

A preliminary reconstruction of the paleocological context of Galili, Ethiopia using bovid dental metrics

AMANDA SLOTTER^{1, 2} and SCOTT W. SIMPSON³

¹School of Human Evolution and Social Change, Arizona State University

²Institute of Human Origins, Arizona State University

³Department of Anatomy, Case Western Reserve University School of Medicine



Case Logo
Here

INTRODUCTION

Paleoanthropological and geological field research at Galili, Afar Regional State, Ethiopia was reinitiated in 2016. Figure 1, pictured below, identifies the location of Galili in relation to other Ethiopian field sites in the Afar region. Galili is the southernmost of the depicted field sites. The site has been established as encompassing sediments ranging between 2.5-4.5± Ma and includes early *Australopithecus* and perhaps *Ardipithecus*.

Figure 1. Location and boundaries of Galili.

WM = Woranso-Mille, LG = Ledi Geraru, H = Hadar, Go = Gona, D = Dikika, MA = Middle Awash, GAL = Galili



Establishing the habitats of Galili is important for both understanding the environment in which the fauna, including hominins, resided and providing comparison to other contemporaneous sites. While preliminary paleoenvironmental analyses have suggested open woodland to bushland-woodland and shrubland, we present here additional evidence from the early Pliocene bovids from Galili. The majority of the bovid specimens included in the analyses come from two geologic members: the Shabeley Laag (SL) Member and the Dhidinley (DHI) Member. Recent geological work at the site supports an age of 3.9—4.0 Ma for the SL member and 4.0—4.4 Ma for the DHI member.

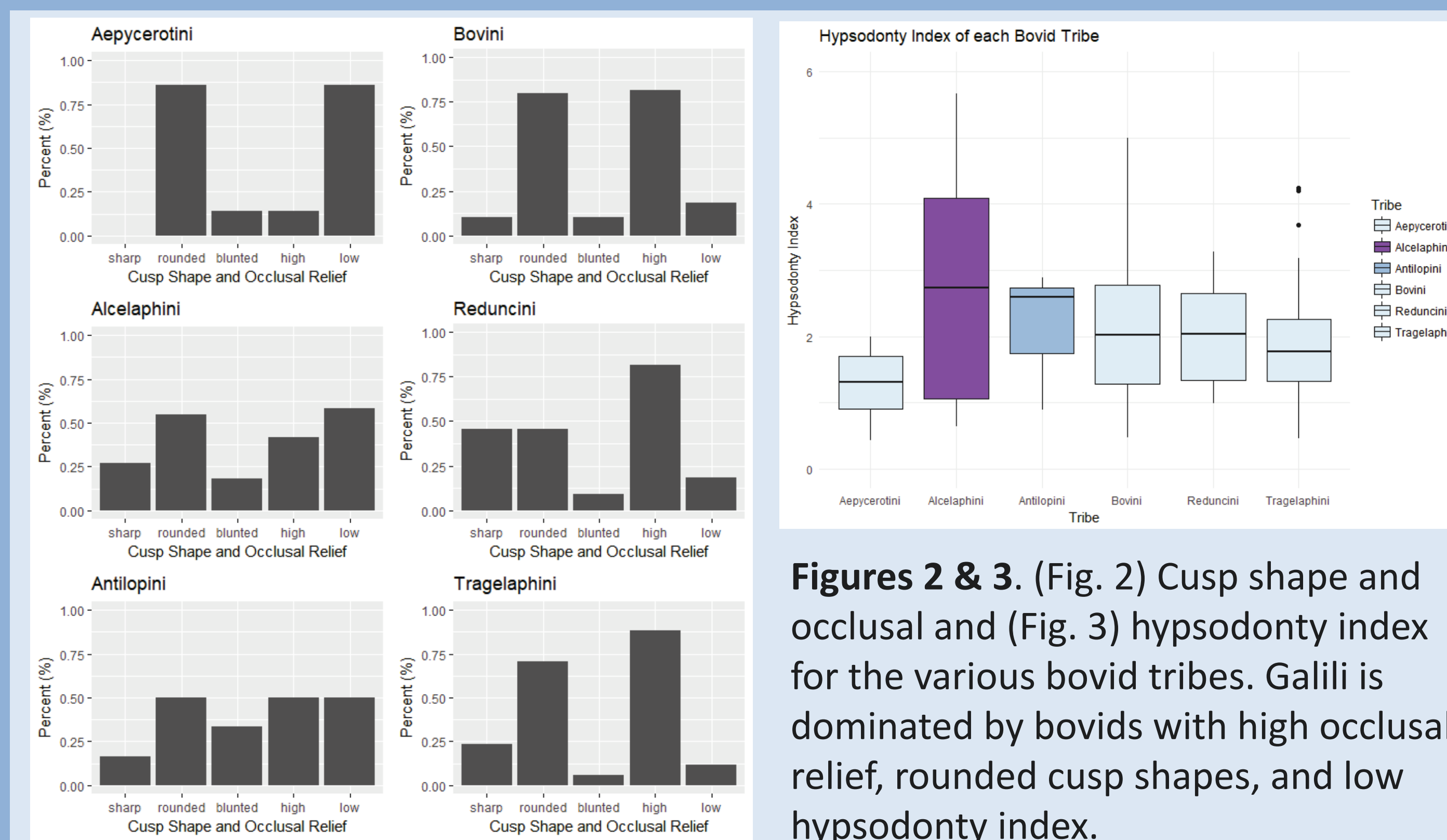
MATERIALS

Occlusal photographs of bovid teeth were taken at the National Museum of Ethiopia in Summer 2017 from the older Galili collection created by Dr. Seidler and his team and the new collection started by Dr. Simpson and his team. Taxonomic identification, metric measurements, and scoring data were collected from the occlusal photographs. Data on bovid tribal abundances at other fossil sites were provided by John Rowan and Faysal Bibi. For the correspondence analysis, data were used from the WorldClim database.

METHODS

- Mesiodistal length, buccolingual breadth, and crown height measurements were taken from occlusal photographs.
- Cusp shape and occlusal relief scores were assigned according to the methodology outlined by Fortelius and Solounias (2000).
- The bovid tribal abundances for the different sites was calculated using provided data on bovid abundance.
- The correspondence analysis was run using the statistical program PAST using data including all 19 provided WorldClim bioclimatic variables and bovid tribal abundance data for contemporary sites.

RESULTS



Figures 2 & 3. (Fig. 2) Cusp shape and occlusal and (Fig. 3) hypsodonty index for the various bovid tribes. Galili is dominated by bovids with high occlusal relief, rounded cusp shapes, and low hypsodonty index.

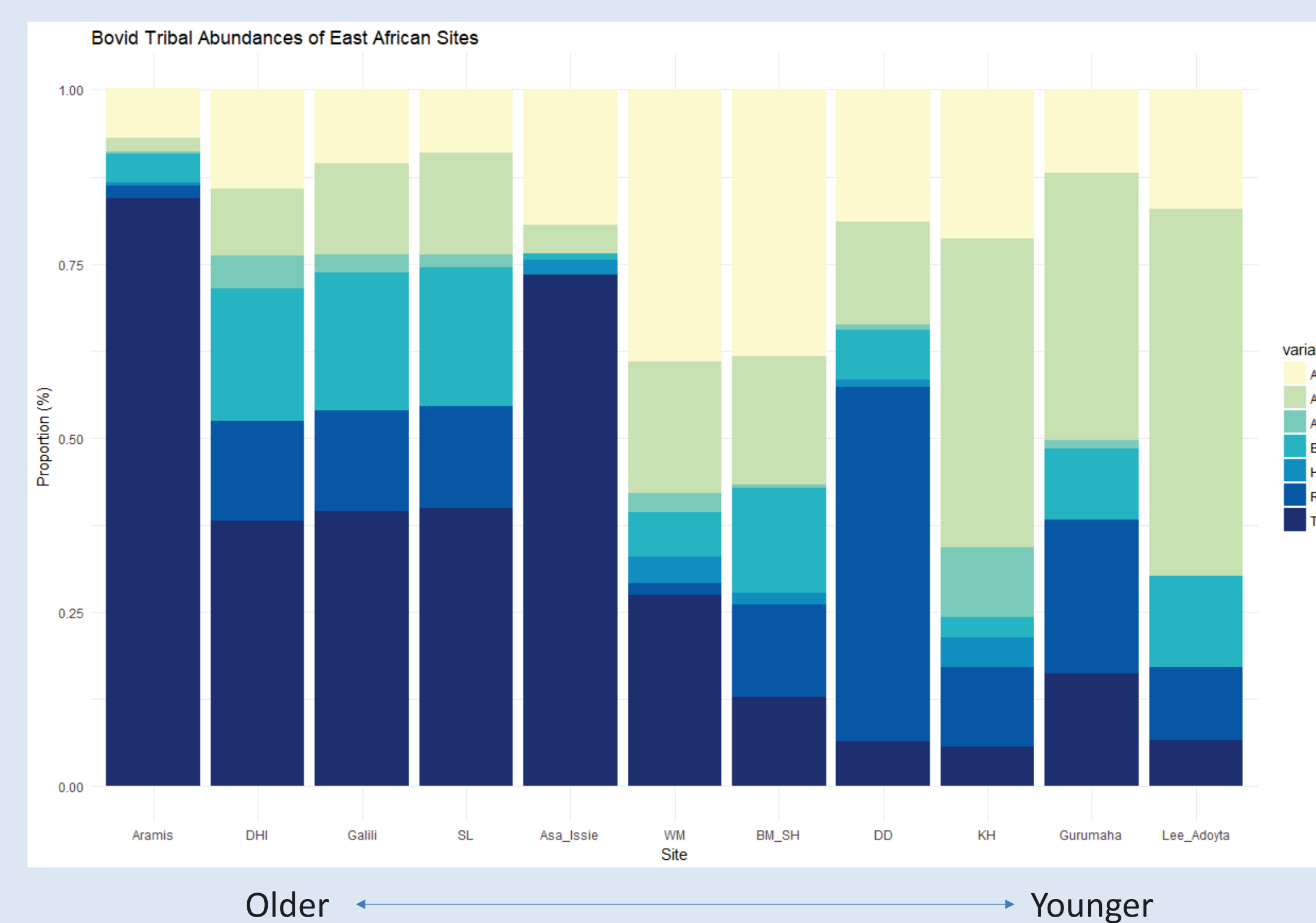


Figure 4. Bovid tribal abundances of Galili compared to other East African sites. There are few differences between the DHI and SL members at Galili. And, compared to the older sites of Aramis and Asa Issie, they have a decrease in Tragelaphini and an increase in Alcelaphini, Bovini, and Reduncini in comparison.



Figure 5. Correspondence analysis of WorldClim climate variables ($n=19$) for contemporary bovid communities in Africa ($n=46$) represented by relative bovid abundances. Axis 1 is correlated with mean annual precipitation and accounts for approximately 28.99% of the observed variation and separates arid (negative) to wet (positive) sites. Axis 2 accounts for 22.32% of the variation and separates woody or mixed (negative) from grassy (positive) sites. Two of the Galili members—DHI and SL—were plotted with the contemporaneous sites according to their respective bovid abundances. The bovid taxa included in the analysis were included as well

CONCLUSION

- The low hypsodonty indices indicate the taxa are dominated by brachydonty. Taken together with the largely rounded cusp shapes and occlusal relief of the specimens analyzed, these results suggest a dominance of browsing taxa.
- There is little change in bovid tribal abundance at Galili from the older DHI member to the younger SL member.
- The tribal abundances of the DHI member (4.0-4.4 Ma) are much different from those at the older site Aramis (~4.4 Ma) and roughly contemporaneous site Asa Issie (~4.1-4.2 Ma).
- The correspondence analysis supports previous preliminary paleoenvironmental analyses that support an open woodland to bushland-woodland and shrubland environment, with the two Galili members included falling towards the wetter and woodier axes. DHI and SL fall close to contemporary sites Quicama, Moremi, and Chobe.



ACKNOWLEDGEMENTS

We thank Prof. H Seidler and his team for allowing access to the fossils they collected. Additional thanks to John Rowan and other IHO-affiliated and SHESC graduate students at ASU for their support and assistance in this project.