

# HUMAN-ELEPHANT INTERACTIONS FROM PAST TO PRESENT: AN INTRODUCTION

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Today, the thriving human lineage occupies all continents of the world, whereas the members of the proboscidean lineage (order Proboscidea) — the African savanna and forest elephants *Loxodonta africana* and *Loxodonta cyclotis*, respectively, and the Asian elephant *Elephas maximus*— are all locally restricted and considered as threatened by extinction. The extant elephants are relics of a group that was once extremely diversified and widely distributed on all continents (apart from Antarctica and Australia), especially during Miocene and Plio-Pleistocene times (Shoshani and Tassy, 1996: figs. 34.2, 34.3). Proboscideans are some of the largest mammals that ever walked on earth, and the largest ones from the Miocene to recent times.

Humans and elephants<sup>1</sup> shared habitats from

Palaeolithic times until recently in both the Old and New World, while in Asia and Africa, the human-elephant interactions carry on until today, following a legacy of hundreds of thousands of years. In recent decades, a significant number of Pleistocene (ca. 2.6 million years–10,000 years ago) open-air and cave sites yielding elephant bones in spatial association with lithic artifacts have been discovered. Many of them show strong and direct evidence of acquisition and processing of elephant carcasses by early humans, leading archaeologists to interpret them as “butchering sites”. Indeed, elephant exploitation by humans has been proposed to have played a significant role in the diet and culture of early humans.

The nature and degree of interactions between humans and elephants is an important field in

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1 For the sake of clarity, we would like to stress that although we use the term “Human-elephant interactions”, we actually refer to all members of the order Proboscidea that have been or potentially could have been exploited by humans (or perhaps other hominins). Apart from *Loxodonta*, *Elephas*, *Palaeoloxodon* and *Mammuthus*, which are classified within the family Elephantidae, exploitation of *Stegodon* (family Stegodontidae) is reported from China (e.g., Wei et al., 2017), while *Sinomastodon* (family Gomphotheriidae) was additionally present there until the late Early Pleistocene (Wang et al., 2014). Although the butchering of the deinotherium *Deinotherium* (family Deinotheriidae) in FLK North 6 (Tanzania) is questioned (Dominguez-Rodrigo

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et al., 2007), the genus persisted in Africa until the late Early Pleistocene; the gomphotherium *Anancus* survived also in Africa until close to the Pliocene/Pleistocene boundary (Sanders et al., 2010). In North America the mastodon *Mammuthus* (family Mammuthidae) survived until the end of the Late Pleistocene and is associated in some sites with Clovis lithics, while in others there is evidence of butchering (Fisher, 1984; Haynes and Klimowicz, 2015). In South America several gomphotheres survived until the end of the Late Pleistocene/beginning of Holocene, some of them exploited by humans (e.g., Mothé et al. 2020).



palaeoanthropological studies since decades, but many questions remain still unanswered or partially explored, and are the focus of current discussions and debates. Some of the most debated subjects revolve around the following research questions:

- Were prehistoric hunter-gatherers actively engaged in elephant hunting? Could elephant scavenging alone be responsible for sustaining a successful diet throughout the Palaeolithic?
- What are the probable methods for elephant hunting in prehistoric times and how can recent anthropological evidence shed light on the subject?
- What would elephant hunting and processing sites look like and what kind of archaeological evidence is to be expected?
- What were the mechanisms for elephant carcass processing, skinning, defleshing and dismembering in the Palaeolithic? What kind of archaeological evidence is to be expected and how can ethnographic and recent experimental data help answer these questions?
- Were elephants a significant food resource for prehistoric hunter-gatherers and how important was elephant meat and fat in the evolution of the human lineage?
- How exactly could the exploitation of elephant carcasses have influenced the subsistence strategies and technological innovations of early *Homo*? Did it play a role in the change from scavenging to active hunting?
- How important was an elephant meat-based diet to biological developments and the nutrition of our ancestors?

In order to address the above and many other questions, to provide a forum to discuss the current state of knowledge in human-elephant interactions, and to develop cross-disciplinary collaborations, a scientific symposium was organized, entitled “Human-elephant interactions: from past to present”. The symposium was held

October 16–18, 2019 at the Schloss Herrenhausen in Hannover (Germany) under the auspices of the Volkswagen Foundation’s “Symposia and Summer Schools Initiative”, and brought together specialists from the disciplinary fields of Palaeolithic Archaeology, Palaeoanthropology, Palaeontology, Zooarchaeology, Geology, Ethnography and Nutrition Studies. The present volume represents the proceedings of the symposium and gathers most of the contributions presented there. By including a diverse array of perspectives on elephant-human interactions across the world, the volume aims to provoke renewed interest for current and further research, and build an interdisciplinary and synthetic understanding of the significance of elephants throughout human history. The volume includes 19 contributions and is divided into four thematic sections: 1) The Palaeolithic record, 2) A view of the evidence, 3) Elephants in past human nutrition, and 4) Ethnography – Human-elephant interactions in recent Africa.

Before the above sections, the volume begins with a perspective chapter by Tanner (Chapter 1), who provides important insights on ontological aspects of meat and fat harvesting among extant North American subarctic hunters. The author examines their animist practices in relation to fat, stone, bone and animal hide, and draws conclusions about how such ethnographic observations contribute to the interpretations of past human behavior.

## THE PALAEOLITHIC RECORD AND A VIEW OF THE EVIDENCE

Elephant remains have been found in numerous Palaeolithic sites, both open-air and cave sites, in Europe, Asia, Africa and the Americas, associated with lithic artifacts and/or humans remains attributed to several hominin species (e.g., *Homo erectus*, Neanderthals and *Homo sapiens*). At all

of these sites, archaeologists face a difficult task: they have to assess whether hominins were actually involved in the accumulation and modification of the elephant remains. To support hominin involvement, zooarchaeologists examine the elephant bones for cut marks, which indicate butchering practices and the removal of meat, as well as percussion marks, which point to the breaking of bones for marrow extraction or tool fashioning. Lithic artifacts provide another line of evidence, as they sometimes preserve micro-wear traces and residues that may suggest the use of tools for meat processing. However, these laboratory investigations have their own methodological problems and must be supplemented by a detailed examination of the geological context of the site. Therefore, palaeontologists and zooarchaeologists study the taphonomy of the finds (e.g., cause of animals' death, bone modifications by carnivores and humans, burial, fossilization) and work together with geoarchaeologists and geologists to investigate site formation processes, while archaeologists examine patterns from the spatial association of lithic tools and faunal remains.

At many sites, human exploitation of elephant carcasses has been argued either on the basis of direct evidence (e.g., cut marks on bones, proboscidean bone artifacts, embedded lithics in proboscidean bones) or indirect evidence (e.g., tight spatial arrangement of lithic and faunal material, fat residue and use-wear on lithic tools) (see for example Goren-Inbar et al., 1994; Potts et al., 1999; Yravedra et al., 2010; Rabinovich et al., 2012; Boschian and Saccà, 2014; Santucci et al., 2016; Wojtal et al., 2019). It has also been proposed that elephant exploitation was more than just a marginal phenomenon, and had particular significance in human lifeways and diet during the Palaeolithic. Elephants were by far the largest terrestrial mammal available to Palaeolithic hominins, and represented a unique food package in terms of the quantity of fat and meat (Ben-Dor et al., 2011; Agam and

Barkai, 2018). The methods of obtaining proboscidean meat by early humans are still under discussion. While for the Early Pleistocene a significant scavenging component and more opportunistic behavior is considered for megafauna acquisition (e.g., Espigares et al., 2013; Domínguez-Rodrigo et al., 2014), in later time periods hunting (e.g., with traps, ambush, confrontational) became perhaps the principal method for obtaining calories (e.g., Agam and Barkai, 2018). Research at elephant butchering sites tries to assess whether the animals were hunted or scavenged by humans, and, in the latter case, whether humans had first access to carcasses, prior to large carnivores.

“The Palaeolithic record” section of this volume (Part 1) starts with Espigares et al. (Chapter 2), who open the window to the Early Pleistocene setting of Spain. The rich palaeontological and archaeological record of the Baza Basin documents the presence of giant hyenas and saber-toothed cats along with hominins. The authors put emphasis on the site of Fuente Nueva-3, where hominins and hyenas may have competed for consumption of a mammoth. Konidaris and Tournloukis (Chapter 3) investigate the Proboscidea-*Homo* record in Early-Middle Pleistocene open-air localities of western Eurasia from a palaeontological and archaeological perspective, focusing among others on the role of large carnivores, the technological advances in material culture, the important developments in human cognition and on relevant inferences about human social behavior. The authors suggest that proboscidean exploitation during the Early Pleistocene may have been occasional and sporadic, relying perhaps mostly on scavenging, whereas during the Middle Pleistocene megafauna procurement became more regular including also hunting. Palombo and Cerilli (Chapter 4) review the Pleistocene record of human-elephant interactions in terms of several factors, such as the geographical and climatic region, the vegetation type, the diversity of large mammal fauna, the material culture and the taphonomic

evidence, and conclude that during the Lower Palaeolithic human-proboscidean interactions were mainly related to “accidental findings”, whereas during the Late Pleistocene the exploitation of proboscidean carcasses was more related to a hunting activity. Wenban-Smith (Chapter 5) presents his research in the Middle Pleistocene Ebbsfleet elephant site in the United Kingdom, addressing the issue of megafaunal exploitation and its importance for the investigation of human adaptations through the Pleistocene. Going beyond this, the author provides perspectives on Neanderthal extinction in north-west Europe during the last ice age, highlighting the potentially crucial role that the mammoth-hunting niche played for both Neanderthals and modern humans. Rosell and Blasco (Chapter 6) compile the zooarchaeological evidence of elephant-human interactions during the Pleistocene in the Iberian Peninsula, and highlight the importance of this geographic region for the investigation of relationships between proboscideans and hominins. The authors conclude that the exploitation of elephants is based mostly on fortuitous encounters, and is characterized by carcass processing at the procurement place or in some cases by the occasional transport of selected anatomical portions to the habitat location. Demay et al. (Chapter 7) synthesize results from zooarchaeological analyses from several Upper Pleistocene sites from Eastern Europe and highlight the importance of mammoths for human territory settlements. The authors present the different ways mammoth resources were acquired (e.g., hunting or dry bone gathering), and describe their use for food, fuel, building material and portable support for tools and mobiliary art.

In the “A view of the evidence” section of the volume (Part 2), Marinelli et al. (Chapter 8) present results from use-wear analysis conducted on small flakes from the Lower Palaeolithic sites Revadim (Israel) and Fontana Ranuccio (Italy), both yielding several megafaunal remains. The comparison with experimental data indicates spe-

cific movements and actions related to butchering, especially for cutting soft material, and the authors suggest that small flakes were particularly efficient in anatomical areas of carcasses that would be more difficult to access with larger tools. Giusti (Chapter 9) highlights the need to move beyond the indirect evidence provided by the spatial association of faunal remains and artifacts. The author emphasizes the importance of applying spatial taphonomy in the study of archaeo-palaeontological assemblages, including proboscidean sites, aiming for more detailed interpretations of past human behaviors. Rocca et al. (Chapter 10) report on their investigations in two Lower Palaeolithic localities of Italy, Cimitero di Atella and Ficoncella, and point to the cultural and behavioral variability during the early Middle Pleistocene in Italy, including a great diversity of tools and reduction sequences. Surovell et al. (Chapter 11) report on the La Prele Mammoth Site, a Clovis mammoth site in Wyoming, and demonstrate that humans not only killed and butchered a mammoth, but they also set up a nearby campsite preserving multiple hearth-centered activity areas. La Prele provides a glimpse into the way Clovis foragers solved the logistical challenges of megafauna hunting and efficiently processed a proboscidean kill.

## ELEPHANTS IN PAST HUMAN NUTRITION

Human nutrition during Palaeolithic times was based on calories obtained from animal meat and fat, in addition to plant-based foods (e.g., Barkai and Gopher, 2013; Hardy et al., 2015). The importance of fat in the diet cannot be overestimated, as lean protein without fat, as might be available in the carcasses of emaciated prey animals during lean seasons, loses its nutritional value and can even lead to protein poisoning (Speth, 2010). Proboscideans, with their large size and fat content, might therefore have played a crucial role in Palaeolithic

subsistence. Many Palaeolithic sites have extensive evidence for large mammal consumption and it has been argued repeatedly that big game hunting was a principal procurement strategy for humans to meet their necessary caloric and nutritional demands (Bunn and Gurto, 2014; Domínguez-Rodrigo et al., 2014). Moreover, stable isotope analyses evidence the high amount of mammoth meat consumption by Neanderthals and early modern humans (Bocherens et al., 2015; Metcalfe, 2017). Finally, recent research on the fat composition of juvenile frozen mammoths shows a rare nutritional value of the fat itself with a high concentration of polyunsaturated fatty acids, which are known to build up cell membranes and have a different profile according to milk intake (Guil-Guerrero et al., 2014). Correlating this with the large amount of juvenile elephant bones found at various sites and the fact that the fat of young animals is known as better tasting (along with the high vulnerability of juveniles and the lighter weight of their body parts facilitating their transport to human home bases), brings forth the question of specific targeting of juvenile individuals by early humans (e.g., Fladerer, 2003; Blasco and Fernández Peris, 2012; Germonpré et al., 2012; Nikolskiy and Pitulko, 2013).

In the section “Elephants in past human nutrition” of this volume (Part 3), Ben-Dor and Barkai (Chapter 12), analyze data from ethnographic sources and draw our attention to the fact that proboscideans’ contribution to human subsistence during the Palaeolithic is underestimated in the traditional zooarchaeological analysis of bone assemblages. The authors make the point, for example, that acquisition of large prey was more energetically efficient and less technically complex than the acquisition of small prey animals. Bocherens and Drucker (Chapter 13) provide isotopic insights on ecological interactions between humans and woolly mammoths during the Middle and Upper Palaeolithic in western, central and eastern Europe. Their results indicate a high amount of

mammoth meat consumption by late Neanderthals and early modern humans. The authors also address the question of the predatory pressure exerted by modern humans on the woolly mammoth well before its extinction. Blasco and Fernández Peris (Chapter 14) summarize zooarchaeological data from the Middle Pleistocene site of Bolomor Cave in Spain, where the faunal assemblage ranges from very small-sized animals (lagomorphs, birds and tortoises) to very large-sized herbivores (elephants, hippopotamuses and rhinoceroses). The hominin exploitation of such a wide range of animals indicates a generalist behavior based on a broad spectrum diet, and highlights the diversity in the lifestyles of the human communities of the European Middle Pleistocene. Germonpré et al. (Chapter 15) examine the season of death of juvenile mammoths at several Middle and Upper Palaeolithic sites from Central and Eastern Europe. The authors conclude that the hunting of mammoth calves took place during all seasons and was not limited to the cold part of the year, and that their carcasses, heads or other body parts were transported to human settlements. Fisher (Chapter 16) based on ethnographic parallels and his experimental studies, discusses under-water storage of Late Pleistocene proboscidean carcasses for securing, concealing, and returning to utilize nutritionally significant carcass parts. By pointing out the role of under-water storage of human subsistence, the author sheds light on an important aspect of human subsistence strategies centering on megafauna.

## ETHNOGRAPHY – HUMAN-ELEPHANT INTERACTIONS IN RECENT AFRICA

Anthropological and ethnographic research documents the interactions of extant hunter-gatherers with elephants, mostly in parts of central Africa and India (e.g., Terashima, 1986; Joiris, 1993;

Naveh and Bird-David, 2014). Several contemporary hunter-gatherer groups in the Central African Republic, Republic of the Congo and Cameroon, such as the BaYaka, Baka, Aka, Efe and Mbuti, are still using traditional weaponry such as spears in elephant hunting, and still process and consume elephant carcasses (e.g., Lewis, 2015). This window of opportunity for research into this behavior is being rapidly shut down, however, as guns are being supplied to hunter-gatherer groups by local farmers in exchange for the tusks of the hunted elephants. Nevertheless, during the past decades and particularly in recent years, anthropologists were able to document and study the elephant hunting practices of these groups, the post-hunting processing of elephant carcasses, as well as the role of elephant meat and fat in the diet of hunter-gatherers. Such valuable information could and should shed new light on the silent archaeological record, while the rich and extensive Palaeolithic evidence for similar interactions with elephants throughout hundreds of thousands of years enables a time-perspective into the nature of human-elephant relationships in the past.

Ethnographic and actualistic studies of present-day patterns and processes constitute an invaluable source of information as analogues that help to interpret the archaeological record. For instance, modern elephant butchery experiments have demonstrated that it is possible to deflesh carcasses without leaving visible cut marks or other markings on elephant bones. Ethnographic research also informs us about non-dietary utilization of elephant remains with practices that are almost “invisible” in the archaeological record. There is ample evidence that, during the Palaeolithic, elephant bones were often used as raw material for tool production. Proboscidean bones were also used as fuel and as material for constructing dwelling structures and windbreaks. However, it is the current anthropological research on hunter-gatherers that can inform us on practices with a weak-

er (if any) archaeological signal: for instance, the use of dried hides for clothing; elephant foot-pads used as bowls; or soft tissues, such as tendons, used for making bindings.

In the section “Ethnography – Human-elephant interactions in recent Africa” of this volume (Part 4), Lewis (Chapter 17) focuses on the fact that elephants pose a real danger to BaYaka hunter-gatherers of Congo, and that approaching and killing an elephant with a spear is an extremely difficult and risky task. The author describes traditional techniques for hunting and killing elephants, and their accompanying rituals, focusing on their significance for the BaYaka cultural identity, economics and politics. Ichikawa (Chapter 18) describes elephant hunting methods with spears, hunting party and success rate, the distribution of meat, and the festive nature of meat consumption by the Mbuti hunter-gatherers in the Ituri forest of the eastern Congo Basin. The author discusses the low success rate of elephant hunting, but also the huge quantity of meat supply in a successful hunt, as well as the accompanying ritual performances and festive meat consumption. Finally, Yasuoka (Chapter 19) reports on his investigations on the Baka Pygmies in Central Africa, focusing on the complex procedure that accompanies elephant hunting, and the structure of the Baka Pygmies’ egalitarian society. The author explores aspects of elephant meat sharing and provides ontological clues of elephant hunting, most notably the taboo that forbids the hunter who killed an elephant from eating the meat.

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## REFERENCES

- AGAM, A., Barkai, R., 2018. Elephant and mammoth hunting during the Paleolithic: a review of the relevant archaeological, ethnographic and ethno-historical records. *Quaternary* 1, 3.
- BARKAI, R., Gopher, A., 2013. Cultural and biological transformations in the Middle Pleistocene Levant: a view from Qesem Cave, Israel, in: Akazawa, T., Nishiaki, Y., Aoki, K. (Eds.), *Dynamics of learning in Neanderthals and modern humans: cultural perspectives, replacement of Neanderthals by modern humans series*. Springer Japan, pp. 115–137.
- BEN-DOR, M., Gopher, A., Hershkovitz, I., Barkai, R., 2011. Man the fat hunter: the demise of *Homo erectus* and the emergence of a new hominin lineage in the Middle Pleistocene (ca. 400 kyr) Levant. *PLoS ONE* 6, e28689.
- BLASCO, R., Fernández-Peris, J., 2012. A uniquely broad spectrum diet during the Middle Pleistocene at Bolomor Cave (Valencia, Spain). *Quaternary International* 252, 16–31.
- BOCHERENS, H., Drucker, D. G., Germonpré, M., Lázničková-Galetová, M., Naito, Y., Wißing, C., Brüžek, J., Oliva, M., 2015. Reconstruction of the Gravettian food-web at Předmostí I using isotopic tracking of bone collagen. *Quaternary International* 359–360, 211–228.
- BOSCHIAN, G., Saccà, D., 2015. In the elephant, everything is good: Carcass use and re-use at Castel di Guido (Italy). *Quaternary International* 361, 288–296.
- BUNN, H. T., Gurtov, A. N., 2014. Prey mortality profiles indicate that Early Pleistocene *Homo* at Olduvai was an ambush predator. *Quaternary International* 322–323, 44–53.
- DOMÍNGUEZ-RODRIGO, M., Barba, R., de la Torre, I., Mora, R., 2007. A cautionary tale about early archaeological sites: a reanalysis of FLK North 6, in: Domínguez-Rodrigo, M., Barba, R., Egeland, C.P. (Eds.), *Deconstructing Olduvai: a taphonomic study of the Bed I Sites*. Springer, Dordrecht, pp. 101–125.
- DOMÍNGUEZ-RODRIGO, M., Bunn, H. T., Mabulula, A. Z. P., Baquedano, E., Uribelarrea, D., Pérez-González, A., Gidna, A., Yravedra, J., Díez-Martin, F., Egeland, C. P., Barba, R., Arriaza, M. C., Organista, E., Ansón, M., 2014. On meat eating and human evolution: a taphonomic analysis of BK4b (Upper Bed II, Olduvai Gorge, Tanzania), and its bearing on hominin megafaunal consumption. *Quaternary International* 322–323, 129–152.
- ESPIGARES, M. P., Palmqvist, P., Guerra-Merchán, A., Ros-Montoya, S., García-Aguilar, J. M., Rodríguez-Gómez, G., Serrano, F. J., Martínez-Navarro, B., 2019. The earliest cut marks of Europe: a discussion on hominin subsistence patterns in the Orce sites (Baza basin, SE Spain). *Scientific Reports* 9, 15408.
- FISHER, D. C., 1984. Taphonomic analysis of Late Pleistocene mastodon occurrences: evidence of butchery by North American Paleo-Indians. *Paleobiology* 10, 338–357.
- FLADERER, F. A., 2003. A calf-dominated mammoth age profile from the 27 kyBP stadial Krems-Wachtberg site in the middle Danube valley, in: Reumer, J. W. F., de Vos, J., Mol, D. (Eds.), *Advances in mammoth research (Proceedings of the Second International Mam-*

- moth Conference, Rotterdam, May 16-20 1999). *Deinsea*, pp. 135–158.
- GERMONPRÉ, M.**, Udrescu, M., Fiers, E., 2014. Possible evidence of mammoth hunting at the Neanderthal site of Spy (Belgium). *Quaternary International* 337, 28–42.
- GOREN-INBAR, N.**, Lister, A., Werker, E., Chech, M., 1994. A butchered elephant skull and associated artifacts from the Acheulian site of Geshert Benot Ya'aqov, Israel. *Paléorient* 20, 99–112.
- GUIL-GUERRERO, J. L.**, Tikhonov, A., Rodríguez-García, I., Protopopov, A., Grigoriev, S., Ramos-Bueno, R. P., 2014. The fat from frozen mammals reveals sources of essential fatty acids suitable for Palaeolithic and Neolithic humans. *PloS ONE* 9, e84480.
- HAYNES, G.**, Klimowicz, J., 2015. Recent elephant-carcass utilization as a basis for interpreting mammoth exploitation. *Quaternary International* 359–360, 19–37.
- HARDY, K.**, Brand-Miller, J., Brown, K. D., Thomas, M. G., Copeland, L., 2015. The importance of dietary carbohydrate in human evolution. *The Quarterly Review of Biology* 90, 251–268.
- JOIRIS, D. V.**, 1993. Baka Pygmy hunting rituals in southern Cameroon: How to walk side by side with the elephant. *Civilisations* 41, 51–81.
- LEWIS, J.** 2015. Where goods are free but knowledge costs: hunter-gatherer ritual economics in Western Central Africa. *Hunter Gatherer Research* 1, 1–27.
- METCALFE, J. Z.**, 2017. Proboscideans isotopic compositions provide insight into ancient humans and their environments. *Quaternary International* 443, 147–159.
- MOTHÉ, D.**, Avilla, L. S., Araújo-Júnior, H. I., Roti, A., Prous, A., Azevedo, S. A. K., 2020. An artifact embedded in an extinct proboscidean sheds new light on human-megafaunal interactions in the Quaternary of South America. *Quaternary Science Reviews* 229, 106125.
- NAVEH, D.**, Bird-David, N., 2014. How persons become things: economic and epistemological changes among Nayaka hunter-gatherers. *Journal of the Royal Anthropological Institute* 20, 74–92.
- NIKOLSKIY, P.**, Pitulko, V., 2013. Evidence from the Yana Palaeolithic site, Arctic Siberia, yields clues to the riddle of mammoth hunting. *Journal of Archaeological Science* 40, 4189–4197.
- POTTS, R.**, Behrensmeyer, A. K., Ditchfield, P., 1999. Paleolandscape variation and Early Pleistocene hominid activities: Members 1 and 7, Ologesailie Formation, Kenya. *Journal of Human Evolution* 37, 747–788.
- RABINOVICH, R.**, Ackermann, O., Aladjem, E., Barkai, R., Biton, R., Milevsky, I., Solodenko, N., Marder, O., 2012. Elephants at the Middle Pleistocene Acheulian open-air site of Revadim Quarry, Israel. *Quaternary International* 276–277, 183–197.
- SANDERS, W. J.**, Gheerbrant, E., Harris, J. M., Saegusa, H., Delmer, C., 2010. Proboscidea, in: Werdelin, L., Sanders, W. J. (Eds.), *Cenozoic mammals of Africa*. University of California Press, Berkeley, pp. 161–251.
- SANTUCCI, E.**, Marano, F., Cerilli, E., Fiore, I., Lemorini, C., Palombo, M. R., Anzidei, A. P., Bulgarelli, G. M., 2016. *Palaeoloxodon* exploitation at the Middle Pleistocene site of La Polledrara di Cecanibbio (Rome, Italy). *Quaternary International* 406, 169–182.
- SHOSHANI, J.**, Tassy, P., 1996. Summary, conclusions, and a glimpse into the future, in: Shoshani, J., Tassy, P. (Eds.), *The Proboscidea: evolution and palaeoecology of elephants and their relatives*. Oxford University Press, New York, pp. 335–348.
- SPETH, J. D.**, 2010. *The Paleoanthropology and archaeology of big-game hunting. Protein, fat, or politics?* Springer, New York.
- TERASHIMA, H.**, 1986. Economic exchange and the symbiotic relationship between the Mbu-



- ti (Efe) Pygmies and the neighboring farmers. *Sprache und Geschichte in Afrika* 7, 391–405.
- WANG, Y., Jin, C., Mead, J.I., 2014. New remains of *Sinomastodon yangziensis* (Proboscidea, Gomphotheriidae) from Sanhe karst Cave, with discussion on the evolution of Pleistocene *Sinomastodon* in South China. *Quaternary International* 339–340, 90–96.
- WEI, G., He, C., Hu, Y., Yu, K., Chen, S., Pang, L., Wu, Y., Huang, W., Yuan, W., 2017. First discovery of a bone handaxe in China. *Quaternary International* 434, 121–128.
- WOJTAŁ, P., Haynes, G., Klimowicz, J., Sobczyk, K., Tarasiuk, J., Wroński, S., Wilczyński, J., 2019. The earliest direct evidence of mammoth hunting in Central Europe – The Kraków Spadzista site (Poland). *Quaternary Science Reviews* 213, 162–166.
- YRAVEDRA, J., Domínguez-Rodrigo, M., Santonja, M., Pérez-González, A., Panera, J., Rubio-Jara, S., Baquedano, E., 2010. Cut marks on the Middle Pleistocene elephant carcass of Áridos 2 (Madrid, Spain). *Journal of Archaeological Science* 37, 2469–2476.

