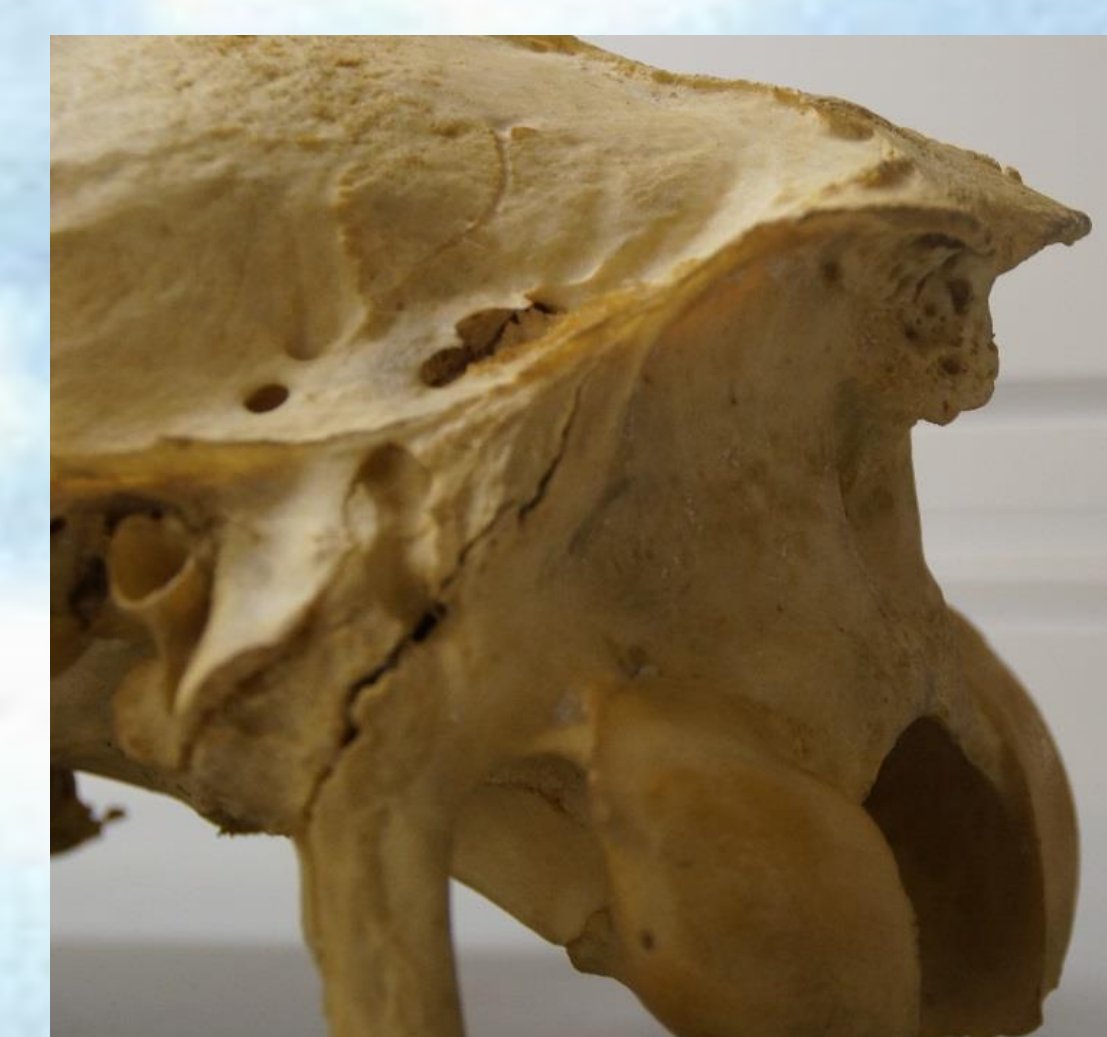


William Taylor¹, Tumuurbaatar Tuvshingjargal², and Jamsranjav Bayarsaikhan²¹Department of Anthropology, University of New Mexico, ²National Museum of Mongolia, Ulaanbaatar**Abstract**

This poster investigates the utility of equine cranial pathologies for the archaeozoological identification of horseback riding. Human management of horses dates to at least 3500 BCE, but empirical evidence for how these earliest horses were used in transport is scarce (Olsen 2006, Dietz 2003). Few unambiguous equestrian artifacts are known prior to the age of worked metal, and previous attempts to characterize horseback riding through biological means have seen limited success.

Cranial pathologies may be well-suited to the archaeological identification of horse transport. New data from museum collections suggest that reliance on zoo specimens confounded previous efforts to compare the skulls of worked and unworked horses. Changes to the nuchal crest and nasoincise bone, as quantified using 3D digital measurement, provide a useful archaeological signature for horse transport. Applying these techniques to a sample from the *Deer Stone-Khirigsuur* complex of Bronze Age Mongolia (1300-700 BCE) provides compelling evidence of early equestrianism, and indicates that application to other archaeological contexts may be profitable.

**Results**

Occipital crest and nasal grooves (center) from a feral Chincoteague Pony (left), and from General John J. Pershing's war horse Kidron (right). Specimens from the Smithsonian National Museum of Natural History, photos courtesy of Chincoteague.com and Wikimedia Commons, respectively.

Conclusion

3D metric comparison between horses of known work histories suggests that both nuchal ligament ossification scores and nasal groove depth track differences in human management and use of horses. Age-dependency does not explain observed patterns of medial groove depth, which means it can be profitably applied to a wide range of archaeological contexts where riding artifacts themselves are lacking. Better age control is needed before nuchal ossification can be used as stand-alone evidence for horseback riding, but a positive relationship between the two measurements points to a common causal mechanism. Lateral groove formation requires further research, but may be the result of bridle use. Taken together, these osseous changes to the cranium provide a quantitative means of identifying prehistoric horse transport, and point to chariot use and equestrianism as early as 1300 BCE in the Mongolian steppe.

Figure 1(left), NextEngine3D scanner in action. Figure 2 (upper right). Horse head burial at deer stone site in Khushuutin Gol, Mongolia. From Fitzhugh (2009). Figure 3 (lower right). Naso-incisive remodeling identified on this same specimen in a 2013 pilot study.

Methods

- 25 DSK skulls from Mongolian museum collections aged using dental eruption/wear patterns.
- Scanned using a NextEngine3D digital scanner (Figure 1).
- Ossification at the nuchal ligament attachment site measured and given qualitative score after Bendrey (2008).
- Naso-incisive groove depth measured digitally
- Data compared to 25 feral, zoo, and wild horses from museum collections.
- Qualitative and statistical analysis performed to test hypothesis of DSK horsemanship and explore archaeological utility of cranial bone changes.

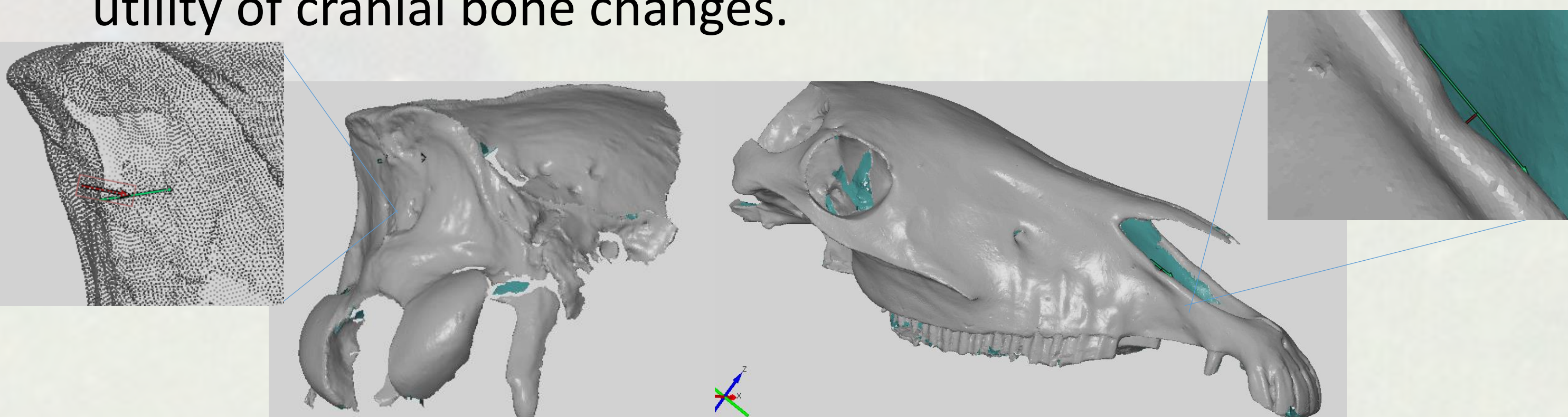


Figure 4. Measurement protocol for nuchal ligament ossification (left) and nasal groove (right). MSM scores were assigned a qualitative score based on bone protrusion, texture, and areal coverage. Nasal measurements were taken at the deepest point of the groove, at the intersection of groove walls with the dorsal border of the naso-incisive bone.

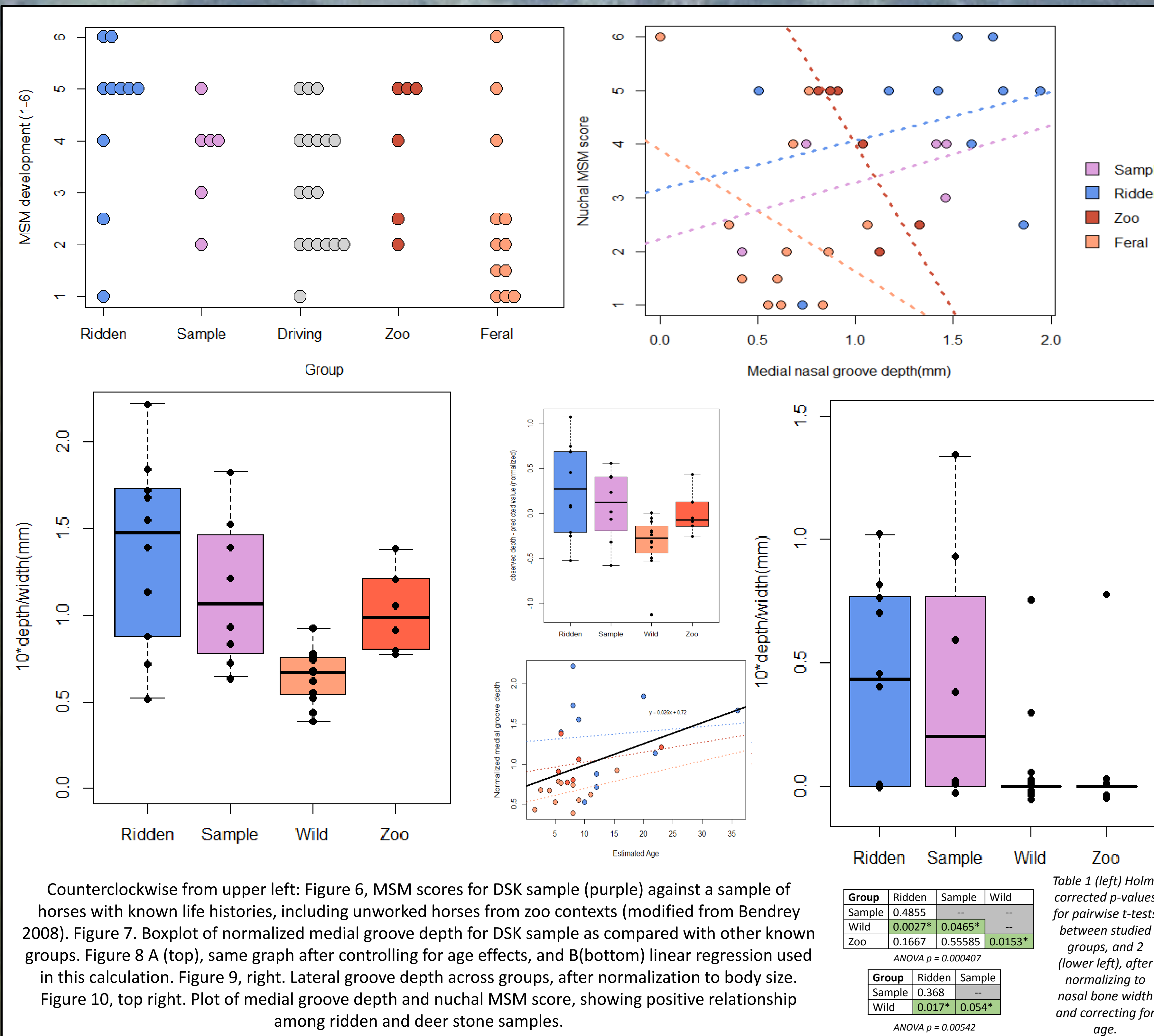


Figure 10, right. Carvings found on Deer Stone sites in Mongolia, including horses on 'tool belts' (L through Center), chariot (second from right) and saddled horse (right). Modified from Volkov 2002.

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