

## Introduction

Currently, rhinoceroses are mainly hunted for their horns. In prehistoric times, hominins were likely interested in rhinoceroses for their meat. Evidence from butchered bones and stone tools indicate that hominins first started consuming meat from large animals at least 2.6 Ma<sup>5</sup> and then migrated out of Africa around 1.9 Ma<sup>9\*</sup>, their diets became broader and more flexible. As the consumption of animal-based foods (especially meat) provided more calories for various amino acids and micronutrients used for rapid development<sup>1</sup>, the selective pressure to consume these foods increased. We conducted a literature review to determine when and where early humans started preying on rhinoceroses, and how rhinoceroses may have been used as food. We also intended explore the evidence for the interactions of hominin and rhinoceros species that inhabited the same geographical location during the same period of time and how often rhinoceros consumption events took place.

## Materials and Methods

### Literature Search

- We searched for relevant scientific archeology, paleontology, and evolutionary biology papers in online and print journals and books using keywords including “rhinoceros”, “cut marks”, “hunting”, “scavenging” “butchery”, and “stone tools” .
- We contacted relevant researchers by email to obtain information about sites they have studied or are currently studying that provide evidence of rhinoceros presence and consumption.

### Literature Review

- We recorded information into a spreadsheet including the excavation site name, geographic coordinates, sample ID, estimated age of fossils, lithic industry, species of hominin and rhinoceros present, NISP/MNI, age profile, number of butchery marks presented, and other fauna found.

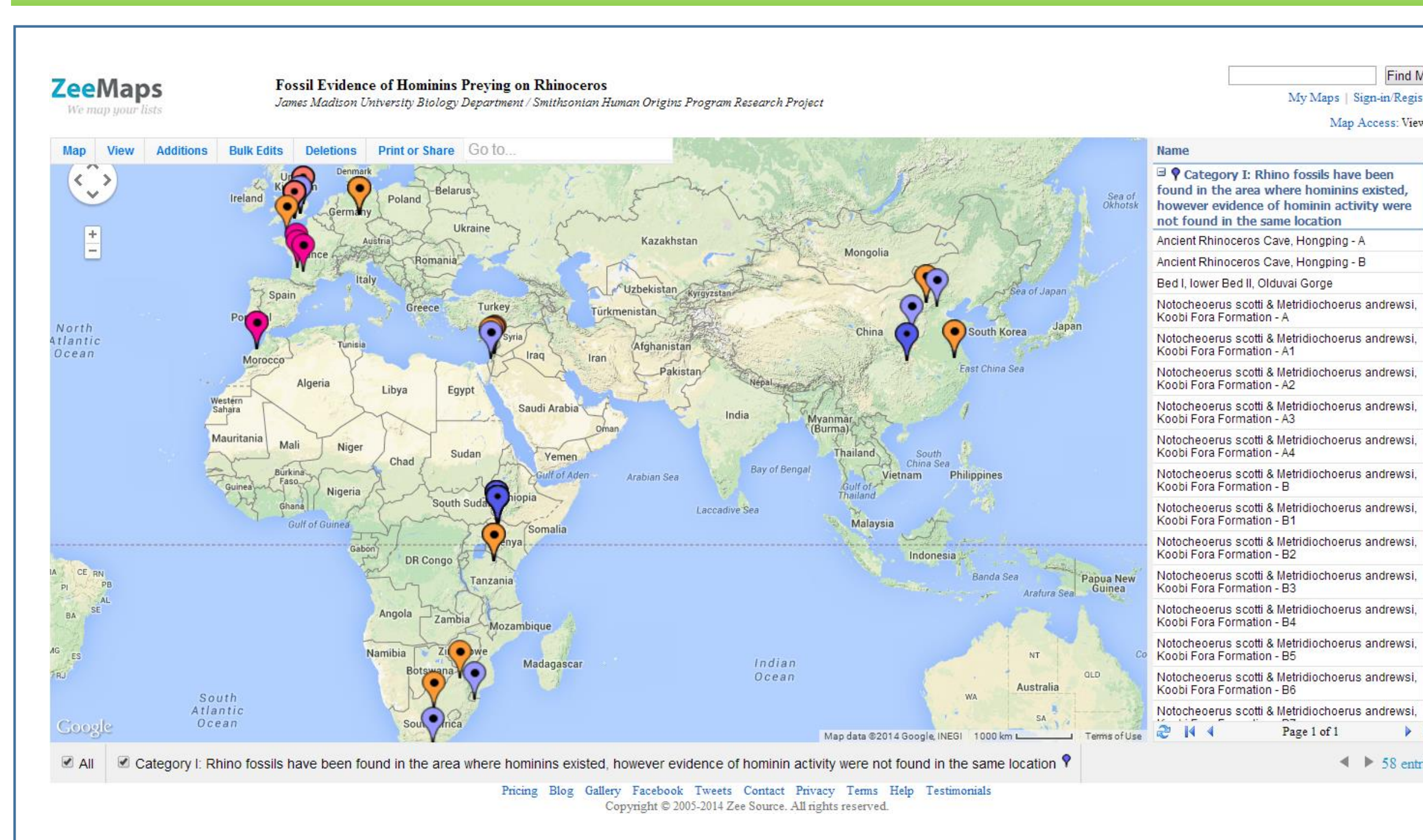
### Data Visualization

- We color coded each entry in the spreadsheet.
- We created a map of locations of relevant fossils and timeline of existing and our own hypotheses regarding human predation on rhinoceroses.

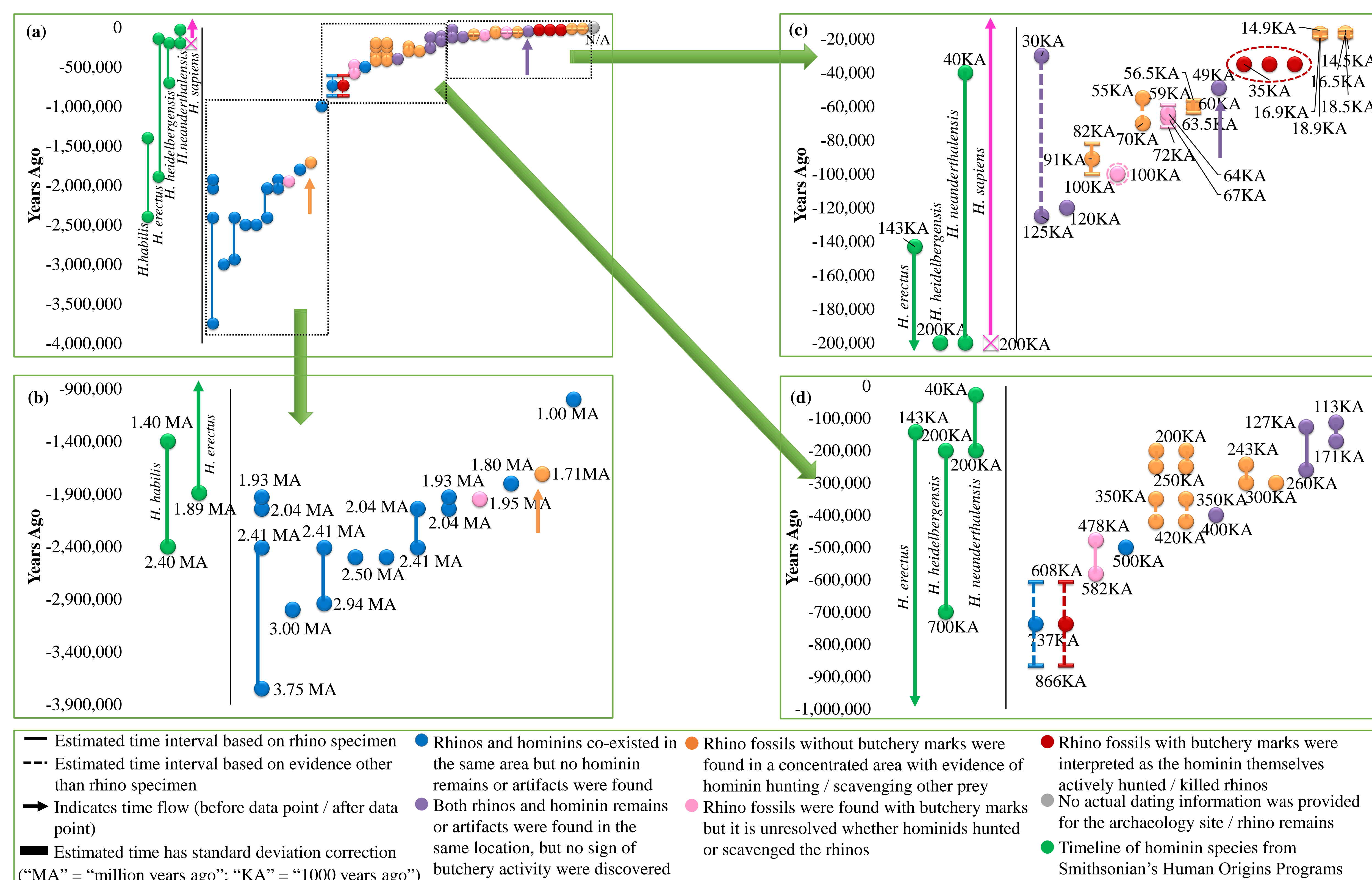
## Discussion

It is clear that hominins interacted with rhinoceroses as food sources. Skeletal elements of rhinoceroses were frequently reported from zooarcheological sites across Africa, Asia, and Europe (Figure 1). According to our literature review, the earliest hominin species to have coexisted with and possibly had the ability to hunt rhinos were *Homo erectus* and *Homo neanderthalensis*<sup>2,3</sup>, who lived between 1.89 million and 143,000 years ago and from 200,000 to 40,000 years ago (respectively)<sup>4,9\*</sup>. Rhinoceroses are large, usually solitary, often aggressive ungulates, which made them rare to encounter and dangerous to kill. However, it may have been possible for hominins to obtain rhinoceros meat by scavenging after other predators had killed the rhinoceros<sup>6,7</sup>. In addition, numerous skulls and a several bones of rhinos have been found in caves where hominins may have potentially lived or congregated, which suggests that hominins were at least capable of scavenging meat and detaching parts of these animals<sup>8</sup>. A main reason we were not able to confirm hunting by hominins on rhinoceroses is due to their size; it may be possible for an early human to kill prey without leaving any marks on the bones<sup>7</sup>. Although our literature review found very few butchery marks on rhino fossils, the presence of cut marks on other species such as elephants, buffalos, and deer suggest that early hominins were capable of harvesting meat from large animals<sup>3,5,6,7</sup>.

## Results



**Figure 1.** Interactive map containing 58 detailed specimen data entries created using ZeeMaps. Different color pins correspond to the five different categories based on the interaction between rhinoceros and hominin (detailed descriptions of each category are available on the actual map). Detailed data for each entry can be seen by clicking on the “entry name” on the right list or by clicking on the actual pin point. Viewers of the map will be able to download the entire database as a CSV file. Admin access will also be available for scientist to modify current data or add a data entry.



**Figure 2.** (a) summary of the timeline based on the dating information either provided by rhinoceros remains or other specimens found at each site. Data entries were reorganized based on the likely interaction between rhinoceros and hominins and the estimated age of the fossil specimen. The left side of each chart is the estimated timeline of the major hominin species according to the Smithsonian’s Human Origins Program. The right side of each chart corresponds to the timeline for different sites. (b) detailed dating from 3.75 million years ago to 1.00 million years ago; (c) detailed dating from 150 thousand years ago to 14 thousand years ago; (d) detailed dating from 900 thousand years ago to 150 thousand years ago.

## Conclusion

- Fossil records from prehistoric sites in Africa, Asia, and Europe showed *Homo erectus* and *Homo neanderthalensis* coexisted and may have been capable of hunting rhinoceroses.
- It is highly plausible that early hominins were able to deflesh and consume rhinoceros meat. Many bone fossils show butchery marks (cut or percussion) on their surface.
- However, it is difficult to confirm whether or not early hominins hunted rhinoceroses directly or scavenged the meat after another predator.
- It is unclear where early hominins processed the rhino meat. Rhinos are large animals that would have been difficult to drag complete, yet some of their bones have been found in caves.
- We are unable to find evidence of hunting through the fossil records because hominins may have been able to kill and butcher rhinoceroses without leaving marks on their bones.

## Key References

<sup>1</sup>Aiello, L. C., & Wheeler, P. (1995). The expensive-tissue hypothesis: The brain and the digestive system in human and primate evolution. *Current Anthropology*, 36(2), 199-221. <sup>2</sup>Bocherers, H., Drucker, D. G., et al., (2005). Isotopic evidence for diet and subsistence pattern of the Saint-Césaire I Neanderthal: Review and use of a multi-source mixing model. *Journal of Human Evolution*, 49(1), 71-87. <sup>3</sup>Brain, D., Harris, J., Levin, N., et al., (2010). Early hominid diet included diverse terrestrial and aquatic animals 1.95 Ma in East Turkana, Kenya (R. Klein, Ed.). *Proceedings of the National Academy of Sciences of the United States of America*, 107(22), 10002-10007. <sup>4</sup>Higham, T., Douka, K., Wood, R., et al., (2014, August 20). The timing and spatiotemporal patterning of Neanderthal disappearance. *Nature*, 506-509. <sup>5</sup>Pobiner, B. L. (2007). Hominin-carnivore interactions: evidence from modern carnivore bone modification and early Pleistocene archaeofaunas (Koobi Fora, Kenya; Olduvai Gorge, Tanzania); Doctoral dissertation. <sup>6</sup>Rabinovich, R., Bar-Yosef, O., et al., (2004). Hominid-carnivore interactions in the Paleolithic site of Qafzeh cave, Israel. *Revue De Paleobiologie, Genève*, 23(2), 627-637. <sup>7</sup>Smith, G.M. (2010). A contextual approach to the study of faunal assemblages from Lower and Middle Pleistocene sites in the UK. Doctoral thesis, *DCL, University College London*. <sup>8</sup>Tong, H. (2001). Age profiles of rhino fauna from the Middle Pleistocene Nanjing Maus site, south China – explained by the rhino specimens of living species. *International Journal of Osteoarchaeology*, 11, 231-237. <sup>9</sup>Human Origins Website: <http://humanorigins.si.edu/>. (\* indicates information source is from Internet)

## Online Source Links / Email

ZeeMaps: <https://www.zeemaps.com/map?group=1113706>  
 Human Origins Program: <http://humanorigins.si.edu>  
 Elizabeth V. Berkeley: [berkelev@jmu.edu](mailto:berkelev@jmu.edu)  
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