem	Functional Richness	Functional Evenness	Functional Dispersion	Rao's Q
Etosha	0.08789977	0.4732367	1.261431	2.050994
Kruger	0.39896882	0.4970055	1.452594	2.917098
Serengeti	0.39896882	0.4683516	1.147659	2.222022
Tulu Bor	0.03433693	0.6441063	1.638068	3.462838
Upper Burgi	0.39896882	0.6725402	1.647974	3.275118
KBS	0.39896882	0.6563086	1.817863	3.724547
Okote	0.16478357	0.5540465	1.789479	3.753933

FRic: breadth of ecological strategies
FEve: evenness of ecological strategies
FDis: ecological differences among taxa
Rao's Q: abundance-weighted ecological differences

Conclusions and Implications:

PCA Results:

PC1: driven by water dependence, diet, and body size
PC2: Locomotion, habitat, sociality
PC1 + PC2 traitspace: Falling into their own plot, not exactly aligned → **Non Analog Ecosystems**

Functional Diversity Metrics:

Functional richness varied across assemblages, indicating differences in the breadth of prey types and access opportunities.

Functional evenness was higher in fossil assemblages, suggesting more consistent foraging opportunities.

Functional dispersion was higher in fossil assemblages, suggesting more opportunity for specialized acquisition strategies.

Rao's Q was higher in fossil assemblages, suggesting more diverse foraging strategies in variable habitats.

Overall, fossil ecosystems may have offered more varied and less predictable foraging opportunities, favoring flexible hominin behavior.

Acknowledgements:

Tyler Center Fellowship for Global Studies. Dr. Kaedan O'Brien for his guidance. George Washington University. National Museums of Kenya. NACOSTI. GWU NSF grant (NSF SBE Archaeology 2515207).

Bibliography:



Research Questions

- 1) How did functional diversity differ among fossil and modern bovid communities?
- 2) What might these differences suggest about hominin meat-acquisition opportunities?

Materials and Methods:

- Bovid tribes were identified using fossil teeth from Koobi Fora.
- The fossil dataset was supplemented with records from the Turkana Public Database and collections from previous field seasons.
- Fossil collections were compared with bovid community data from modern African game reserves.
- Functional richness, evenness, dispersion, Rao's Q, and PCA were used to compare community structure.

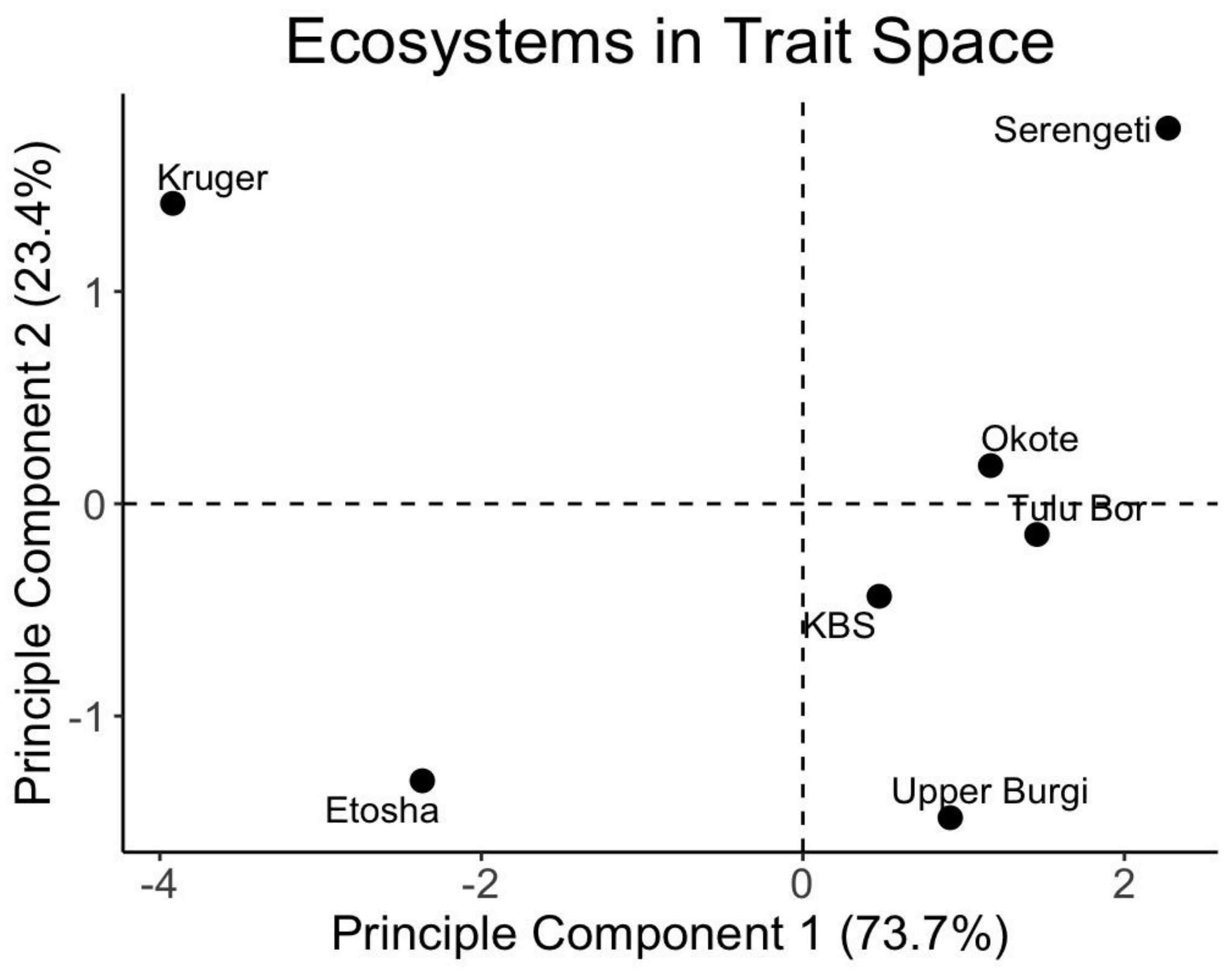


Figure 2: PCA analysis of bovid teeth in paleo-assemblages when compared to modern ecosystem data