

Upper Pleistocene Fauna from the Middle Palaeolithic Site of Foz do Enxarrique (Vila Velha de Ródão, Naturtejo Unesco Global Geopark)

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Abstract

Foz do Enxarrique (FENX) is an open-air archaeological site from the end of the Middle Palaeolithic, with faunal remains and Mousterian industry, dated 44–32 Ka. The faunal accumulation shows evidence of human intervention. It can be seen as a paradigm for the interpretation of taphonomic processes typical of open-air sites and difficulties of interpretation. Foz do Enxarrique preserves a single archeological horizon accumulated in low energy conditions, as shown by the fragmentary bones, the predominance of remains of human-hunted animals and the presence of cut marks on some bones. The Municipality of Vila Velha de Ródão has been aware of the interest in the patrimonial value of this archaeological site. The local authorities implemented and developed a project of museology, becoming one of the few Portuguese open-air Palaeolithic sites with a musealization *in situ*.

Keywords: Paleolithic; Neanderthal man; open-air archaeological site, Pleistocene fauna; in situ museum.

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Introduction

Foz do Enxarrique is an open-air archeological site from the end of the Middle Palaeolithic, protected as in the national public interest under the Portuguese Law for Cultural Heritage, on July 17th 1990, and it was also protected by the national law for nature conservation under the Portas de Ródão Nature Monument in 2009. This site includes a Mousterian industry and faunal remains and it is dated between 44–32 Ka, using Uranium–thorium (U/Th), Quartz Optically-Stimulated Luminescence (OSL) and infrared stimulated luminescence dating (IRS) methods (Raposo 1995; Cunha *et al.* 2016, 2019). The bones show evidence of human influence, and the site can act as a case study in the interpretation of taphonomic processes acting in open air environments. Thus, even if Foz do Enxarrique documents a single and thin, well preserved archeological horizon that was fossilized in low energy river conditions on an alluvial plain, it still represents an anthropic palimpsest, whose exact duration is virtually impossible to establish. It could have lasted from a few years to a few millennia.

During archeological excavations between 1982 and 1999, a rich collection of animal bones and teeth were retrieved, including remains of deer, horses, bovids, straight-tusked elephant, rhinoceros, and very few carnivores (Cardoso 1993; Brugal and Raposo 1999; Sousa and Figueiredo 2001; Figueiredo and Sousa 2003; Figueiredo 2012). The fauna collected in subsequent campaigns between 2000 and 2001 was similar (Figueiredo and Raposo 2018). The key faunal characteristics, a predominance of herbivores and very rare carnivores, and some cutting traces on the bones are compatible with an anthropogenic accumulation. The confluence between the Enxarrique stream and the Tagus river suggests this was a site where animals went to drink water in the alluvial plain, where herbivores converged in a small area and consequently became a privileged hunting ground for Neanderthals, who were living in the area and exploiting local hunting and gathering resources.

The archeological level is a fine sandy stratigraphic sequence of about 6 m in thickness that originated as a composite river terrace at the Enxarrique confluence. The lithic industry, consisting of quartzite, quartz and rare flint or flint-like materials, is characterized by the occurrence of nuclei, centripetal discoids and *levallois*, and a high incidence of by-products, consisting mainly of flakes and debris, where the entire flaking sequence is present. The study of this lithic material indicates an opportunistic use of mostly local raw materials, such as the quartz and quartzite pebbles that occur in the aggradational river terraces sequences (Raposo 1995). Research on the sedimentary record of the Enxarrique stratigraphic sequence represents an important archive to explore the relations between paleoenvironmental conditions and early human occupation dynamics (Cunha *et al.* 2019).

The Foz do Enxarrique archeological site is located in the lowest terrace of the Tagus River (T6) (Cunha *et al.* 2008, 2016), on the right bank of the Tagus River, at the mouth of the Enxarrique stream, in Vila Velha de Ródão, about 10 km from the border between Portugal and Spain (Fig. 1). It is one of the most relevant archeosites and geosites of the Naturtejo UNESCO Global Geopark.

Characterization and Importance of the Foz do Enxarrique Site

The Middle Paleolithic site of Foz do Enxarrique is a single archeological level (Fig. 2) with a Mousterian lithic industry where about 10000 lithics were found, associated with a rich Pleistocene fauna (Raposo 1991, 1993, 1995; Brugal & Raposo 1999). A total of 958 fossil bone specimens were studied (Brugal and Raposo 1999). Among the studied remains, 58% are small fragments of unidentified bones; there are 42% of identified bone remains (Brugal & Raposo 1999), which represents a high rate compared to other Paleolithic sites, where the fauna remains appear very fragmented, i.e., 10–20% identifiable of the total number of remains (TNR). The study of these identified remains (Fig. 3) allowed the identifica-

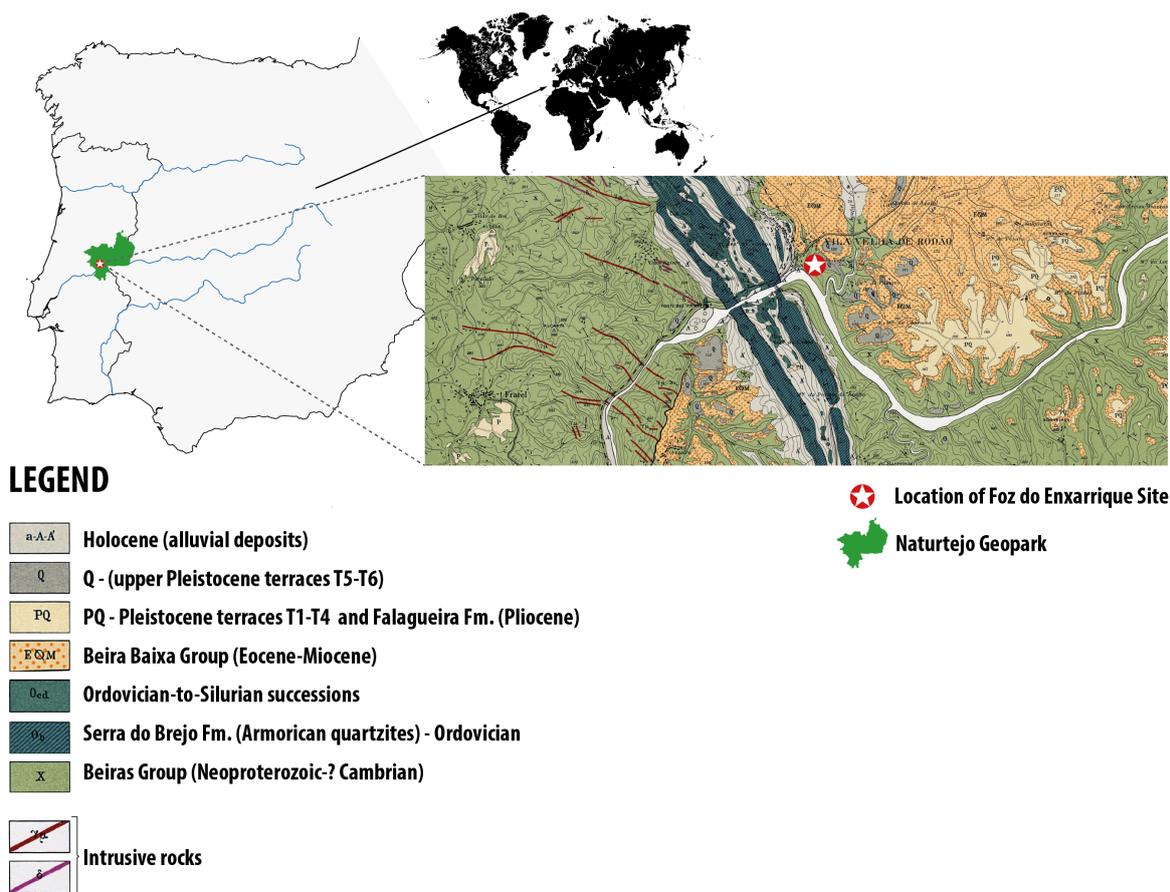


Figure 1. Location of the archeological site of Foz do Enxarrique in the Iberian Peninsula and the geological background of the region. (Based on the Portuguese Geological Map, 28B: NISA.)

tion of *Cervus elaphus*, *Equus caballus*, *Bos primigenius*, *Palaeoloxodon antiquus*, *Rhinoceros* sp., *Oryctolagus cuniculus*, and very few carnivores (only 0.9% of the TNR) like *Vulpes* sp., and *Crocuta* sp. (Cardoso 1993; Brugal & Raposo 1999; Sousa & Figueiredo 2001). The predominance of herbivores and the rare occurrence of carnivores point to an anthropogenic accumulation (Figueiredo & Raposo 2018). This seems to be reinforced by the fresh nature of both complete and heavily broken bones and the distribution of the anatomical units of the skeleton identified from the most represented species of *Cervus* and *Equus*. The cranial remains are the most represented (47.3% for the deer and 75.3% for the horse), the axial and appendicular skeleton representing only 52.7% and 24.7% respectively (Brugal & Raposo 1999; Figueiredo & Raposo 2018). The over-representa-

tion of the cranial skeleton part suggests the idea that the site served as a hunting zone, because the parts of the appendicular and axial skeleton (edible parts) have been removed to the “living area” of that hunter community. It is worth noting the absence of birds, reptiles, fish and mollusc remains (Figueiredo & Raposo 2018), which indicates a clear preference for megafauna hunting by this Neanderthal community. Thirteen bones were identified with marks from the action of carnivores/scavengers and 15 with marks from human butchery, nine with cutmarks and six with evidence of burning (Brugal & Raposo 1999). Results from the use-wear study on the lithic assemblage (performed on 110 quartzite artefacts) showed a dominance of wear traces associated with butchering, cutting of soft-animal tissue and scraping on bone activities (Berruti *et al.* 2016). The predominance

of megafauna remains, the fresh and fragmentary character of the faunal assemblage and the evidence of human butchery (some bones present cut and fire marks), reinforce the evidence for human activity on this faunal accumulation. The bones show minimal pre-depositional abrasion and ac-

cumulation produced by river flooding; the bone edges are mostly angular.

In terms of absolute ages, U/Th series study of some teeth dated the Mousterian level between 34 and 32 Ka (Raposo 1995) and OSL and IRSL

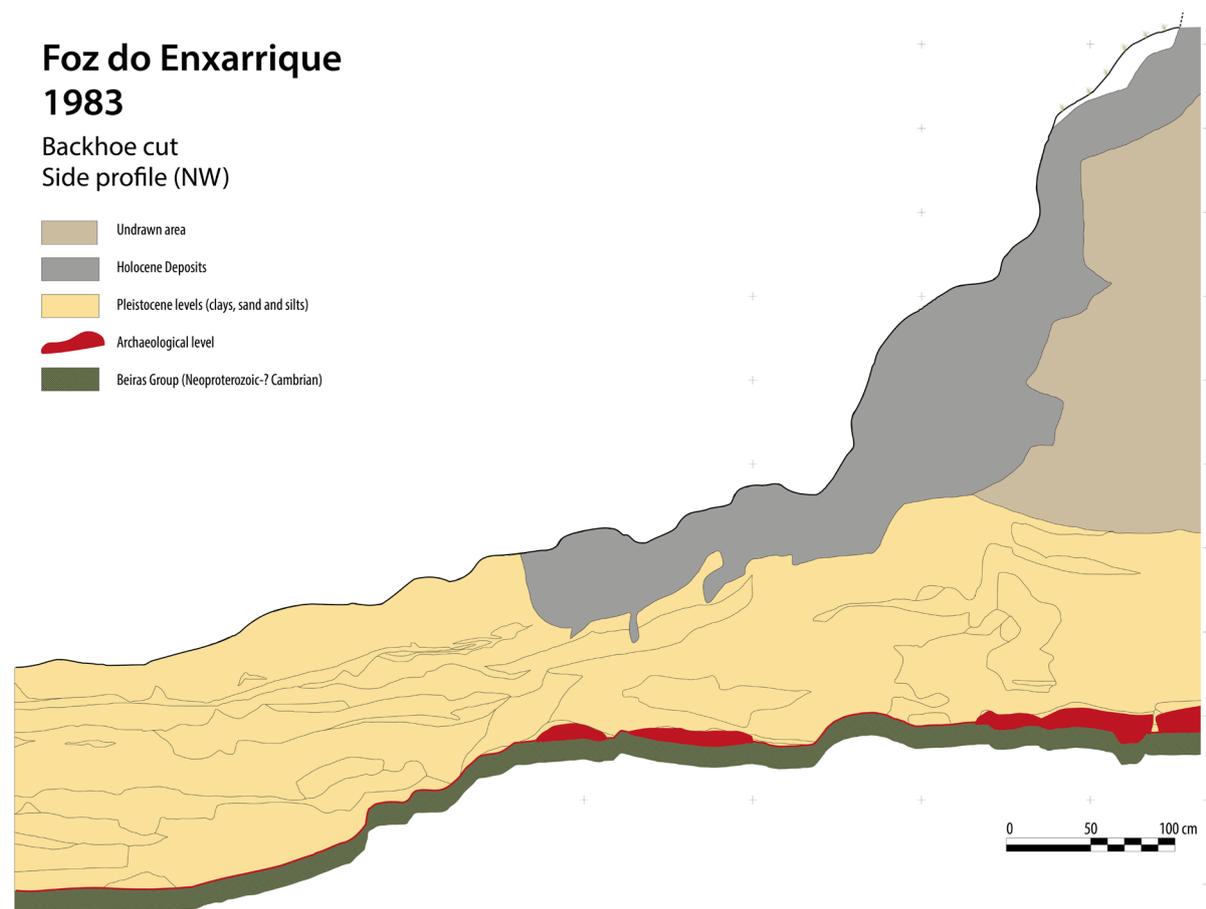


Figure 2. Stratigraphic sequence and location of the archeological level.

dating of sediments (quartz) (Cunha *et al.* 2008, 2016, 2019) gave the age of the terrace where the archeological site is located between 44 and 39 Ka. These dates represent one of the most recent phases of the Middle Paleolithic in Portugal and Europe. The elephant remains, represented by a lamella of an upper molar and four bone fragments, identified as *Elephas antiquus* (= *Paleoloxodon antiquus*) by Brugal and Raposo (1999), indicate the survival of this animal in the Iberian Peninsula until the beginning of the final part of the Last Glacial and it is one of the latest known

straight-tusked elephant records in Europe (Antunes & Cardoso 1992; Sousa & Figueiredo 2001; Neto de Carvalho 2012; Figueiredo *et al.* 2017; Cunha *et al.* 2019; Neto de Carvalho *et al.* 2020). Iberian Middle Paleolithic sites with dates of 40–30 Ka have received considerable attention in recent times in connection with the extinction of the Neanderthals. Therefore, Foz do Enxarrique has high scientific significance for national and international Middle Paleolithic studies because of its dates, the occurrence of abundant lithics attributed to Neanderthals and the taxa identified, especial-

ly the presence of *P. antiquus* and *Rhinoceros* sp. (Brugal & Raposo 1999; Figueiredo et al. 2017; Cunha et al. 2019). Other relatively rare Paleolithic sites with similar dates and fauna in Portugal and Spain support the theory, recently debated and confirmed by different research, that Iberia was a biotope refuge in a biogeographical transition under the mild climate influence of the Atlantic and the Mediterranean, during the Late Pleistocene glacial stages, for a fauna that was then already extinct in the rest of Europe (e.g., Brugal & Valente 2007; Figueiredo et al. 2017, Neto de Carvalho et al. 2020).

Geotourism and Geotrail Potential of the Foz do Enxarrique Archaeological Site

Foz do Enxarrique is within the area of the Naturtejo UNESCO Global Geopark. Taking into account its scientific and heritage importance in the areas of stratigraphy (occurring in terrace T6 of the Tagus River), palaeontology (the associated

fauna) and prehistoric archeology (lithic industry), the site has great potential for geotourism and archaeological tourism.

Foz do Enxarrique presents ideal conditions and potential to enable geotourism and archeotourism because of its location in the suburban area of the town of Vila Velha de Ródão and in a protected national Natural Monument, its strategic positioning over the river, easy access to the site by a riverine path and footbridge built to enable visits to the site, and a geological and archeological thematic trail, besides its patrimonial and scientific importance. The project developed on the site (see below) also includes further development of an international excavation school (Raposo 2013; Raposo & Figueiredo 2013; Raposo & Benjamin 2017). This field school will not only be educational but also encourage scientific tourism. Besides, the natural heritage in the vicinity means that this international archeological school can

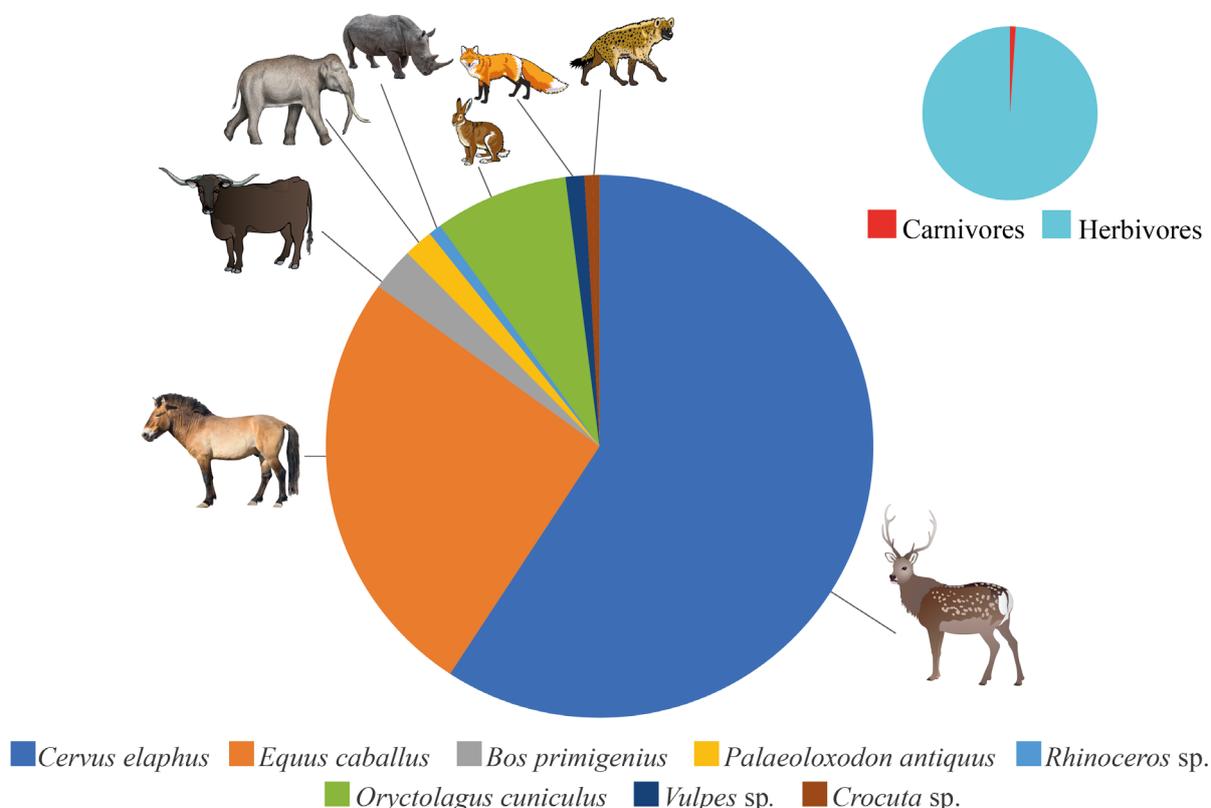


Figure 3. The faunal assemblage: comparative occurrence of the species identified in the archeological site and the proportional comparison between carnivores and herbivores.

also be included in broader heritage and educational programs already developed by Naturtejo Geopark in Portas de Ródão Natural Monument, namely those focused on archeology, paleontology, geology, geomorphology and biology/ecology (Raposo 2013; Raposo & Figueiredo 2013; Raposo & Benjamin 2017).

Conservation Actions at Foz do Enxarrique

Foz do Enxarrique is currently the only open-air site of the Middle Paleolithic with fauna pre-

served in Portugal, which makes it one of the most important archeological sites in the country. Considering this scientific and patrimonial importance, the Municipality of Vila Velha de Ródão made a landscape intervention at the site and surrounding areas, creating a museums project, idealized and coordinated by Luís Raposo (Raposo 2013; Raposo & Benjamin 2017; Fig. 4), that opened to the public in 2015 and received, in the same year, an honorable mention at the *Ibermuseum* award.

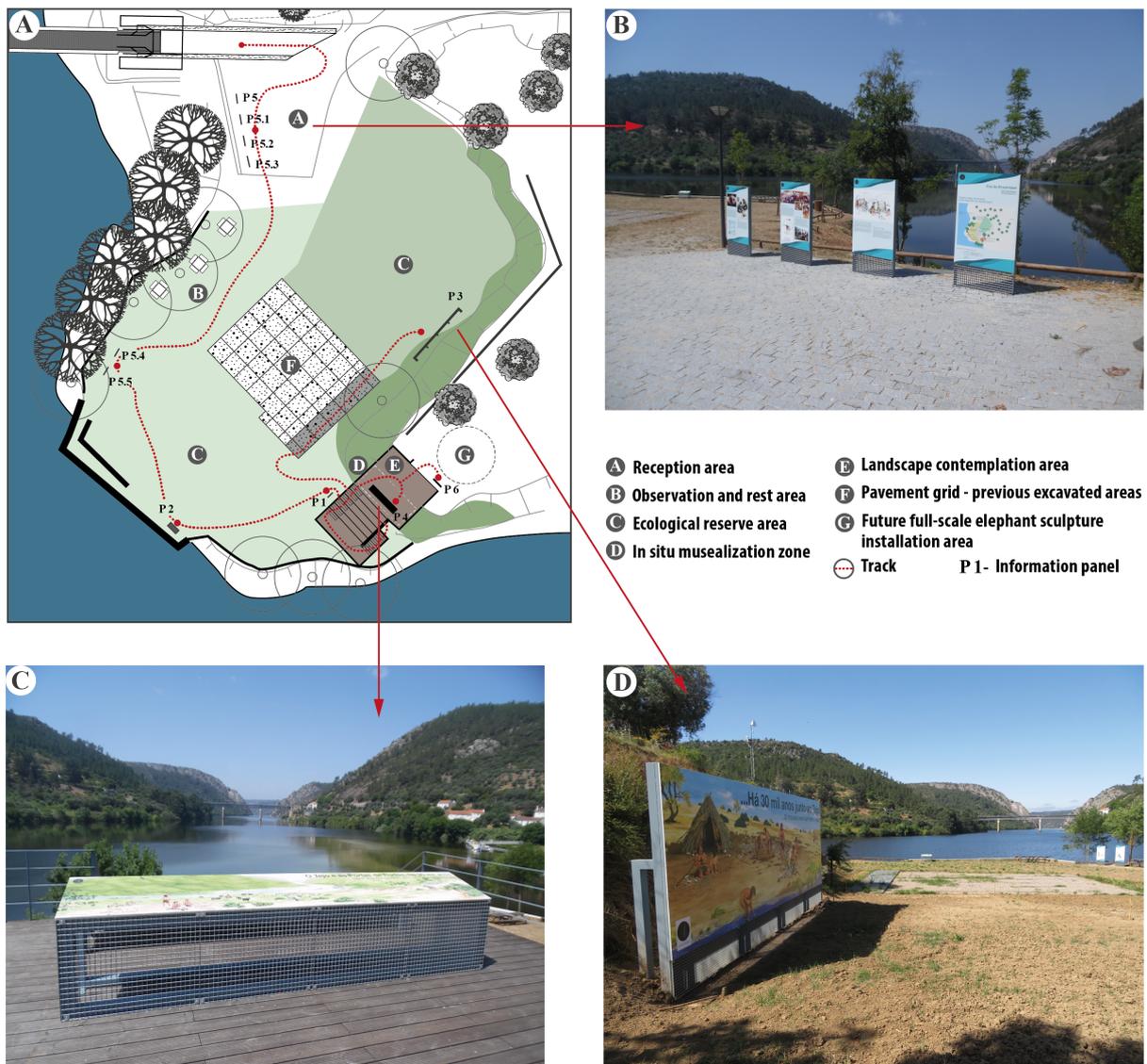


Figure 4. Architectural project of the intervention made in the Foz do Enxarrique site and surrounding areas. A) Architectural project. B) Photo of the area A, after the intervention, showing the different thematic panels. C) View to the river from the area E with the Upper Pleistocene landscape interpretation. D) Photo of the area P3, after the intervention.

The excavations carried out in the archeological site allowed sufficient volume of data to be gathered for scientific purposes, aiming to characterize the site and its human occupation and making this site one of the most important places of its type and age in Portugal and in the Iberian Peninsula (Raposo 2000). Scientific knowledge of the archeological site allowed the development of a heritage enhancement project. Thus, the Municipality of Vila Velha de Ródão, aware of interest in the patrimonial value of the Foz do Enxarrique site, implemented and developed this project, consisting of explanatory panels, the construction of green space for recreation and leisure and other infrastructures such as an amphitheatre-viewpoint. Examples of interventions in Paleolithic outdoor habitat sites are not common in the international context (Raposo 2013; Raposo & Figueiredo 2013; Raposo & Benjamin 2017), which makes this intervention an international example of good management of an archeological site.

Summary

Foz do Enxarrique is an internationally important

archeological site with a unique paleontological, archeological, geological and geographical situation. The diversified, mostly herbivorous fauna of this site associated with the abundant lithic industry and the dates obtained, allow a more in-depth characterization and knowledge of the fauna of the end of the Late Pleistocene in southern Europe, and how the last Neanderthals exploited natural resources. Its occurrence on a Pleistocene terrace of the Tagus River allows us to relate the human occupation and fauna to different phases of evolution of the Tagus River related to climate change. Finally, its location and good access enable the development of various projects and activities aimed at all types of public audiences, valuing the didactic and educational aspect of this Paleolithic site, which are reflected in various projects now and in the future, with particular emphasis on the school of archeology. One of the future projects is to make an excavation and expose the archeological level in an area located under the viewpoint (area E, Figs. 4A, C, 5), thus creating an exhibition space *in situ*.



Figure 5. Night view of the staircase access to the amphitheater-viewpoint. The most illuminated area will be the excavation area where the archeological level will be exposed.

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References

- Antunes MT & Cardoso JL (1992). Quaternary elephants in Portugal: new data. *Ciências da Terra*. 11:17–37.
- Berruti GLF, Rosina P & Raposo L (2016). The use-wear analysis of the quartzite lithic assemblage from the middle Palaeolithic site of Foz do Enxarrique (Ródão, Portugal). *Mediterranean Archaeology and Archaeometry*. 16:107-126.
- Brugal J-P & Raposo L (1999). Foz do Enxarrique (Ródão – Portugal): preliminary results of the analysis of a bone assemblage from a Middle Palaeolithic open site in The Role of Early Humans in the Accumulation of European Lower and Middle Palaeolithic Bone Assemblages (pp. 367–379). Mainz.
- Brugal J-P & Valente MJ (2007). Dynamic of large mammalian associations in the Pleistocene of Portugal. *Proceedings of the IV Congresso de Arqueologia peninsular* (pp. 15–27), Faro.
- Cardoso JL (1993). Contribuição para o conhecimento dos grandes mamíferos do Plistocénico Superior de Portugal. Câmara Municipal de Oeiras, Oeiras.
- Cunha PP, Martins AA, Huot S, Murray AS & Raposo L (2008). Dating the Tejo River lower terraces in the Ródão area (Portugal) to assess the role of tectonics and uplift. *Geomorphology*. 102:43–54.
- Cunha PP, Martins AA & Gouveia MP (2016). As escadarias de terraços do Ródão à Chamusca (Baixo Tejo) - Caracterização e interpretação de dados sedimentares, tectónicos, climáticos e do Paleolítico/The terrace staircases of the Lower Tagus River (Ródão to Chamusca). *Estudos do Quaternário* 2016. 14:1–24.
- Cunha PP, Martins AA, Buylaert J-P, Murray AS, Gouveia MP, Font E, Pereira T, Figueiredo S, Ferreira C, Bridgland DR, Yang P, Stevaux JC & Mota R (2019). The lowermost Tejo River Terrace at Foz do Enxarrique, Portugal: a palaeoenvironmental archive from c. 60–35 ka and its implications for the last Neanderthals in westernmost Iberia. *Quaternary*. 3:31-60.
- Direcção-Geral de Minas e Serviços Geológicos. (1964). Carta Geológica de Portugal. 1/50000, folha: 28B (NISA). Lisboa.
- Figueiredo SD & Sousa MF (2003). *Os Elefantes Pleistocénicos de Portugal*, Separata da *Revista Evolução* nº1, Centro Português de Geo-História e Pré-História, Lisboa.
- Figueiredo S (2012). The Pleistocene elephants of Portugal. *Atas Del Coloquio Internacional Marfim y Elefantes en la Peninsula Iberica y el Mediterraneo Occidental*:37–44.
- Figueiredo S, Cunha PP, Neto de Carvalho C & Sousa F (2017). Presença de *Paleoloxodon antiquus* no Plistocénico de Portugal: estado Atual dos Conhecimentos. In IX Reunião Do Quaternário Ibérico. Universidade Do Algarve: 19-20.
- Figueiredo S & Raposo L (2018). As Aves como recurso alimentar do homem do Paleolítico Médio: interpretação tafonómica das acumulações faunísticas da Gruta Nova da Columbeira e da Foz do Enxarrique. *Boletim do Centro Português de Geo-História e Pré-História*. 2018(1):57–63.
- Neto de Carvalho C (2012). Paleobiologia do maior animal que alguma vez habitou o Ródão. *Açafa Online*. 5:231–250.
- Neto de Carvalho C, Figueiredo SD, Muniz F, Belo J, Cunha PP, Baucon A, Cáceres LM, Rodriguez-Vidal J. (2020). Tracking the last elephants in Europe during the Würm Pleniglacial: the importance of the Late Pleistocene aeolianite record in SW Iberia. *Ichnos*. 27:352–360.
- Raposo L (1983). As comunidades de caçadores recolectores do Paleolítico, in *História de Portugal*, Dir.

- José Hermano Saraiva (Vol. 1, Ed. Alfa, Lisboa, pp. 31 – 62). Oxford.
- Raposo L (1987). Os mais antigos vestígios de ocupação humana paleolítica na região de Ródão. In Da Pré-História, Homenagem a O. Veiga Ferreira (pp. 153–178) Editorial Delta: Madrid, Spain.
- Raposo L (1991). Campanha de Escavações Arqueológicas no Sítio da Foz do Enxarrique. Alto Tejo. Boletim Informativo do Núcleo Regional de Investigação Arqueológica. 9:1–2.
- Raposo L (1993). O Paleolítico Médio, in *O Quaternário em Portugal – balanço e Perspectivas* (pp. 147-161). APEQ, Ed. Colibri, Lisboa
- Raposo L (1995). Ambientes, Territorios y Subsistencia en el Paleolítico Medio de Portugal, Complutum. 6:57–77, Madrid.
- Raposo L (2000). The Middle-Upper Palaeolithic transition in Portugal. In Stringer C, Barton RNE, Finlayson C (eds.), *Neanderthals on the Edge: 150th Anniversary Conference of the Forbes' Quarry Discovery*, Gibraltar (pp. 95-109). Oxbow Books,
- Raposo L (2013). Bases para um projeto de Valorização Patrimonial e Educativa do Sítio Arqueológico da Foz do Enxarrique, *Arqueologia em Portugal – 150 anos*, Associação Arqueólogos Portugueses. Lisboa.
- Raposo L & Benjamin M (2017). Musealização do Sítio Arqueológico da Foz do Enxarrique: do projeto à obra feita. In *A Arqueologia em Portugal: 2017 - o estado da questão*. Coor José Morais Arnaud, Andrea Martins. Associação dos Arqueólogos Portugueses. Lisbon.
- Raposo L & Figueiredo S (2013). A valorização patrimonial e educativa de sítios paleolíticos: o exemplo da Foz do Enxarrique, *Arqueologia em Portugal – 150 anos*, Associação dos Arqueólogos Portugueses (pp. 189–196), Lisboa.
- Sousa MF & Figueiredo SD (2001). The Pleistocene elephants of Portugal. In Cavarreta G, Giola P, Mussi M & Palombo MR (Eds.), *La Terra Degli Elefanti/ The World of Elephants. Proceedings of the 1st International Congress*, Rome, 16–20 October 2001.