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The Flint Quarry of Pozarrate (Treviño, Spain) in the Context of Iberian and Early European Neolithic Mining

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This paper presents the current state of research on the Early Neolithic flint quarry of Pozarrate (Treviño, Burgos) in the north of Spain. This site is part of the Prehistoric Flint Mining Complex of Treviño. The geological features of the territory made it a suitable place for the exploitation of the Treviño flint since Paleolithic times, especially during the Neolithic. Recent research at the site has revealed interesting findings, such as antler and dolerite mining equipment and different

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flint tools, among other recoveries. Radiocarbon dates indicate an Early Neolithic activity which makes Pozarrate one of the few flint procurement sites in the Iberian Peninsula from this period. Moreover, a considerable number of elements link Pozarrate to the Early European Neolithic flint mining phenomenon.

KEYWORDS: Treviño Flint, prehistoric mining, Early Neolithic, Iberian Peninsula

INTRODUCING THE MINING COMPLEX OF THE TREVIÑO FLINT, IN THE SIERRA DE ARAICO-CUCHO

Throughout Europe, there are many documented examples of the phenomenon of prehistoric flint extraction and mining that show certain similarities and a form of homogeneity between the mining sites. There are, of course also noticeable differences, reflecting the considerable social, economic, and ideological diversity of the human groups that exploited these specialized archaeological contexts. Labouring to extract flint involved an enduring transformation of landscapes, in contrast with the frequently small-scale, dispersed, and mobile residential patterns, whether carried out through small-scale, part-time, maybe seasonal, long-term actions, or through the efforts of some few generations involving large-scale actions, as seen for some European Neolithic mining events (Capote and Díaz-del-Río 2019).

In this context, whilst opencast quarrying of outcrops and shallow deposits was carried out, perhaps even as the first episodes of extraction at mining sites (Barber *et al.*, 1999: 33) as reported for some Palaeolithic and Mesolithic sites (e.g., Negrino *et al.*, 2006; Oliva 2011; Osipowicz *et al.*, 2019), extensive flint mining seems to be a largely Neolithic phenomenon. According to the radiocarbon dating, the peak of mining activities occurred during the fourth millennium BC, but the best-known mines and circulating products are mainly dated to the third millennium BC (Longworth and Varnell 1996; Mallet *et al.*, 2004).

The flint mining complex of Treviño is located in the territory of Condado de Treviño (Burgos, Spain). The outcrop area is delimited by the boundaries of the Sierra de Araico-Cucho mountains, located in the Upper Ebro Basin, an area (Fig. 1) that provided easy contacts between the Bay of Biscay (Atlantic coastal zone), the Middle Ebro open valley (towards the Mediterranean) and the northern Meseta (interior highlands of Iberia and the Duero Basin).

There are some key features that help to interpret a flint mining complex, such as coherence in the structure and nature of their remains; the lack of overlapping extractive structures; some systematic technical reiterations of the operative chains;

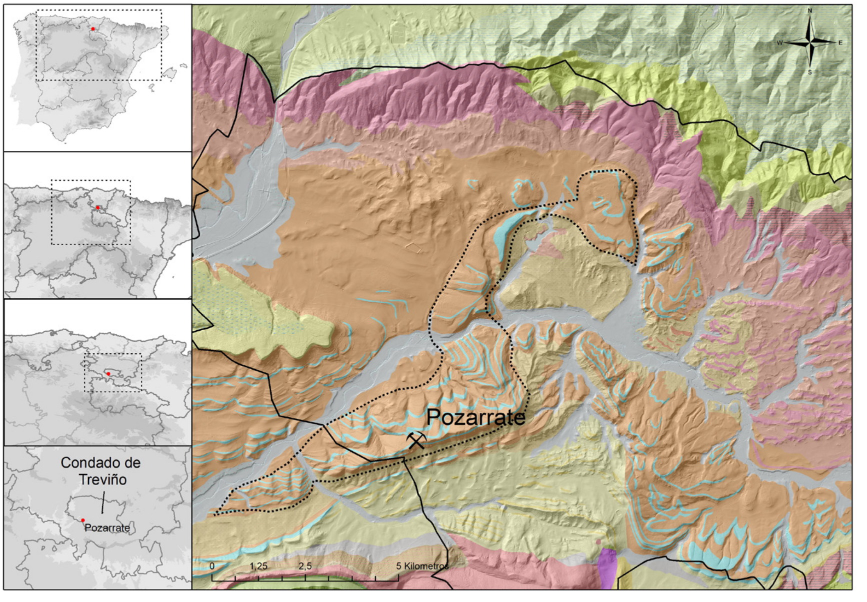


Fig. 1. Location of the Pozarrate site, the Sierra de Araico-Cucho and the Neolithic Flint Mining Complex of Treviño within the Iberian Peninsula. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

sets of statistically identical radiocarbon dates (dating apparently different mining events); the reffiting of some of the rejected extracted flint (Capote and Díaz-del-Río 2019); or the planned procurement of tools in advance (Clutton-Brock 1984: 15–16; Felder et *al.*, 1998: 47). In the current state of the archaeological research at the Sierra de Araico-Cucho, we can observe most of these characteristics at the site. Furthermore, there are other aspects to take into account in order to describe this study area as a mining complex. The first common element is the presence of the so-called Treviño flint (Tarriño 2006a), the common name for the silicifications found in the Sierra de Araico-Cucho mountains. Secondly, there is undated evidence for ancient flint procurement along all the mountain ranges of Araico-Cucho, even in more recent times for use in threshing equipment (see Elorrieta and Berjón 2017).

Archaeological work in the Sierra de Araico-Cucho started in the 1950s and 1960s, when D. Estavillo collected several superficial finds, mainly dolerite hammer stones, and located several sites related to the extraction of flint (Estavillo 1975; Ortiz *et al.*, 1990, Tarriño 2005; Tarriño 2006a). Thirdly, a LiDAR survey carried out at a resolution of: 1m/pixel (obtained from the cartographic server Geoeuskadi) resulted in the identification of a number of crescent-shaped associated structures at the top of the mountain range, coinciding with the area of the primary Treviño flint outcrop (Tarriño *et al.*, 2014; 2022). Despite the fact that most of these structures are difficult to observe in the field, on LiDAR images we can recognize eight of them of about 25–30 metres in diameter which overlap from the lowest part of the hill to the top, along a section of 160 metres. The mining structures are best accessed through individual interventions, but direct stratigraphic relationships between neighbouring structures are generally absent where the surface traces are less well preserved (Capote and Díaz-del-Río 2019), as in the case of the surveyed section of the Treviño flint mining complex.

From 2010 to the present, we have been excavating the first of the eight crescent-shaped structures, called Pozarrate. Therefore, the aim of this text is to present the current state of research on this mining structure (novel in terms of typology regarding its associated radiocarbon chronology) and the results of the fieldwork, as well as the preliminary research on the quarry of Pozarrate and its comparison with the evidence of other European prehistoric mines.

THE EARLY NEOLITHIC QUARRY OF POZARRATE

The first archaeological structure that is being excavated is Pozarrate (Fig. 2). After the fieldwork, we can confirm that it is a flint quarry from the Neolithic period that was totally filled by a dump. To determine and analyse the quarry's structure, a trench was dug perpendicular to the stratification in the lower dump. The flint layer exploited has a direction of N180° and a dip of 21° towards the north. The exploitation front in the deepest part of the quarry is more than five metres high. Two phases of infilling were identified in the quarry. The first dump is associated with the earliest lineal extraction work along the geological flint layer, with an orientation of N90º approximately. The exploitation front in the west of the prehistoric quarry is more than twelve metres long and more than three metres high, including the appearance of a big burnt limestone structure, which we have called pyrobreccia, currently under study, and three small anthropogenic cavities in the rock (Tarriño *et al.*, 2022: Fig. 4a).

This mining feature is the oldest one of its type discovered until today in the Iberian Peninsula (5050–4370 cal. BC; Tarriño *et al.*, 2011; 2022). Currently, work is focussing on clearing the extraction front and we have already discovered that it is more than twelve metres long and more than three metres high. In the eastern cross-section, the clear stratigraphy shows three levels of archaeological deposits, including a superficial level (Tarriño *et al.*, 2022; Fig. 3).

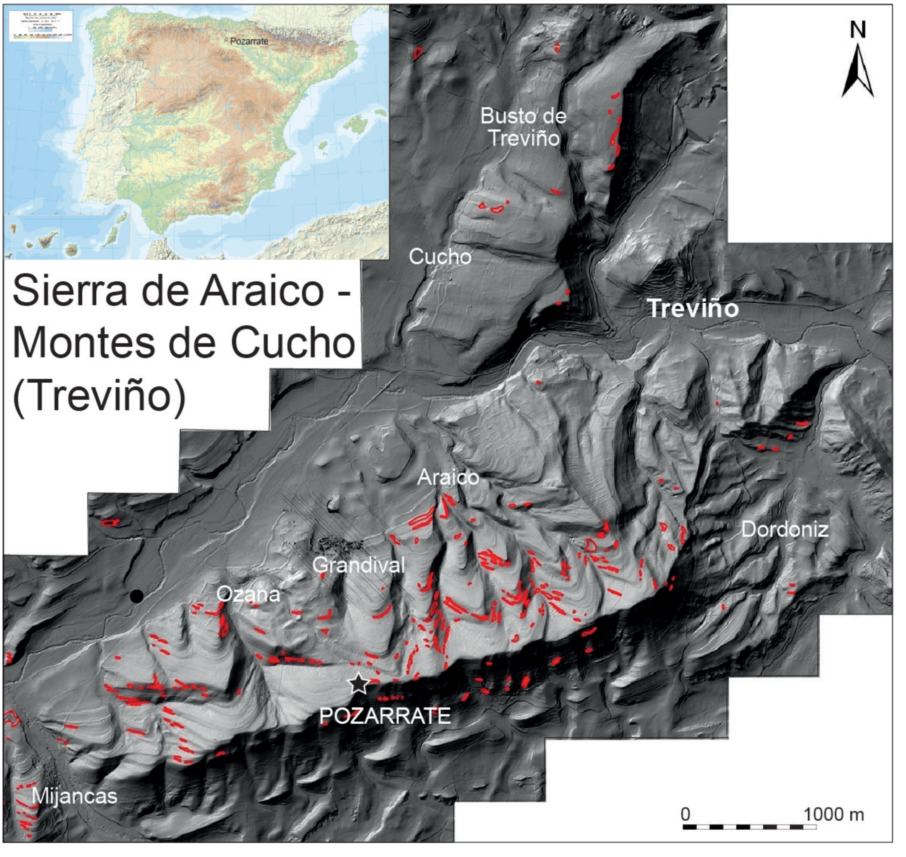


Fig. 2. Situation of the Pozarrate excavation on the northern slope of the Sierra de Araico near the top (star). Other anthropogenic signs of prehistoric flint procurement are marked in red after a LiDAR survey, defining the prehistoric flint mining complex of the Treviño flint. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

ARCHAEOLOGICAL FINDINGS AT POZARRATE

As is consequent with an extraction site, the flint remains in Pozarrate are very abundant. The study of the lithic technology is based on the preliminary analysis of 13,634 pieces, with a total weight of 494 kg. The lithic assemblage was classified into nodules, fragments, debitage products, cores and retouched tools, only 4.3% of the material belong to the superficial level, 28.3% to level 1, and 67.5% to level 2.

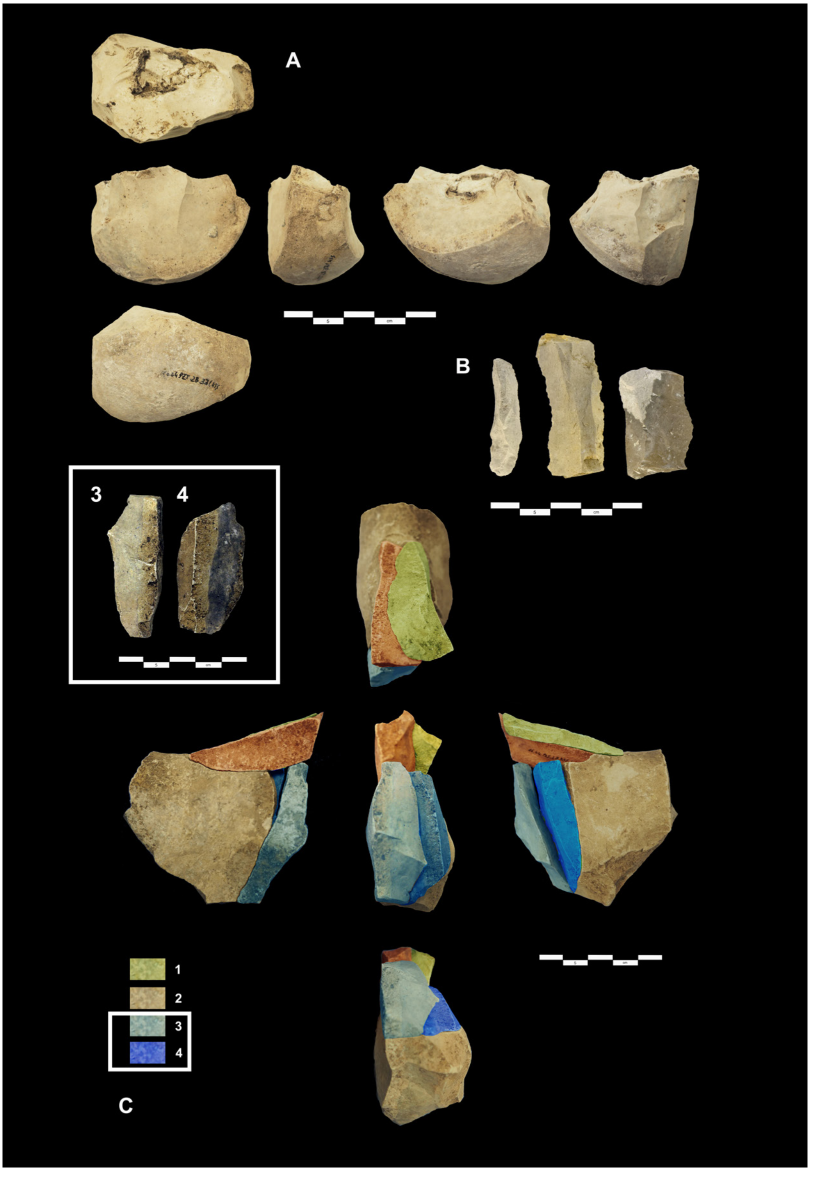


Fig. 3. Archaeological findings at Pozarrate: flint. A. Exhausted core with a unipolar parallel series of blade tendency products; B. Examples of some blade-like byproducts abandoned in the mine. C. Refitted group of five pieces (core and debitage elements) from an orthogonal reduction scheme with blade-like products defined by colours and detail of products 3 and 4. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

The nodules are more abundant at the surface level, as this was the place of abandonment of the discarded material. Among all the categories, the percentage of fragments (64.24%) is the highest as a consequence of the presence of natural internal fractures in the material and breaks occurring during the extraction and testing process. As a consequence of both flake production and blade cores preparation, the best represented products of the debitage are flakes (99.77%), much higher than blades and bladelets (0.23%). Very few elements from the beginning (crests) and maintenance (flanks, edges, core tablets, etc.) phases of the reduction sequences have been recorded.

The identification of the production of the cores in a mine or quarry is difficult considering that many of them are by-products of testing the quality of the nodules or were broken, or they were reduced by inexperienced knappers as seems to have been the case. The reduction scheme of almost half was unidentified in 59 of the 130 analyzed cores from Pozarrate (45%). The rest show a systematic orthogonal reduction scheme of parallel series of blows that reveals the clear intention of producing blades or blade-like products of different sizes in 70% of the cases (51 pieces). The rest of the cores were devoted to the production of flakes (30%; 20 pieces). Although blade production is difficult to assess due to the previously mentioned factors, it is demonstrated by the presence of refittings; discarded blades, crests and rejuvenation core flakes (Fig. 3).

Most of the cores were abandoned in the early phases of the reduction process. Nevertheless, there are some cases in which reduction reached the exhaustion of the core, or technical or raw material difficulties arose in more advanced phases of the work. The scarcity of cores and by-products compared with the total number of pieces suggests testing of nodules on site, with an occasional production of blanks and transporting of the best quality nodules to knapping workshops outside Pozarrate. The occasional production on site corresponds to testing and learning and the need for tools related to tasks on the mining site.

Among the retouched pieces, scrapers, notches and denticulates are the most common types; probably related to wood or antler work and maintenance tasks on the mining tools. It is interesting to observe that 10% of the blanks of the configured tools show obtuse angles at the butt, possibly linked to percussion with mining hammer stones during nodule extraction. Finally, there is evidence of alternate bec perforators, a recurring tool in regional Neolithic assemblages.

We can note that the vast majority of flint material shows mechanical damage associated with processes involving trampling and tumbling. It also shows high percentages of patina and thermal stress. In this sense, an experiment on flint damage by thermal stress has been developed (Hernández *et al.*, 2020) and this has permitted to reinforce the idea of "fire attack", but also some insights about a possible stabilization of the quarry front by the creation of a so-called pyrobreccia, as in quarrying strategies seen in other ancient mining structures (e.g., Tarantini 2005).

The weight of the dolerite fragments recovered until now exceeds 52 kg. This corresponds to more than 550 elements and all of them have been spatially located in the quarry. There are 15 hammer stone tools, with another 22 big fragments of hammers representing approximately 45 kg (86% of the total recovered; Fig. 4.1 and 4.2).

At least 10 of the identified hammer stones show signs of technical configuration (generally notches and picking) to adapt them to hafting and mining. This aspect appears in other Neolithic sites in Europe like Bad Sulzburg (Goldenberg *et al.*, 2003).

According to the modifications described in dolerite hammer stones, these can be assigned to the first stages of the previously developed typologies for this mining tool type (e.g., Pickin 1990; Léchelon 2001; Hunt Ortiz 2003: 285). For now, we can provisionally classify the dolerite tools recovered from Pozarrate as unmodified, or modified to adapt its shape by trimming and notching (with one, two or more notches). After confronting archaeological data with ethnographic and experimental approaches to check some hypotheses about quarrying activities (Hernández *et al.*, 2020), we are inclined to think that the weight and affordance of blanks could determine the design of different quarrying hammer stones.

In the case of antler mining tools, more than fifteen large pieces (Fig. 4.3) have been documented, with a multitude of fragments directly related to extractive work. These pieces show some technological modifications and functional features (these are currently under study). Also, a scapula, probably from a *Cervus* sp., was found in the lower level, on the rocky bed (Fig. 5).

Finally, there was also some procurement of Treviño flint in post-Neolithic times at Pozarrate, mainly evidenced by the presence of fragmented pottery (very few pieces generally of a size less than 4 cm), at high levels in the stratigraphical sequence (intermediate and removilization levels), sometimes associated with metal objects. Four metal pieces found within the assemblage of Pozarrate consist of three bronze sheet fragments and one small iron blade (Tarriño *et al.*, 2022). The cultural affiliation of the ceramics is currently to be determined.

THE TREVIÑO FLINT: CHARACTERIZATION AND ARCHAEOLOGICAL DISTRIBUTION

The flint extracted in Pozarrate is the nodular variety. It is a very fine-grained flint of exceptional quality for knapping. It was formed in a Miocene lacustrine depositional

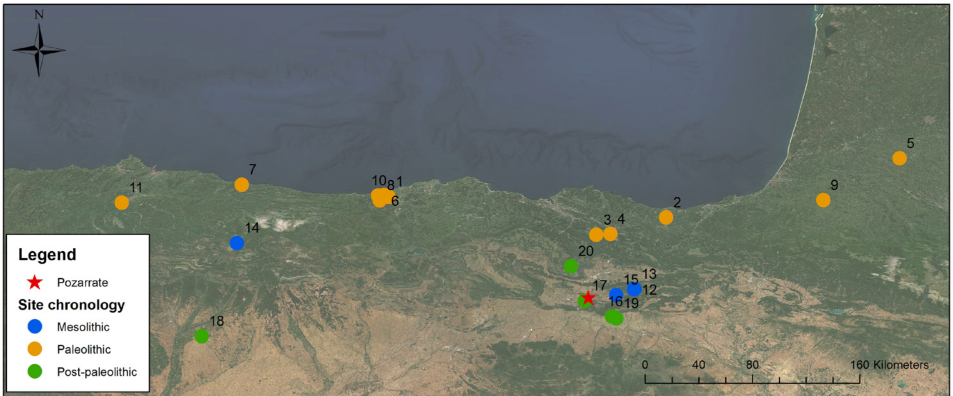
Fig. 4. Archaeological findings at Pozarrate: 1) and 2) dolerite hammerstones at the time of their archaeological recovery. An intensive but non-destructive cleaning protocol is currently being developed to avoid damaging the surfaces prior to conducting its techno-functional study; 3) antler. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

Fig. 5. Scapula, presumably cervid, at the time of its recovery. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

environment and contains bioclasts (ostracods and small gastropods and *Charophyta* algae). It has a high percentage of silica (>98 %) and its main impurities are carbonate and organic matter (Tarriño 2006a). The matrix is opaque with colours in the yellowish-red range (Munsell 10YR). When the flint is patinated, it acquires whitish-yellowish colours and the presence of "Liesegang rings" are visible. The cortex is very thin and smooth, rarely exceeding 2 mm in thickness. In the case of the better-quality flints, this cortex is reduced to a minimum thickness (patina type).

The distribution of Treviño flint predates the beginning of the mining processes carried on at the Sierra Araico-Cucho. The first archaeological sites where items of raw material from Treviño have been identified are those located in the Basque-Cantabrian Basin (Fig. 6), on sites such as Amalda, Axlor and Bolinkoba, dating from the Middle Palaeolithic (Tarriño 2003; González-Urquijo *et al.*, 2005; García-Rojas 2014; Arrizabalaga and Iriarte-Chiapusso 2015).

It is from the beginning of the Upper Palaeolithic when the number of remains associated with the Treviño flint sources multiplied (Fig. 6). There are many sites in the Basque-Cantabrian Basin where this variety has been identified (Tarriño 2000; 2006a; 2011a; 2011b; 2013; Tarriño and Aguirre, 2002; Elorrieta 2016; Sánchez *et al.*, 2016). Furthermore, in contrast to the previous period, remains of Treviño



ID	Site	Chronology	ID	Site	Chronology	ID	Site	Chronology	ID	Site	Chronology
1	*Altamira*	Paleolithic	6	*Cualventi*	Paleolithic	11	*Las Caldas*	Paleolithic	16	*El Sotillo*	Post-paleolithic
2	*Amalda*	Paleolithic	7	*El Cierro*	Paleolithic	12	*Atxoste*	Mesolithic	17	*Larrenke sur*	Post-paleolithic
3	*Axlor*	Paleolithic	8	*El Linar*	Paleolithic	13	*Kanpanoste*	Mesolithic	18	*Las Choperas*	Post-paleolithic
4	*Bolinkoba*	Paleolithic	9	*Isturitz*	Paleolithic	14	*La Uña*	Mesolithic	19	*San Martín*	Post-paleolithic
5	*Brassempouy*	Paleolithic	10	*Las Aguas*	Paleolithic	15	*Mendandia*	Mesolithic	20	*San Sebastian Sur*	Post-paleolithic

Fig. 6. Distribution of Treviño Flint by sites and its chrono-cultural adscription. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

flint are beginning to be identified throughout the Cantabrian region, even reaching Asturian sites such as El Cierro and Las Caldas (Corchón *et al.*, 2009; Tarriño 2016; Martín-Jarque *et al.*, 2019) or Cantabrian sites such as Altamira, El Linar, Las Aguas or Cualventi (Tarriño *et al.*, 2013; Tarriño *et al.*, 2016). This variety is also identified in some sites in the south of France and north of the Pyrenees, such as at Brassempouy or Isturitz (Tarriño and Normand 2002; Tarriño *et al.*, 2007; Elorrieta 2016; Elorrieta and Tarriño 2016).

Treviño flint continued to be collected during the Holocene, as Mesolithic groups continued to make extensive use of this variety (Fig. 6) in sites such as Aizpea, Mendandia, Kanpanoste or Atxoste (Tarriño 2001; Tarriño 2006b; Soto 2014), but it also appeared in areas further away from the Cantabrian Mountains, such as at La Uña (León), although in limited quantities (Herrero-Alonso 2018).

With the transition to producer societies and the beginning of the mining activity at Treviño, the raw material from the exploitation evidences long-distance exchange, becoming an economic axis of connection for the northern area of the peninsula. However, some specific studies have been carried out on the collection of raw material from the Neolithic and during the development of the dolmen phenomenon in the north of the Iberian Peninsula (Fig. 6), as in the case of dolmens such as San Sebastián Sur, El Sotillo or San Martín (Álava), among others (Tarriño and Mujika

2004; Tarriño *et al.*, 2009). In addition, in sites of these later chronologies, we also find cores evidencing exploitation processes, such as those identified in the northwest of the Duero basin (Fuertes-Prieto *et al.*, 2018).

POZARRATE IN CONTEXT: OTHER NEOLITHIC MINING ACTIVITIES ATTESTED IN IBERIA AND EUROPE

There are very few well-attested Early Neolithic flint mines or quarries within the Iberian Peninsula. Together with Defensola (Italy), they can be geographically ascribed to a broader Mediterranean region within the European mining phenomenon (Consuegra and Díaz-del-Río 2018). Other Iberian archaeological sites contemporary to Pozarrate are Casa Montero (Madrid), in the hinterland, with a large field of mining shafts and similar radiocarbon dates, suggesting the flint procurement would only last a century, between 5317 and 5230 cal BC (2σ) (Díaz-del-Río and Consuegra 2011: 226), during the Early Neolithic period, and Montvell (Castelló de Farfanya, Lleida), in the northeastern part of Iberia, the only excavated Neolithic flint quarry in northeastern Spain (Catalonia). Although no radiocarbon dates have been published yet for this site, a chronological span has been suggested that would extend to the epicardial or postcardial Neolithic ware (Terradas *et al.*, 2019), based on the presence of continental molluscs in the stratigraphy, and radiocarbon dating from the adjacent Les Auvelles site, with a chronology between 4516 and 3983 cal BC (2σ), in the Early--to-Middle Neolithic transition (Oms *et al.*, 2019). Procurement activities were performed with the use of consecutive quarry fronts, by taking the flint nodules out of the slopes of the Serra Llarga mountains (Terradas and Ortega 2017).

Other sites with possible evidence of Neolithic mining, to be confirmed, also provide interesting data. One such site is La Leandra (La Muela, Zaragoza), which has been the subject of intense surveys (Picazo *et al.*, 2018) to detect the very subtle traces of ancient trenches that could be prehistoric, probably from the Neolithic (Picazo *et al.*, in press), underneath some circular depressions in the lower part of the slopes that seem to be filled with limestone blocks, gravel, patinated flint remains, sandstone and quartzite hammer stones and other debris, corresponding to 18th-19th flint procurement structures (Picazo *et al.*, 2020), or the Portuguese sites of Pedreira do Aires and Monte das Pedras, in the Lisbon region (Andrade and Cardoso 2004; Andrade 2011), the evidence from which leads its researchers to ascribe both sites to the end of the regional Neolithic or the beginnings of the Chalcolithic (Andrade and Matias 2011).

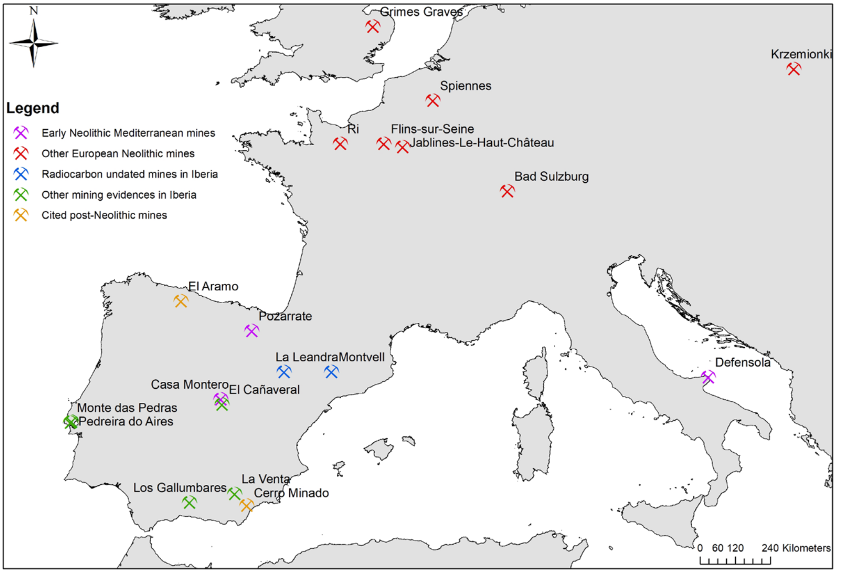


Fig. 7. Iberian and European mining sites referred to in the text. Image of the Spanish Ministry of Science Research Project PID2020-118359GB-I00 "Treviño Flint".

Flint mining exploitation strategies during the Neolithic period are the result of the adaptation of human groups to the geology and natural environment of the outcrops, as a consequence of specialized tasks that accumulate considerable technical knowledge, transmitted from generation to generation (Castañeda 2018). The main objective of these communities was to extract the raw material without spoiling it, in the most planned, efficient way that was safe for the individuals involved. According to its morphology, in the Iberian Peninsula two extraction systems have been documented: the excavation of shafts, as seen in Casa Montero, and creation of an open-air quarry, as in the examples of Pozarrate, Montvell and small areas of Casa Montero (where they are part of a mixed procurement system that combines quarry fronts with the digging of shafts; Díaz-del-Río *et al.*, 2018: 57). In an open-air quarry system, the disposition of the strata where the raw material is found, at different degrees of inclination along the slope, determines the effort required to access flint nodules. Regarding this aspect, Pozarrate and Montvell share a similar morphology, as they are composed of consecutive trenches, potentially covered with the debris generated by a subsequent exploitation trench higher up.

As in the case of other Early European Neolithic flint mining complexes (Fig. 7), in the Iberian ones, there are two models of exploitation: nodule testing with scarce evidence of on-site reduction and complete or almost complete reduction at the mine. Examples of the first exploitation model are Pozarrate (Tarriño *et al.*, 2011; 2014) and Montvell in Spain (Terradas and Ortega 2017; Terradas *et al.*, 2017), together with Defensola A (6990±80 BP, 5993-5652 cal. BC 2σ), in Italy (Galiberti 2005). The second model of complete or almost complete reduction on site took place more often as in Casa Montero (Consuegra *et al.*, 2018) in Spain, Jablines-Le-Haut-Château (Bostyn and Lanchon 1992) and Flins-sur-Seine (Giligny and Bostyn 2016) in France, Spiennes (e.g., Collet and Woodbury 2007; Collet *et al.*, 2016) in Belgium among others. Indeed, at Pozarrate, evidence of lithic production is scarce when quantitatively compared with the total amount of extracted flint, since it was probably conditioned by immediate needs related to quarrying activities. Regarding the objectives of the lithic production, it seems that Early Neolithic examples of flint quarrying and mining from Southern Europe were devoted to blade and bladelet production as at Casa Montero, Defensola and probably Pozarrate, contrary to Central Europe's later mines, which produced mostly axes. In fact, the main activity that all flint mining archaeological establishments have in common is the organized supply of the raw material, frequently associated with lithic production areas in immediate or close surroundings.

As for the mining tools, those classified as hammer stones are made of harder materials than the materials that the quarry is made of, allochthonous to the lithology of the sites of the mines: quartzites in Casa Montero (Capote 2011), dolerites in Pozarrate and quartz, quartzite and hornfels in Montvell (Terradas *et al.*, 2017), among others. The typologies identified include more or fewer modifications from natural forms (large pebbles and blocks from primary outcrops). In general, the Early Neolithic tools present fewer modifications compared to the standardized characteristics, such as polish and central grooves, more typical of those of epi or post-Neolithic times. In the case of Casa Montero, raw materials were collected from nearby terraces within a maximum radius of 2 km and were used without any previous modification (Capote 2011). However, in the case of the Pozarrate site, the sources of the material used occur in diapiric outcrops located at a greater distance (approx. 10ľ15 km). It would seem that there was considerable effort expended to collect the dolerite blocks from which the hammer stones would be made, some of them weighing more than 9 kg.

According to the evidence, macrolithic tools in flint were recycled from byproducts of lithic reduction. Both in Casa Montero and Pozarrate, pieces of flint have been documented that were used as wedges and picks, and in Pozarrate and La Leandra some cores have been reused as hammer stones and mauls of oval form and deep splintering all around their edges. Neolithic miners, therefore, took advantage of the mine's own raw material to continue with the extraction of the flint they wanted to access. In some other European Neolithic mines such as Defensola (Galliberti 2005) or Spiennes (Collet and Woodbury 2007) flint picks have also been used.

Regarding the use of bone materials, in Pozarrate, more than fifteen large antler pieces have been documented, with a multitude of fragments directly related to extractive work. Meanwhile, at Casa Montero, three small horn fragments (<4 cm) that cannot be related to work in the mine have been documented (Terradas *et al.*, 2011), as well as seven sharp objects made of bone and twenty-one pieces related to personal adornment that correspond to bone rings or matrices to obtain them (Yravedra *et al.*, 2008). In European mining contexts, antler picks are usual, as in the case of Ri (Tsobgou *et al.*, 2011).

Finally, pottery appears in Casa Montero and Pozarrate. In the first, ceramics are distributed in 23 shafts, including practically complete containers (Consuegra *et al.*, 2018), while in Pozarrate, there are only few very small fragments located at specific points high up in the stratigraphy.

CONCLUSIONS

The Treviño flint mining complex relates to a greater area in which flint procurement occurred from the Palaeolithic to post-Neolithic times following different extraction strategies that, before the archaeological works performed at Pozarrate, were known only by survey and indirect evidence, such as the Treviño flint distribution all along the Cantabric region. The abundance, quality and accessibility of flint levels made this place a perfect procurement place.

The discovery of the Pozarrate flint quarry has indicated the importance of the phenomenon of Early Neolithic flint procurement by huge modification of landscape that occurs in Europe from the beginning of this critical chronological period. Until then, there was only one example in the Iberian Peninsula.

The Pozarrate quarry is associated with at least seven other crescent-shaped dumps of about 25–30 m diameter, extending deep in the ground over linear trenches. This type of structure is unique at the moment in the Iberian Peninsula. The only excavated dump was dated from 5050–4370 cal. BC.

The raw material extracted in Pozarrate is a very fine-grained nodular flint of exceptional quality for knapping. The variety exploited is a nodular flint with bioclasts from the Miocene. Its wide distribution in the Cantabrian region during prehistory allows us to consider this flint as a tracer of long-distance exchange.

Flint remains in the site reveal a light transformation of nodules that appear mostly to have been tested on site and transported to other places to reduce them. Blade production seems likely to have been the aim of lithic production. A few tools were made on site in connection with the peripheral tasks carried out during the mining process. Transport of both nodules and blades without on-site reduction seems to be the most frequent strategy used in Mediterranean Early Neolithic flint mining contexts.

One of the most important features of the site is the assemblage of mining tools, consisting of more than forty dolerite hammers, some flint cores reused as hammers and more than fifteen large antler fragments (the largest set of antler tools found in Iberia). Procurement of hard stones for use on the mining site and reutilization of flint elements are common strategies in European Neolithic flint mining.

Early Neolithic flint mining contexts of the Iberian Peninsula, although scarce, were specialised places, in which adaptation strategies to geological formation were developed employing open-air quarries and the excavation of deep shafts.

The Pozarrate quarry shows several elements that link it to the European phenomenon of flint mining. It reinforces the idea of the complexity of flint mining in the Neolithic and that it is expressed in a heterogeneous way with a variety of strategies from the beginning of the Neolithic. Flint mining became a critical strategy for Early Neolithic groups and may be considered one of the elements that characterized this period of history.

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