



## Research Article

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# The Neolithic Flint Quarry of Pozarrate (Treviño, Northern Spain)

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**Abstract:** In this work, we present the preliminary data we have obtained in the Neolithic flint quarry of Pozarrate, currently under archaeological works. We want to put forward an update about the sedimentary fillings of one of the crescent-shaped dump quarries (6000–5600 BP). It is located at the Sierra de Araico-Cucho (Treviño, northern Spain). In this region, Tertiary carbonated terrains which host important silicifications called Treviño flint (Tarrío, A. (2006). *El sílex en la cuenca vasco-cantábrica y Pirineo Navarro. Caracterización y su aprovechamiento en la Prehistoria*. Monografía 21, Museo Nacional y Centro de Investigación de Altamira. Madrid: Ministerio de Cultura) are outcropped. The procurement of these silicifications by prehistoric populations was motivated by the good quality of this raw material for knapping. Currently, it constitutes one of the few Neolithic known flint mines of the Iberian Peninsula, understood as places of exploitation of flint with landscape modifications. Some instruments related to prehistoric quarry works have been recovered, such as picks, maces, and hammers made of flint, dolerite, and deer antler.

Studies on Pozarrate material remains have been conducted in an interdisciplinary way, in order to have a better understanding of the prehistoric mining processes. Several methodologies are being used in the study of the lithic industries, including flint characterization, procurement, typological, typometrical, technological, and functional approaches. We have obtained the initial data about extraction, selection, management, and use processes of the flint and dolerite assemblages. Deer antler remains have recently undergone a restoration process and preliminary data have been offered. Moreover, an experimental

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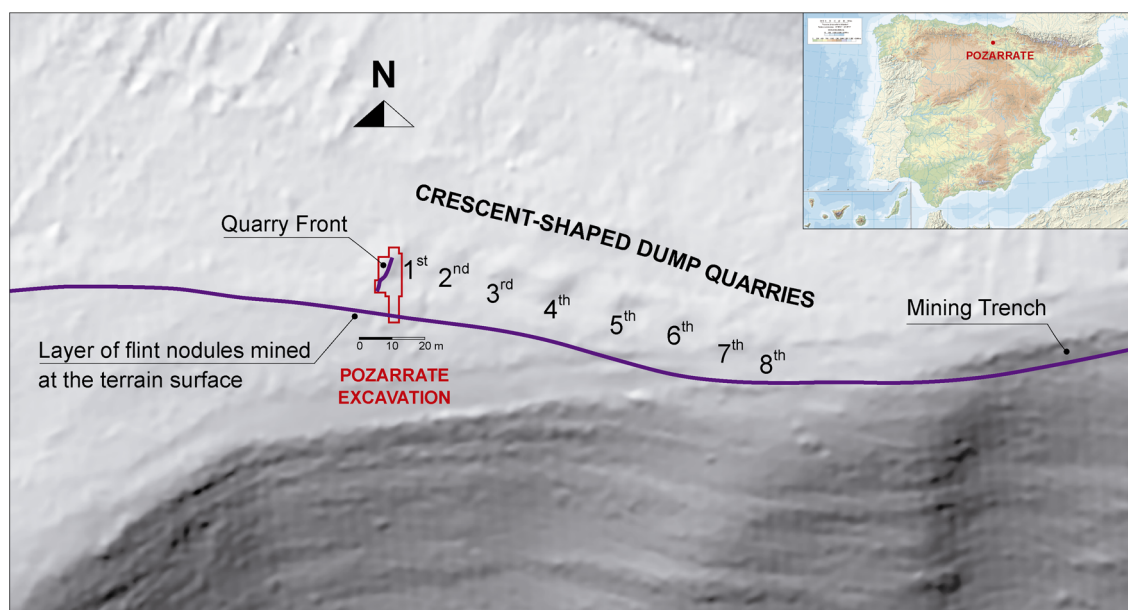
approach has been applied to clarify specific archaeological issues and technical solutions for quarrying using dolerite maces.

**Keywords:** prehistoric quarry, raw materials, Treviño flint, Neolithic

## 1 Introduction and Objectives

Lithic procurement studies allow us to understand economic human and geographical networks from the past. This kind of archaeological studies have been well developed, defining supply areas, lithic workshops, etc., as specialized sites, helping us to understand economic/exchange human networks and productive environments/landscapes from the past. Although our work is more focused on the extraction of Treviño flint due to its importance as a regional to long-tracer raw material (Tarrío, 2006), other materials associated with flint extractive processes are also considered, in order to have a picture as complete as possible of the Neolithic quarrying set of Pozarrate, composed by flint, dolerite, and antler tools, according to the archaeological evidence found so far.

Prehistoric mining for flint extraction is an activity that has been recorded in many European archaeological contexts. Some well-known sites such as the Neolithic flint mines of Spiennes (Belgium) (e.g., Collet, 2004), Grime's Graves (England) (Russell, 2000), Krzemionki (Poland) (Sobczyk, 1993) or Rijckholt St. Geertruid (Netherlands) (Felder, Rademakers, Cor, & De Grooth, 1998), must be highlighted many others. In the Iberian Peninsula, although more scarcely, other relevant archaeological mining contexts have been documented, such as Casa Montero (Madrid) (Consuegra *et al.*, 2018), or more recently La Muela (Zaragoza) (Picazo, Pérez Lambán, Fanlo Loras, & Leorza Álvarez de Arcaya, 2018), and Montvell (Lérida) (Terradas, Ortega, Marín, Masclans, & Roqué, 2017). The Araico mining complex should be included within these Neolithic sites, located in the Sierra de Araico-Cucho, between Condado de Treviño (Burgos) and Berantevilla (Álava), in the northern Spain, with a maximum altitude of 901 m (Figure 1). From a strategic point of view, the Sierra de Araico is located in the center of a large open valley with various watercourses that allow the habitability of the area, as evidenced by the presence of various prehistoric occupations since the Paleolithic. In addition, Araico-Cucho is located in the upper Ebro Basin, an area where 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



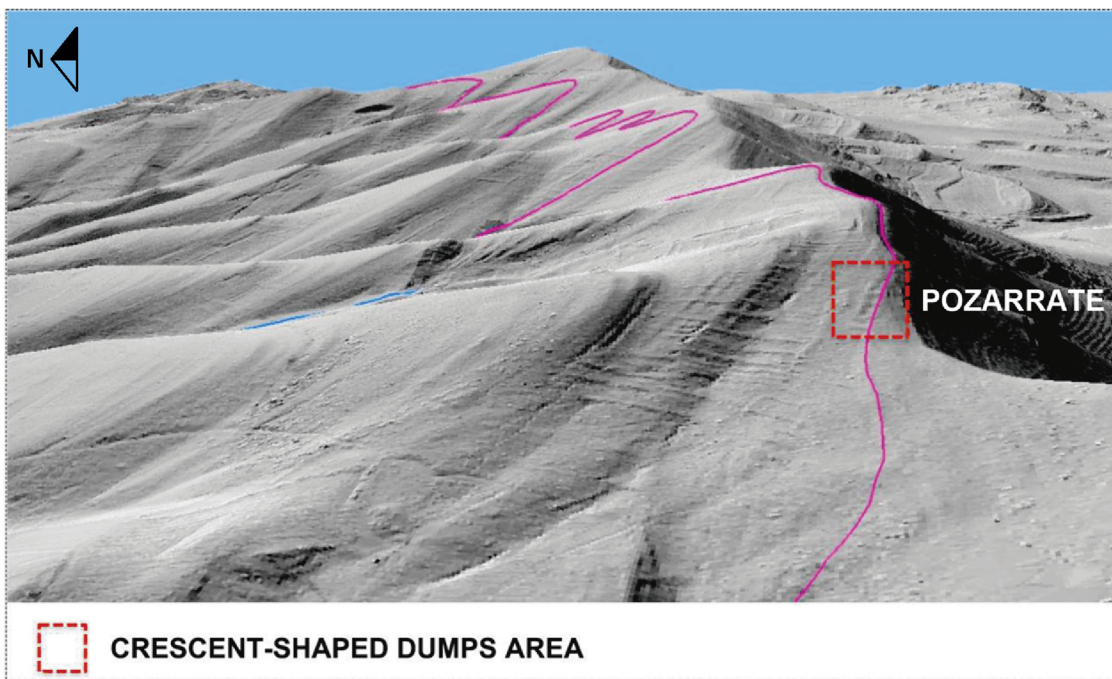
**Figure 1:** Location of Pozarrate archaeological quarry in the Araico-Cucho Neolithic flint mining complex – 3D LiDAR image.

the Duero Basin). From a geological point of view, Araico-Cucho mining complex takes advantage of Miocene lacustrine-palustrine materials from the Miranda-Treviño syncline (Tarrío, Elorrieta, García-Rojas, Orue, & Sánchez, 2014).

Archaeological works in the Sierra de Araico-Cucho started in the decades of 1950–1960, when D. Estavillo collected several superficial findings, mainly dolerite maces, in the area. Several sites related with the extraction of flint were located by him, who differentiated quarries and flint workshops (Estavillo, 1975). In 1990, a collective book about the valley's prehistoric habitats was published. Among their findings, they revealed the existence of a chalcolithic open-air site, Larrenke Sur (Ortiz et al., 1990). Finally, in 2006, a monograph by A. Tarrío was published, in which geological characterization of Treviño flint and its prehistoric procurement were defined (Tarrío, 2006).

The current archaeological works carried out at Araico-Cucho mining complex include both surface surveys and seasonal field excavations. Based on the analysis of LiDAR images, a series of crescent-shaped dumps and ditches of anthropic origin were identified in the upper part of the mountain range, concurring with a change in the current slope (Figure 2). In order to understand the formation process of these mining remains, an archaeological intervention was carried out in the lowest and oldest crescent-shaped dump, which was called Pozarrate (Tarrío, Benito-Calvo, Lobo, Junguitu, & Larreina, 2011a).

Focusing on Treviño flint, it was described by Tarrío (2006), who defined several microfacies in the basis of petrographic thin sections: lumpy micrite, ostracod micrite, algae laminated micrite, and brechoid silcrete. Treviño flint has been found in several prehistoric sites in the area (Tarrío et al., 2011b), such as in Antoliñako Koba (Upper Paleolithic) or the Neolithic dolmen of San Sebastian Sur (Álava). In addition, it is a variety that has been used recurrently in the north of the Iberian Peninsula, since it has been found both on western sites such as Las Caldas (Asturias) (Corchón, Tarrío, & Martínez, 2007) or La Uña (León), (Herrero-Alonso, Fuertes-Prieto, Tarrío, & Neira, 2020 and Herrero-Alonso, Tarrío, Fernández-Martínez, Fuertes-Prieto, Neira, 2021), to Brassempouy (Landes, France) (personal analysis of A. Tarrío, unpublished) on the east. With this data, we are working on elaborate diachronic maps for different prehistoric periods, with the aim of evaluating the differential diffusion of Treviño flint dispersal over time, as the recovery of prehistoric tools manufactured on Treviño flint has also been recurrent for several chronocultural periods, from Upper Paleolithic (Aurignacian to Magdalenian), as well as for Mesolithic, Neolithic, and post-Neolithic times.



**Figure 2:** Location of the Pozarrate excavation in the northern slope of the Sierra de Araico, on a saddle near the top.

**Table 1:** Chronology of the two samples dated by  $^{14}\text{C}$  currently in Pozarrate

Sample	Material	Date BP	Cal. BC 1 sigma	Cal. BC 2 sigma
Beta-312351	Antler fragment	5640 ± 30	4500–4450	4540–4440
ARC 11A	Layer 2			4420–4400 4380–4370
Beta-312352	Charcoal fragment	6050 ± 40	5000–4910	5050–4840
ARC 11C	( <i>Quercus robur</i> sp.) Layer 2		4860	

## 2 The Archaeological Quarry of Pozarrate

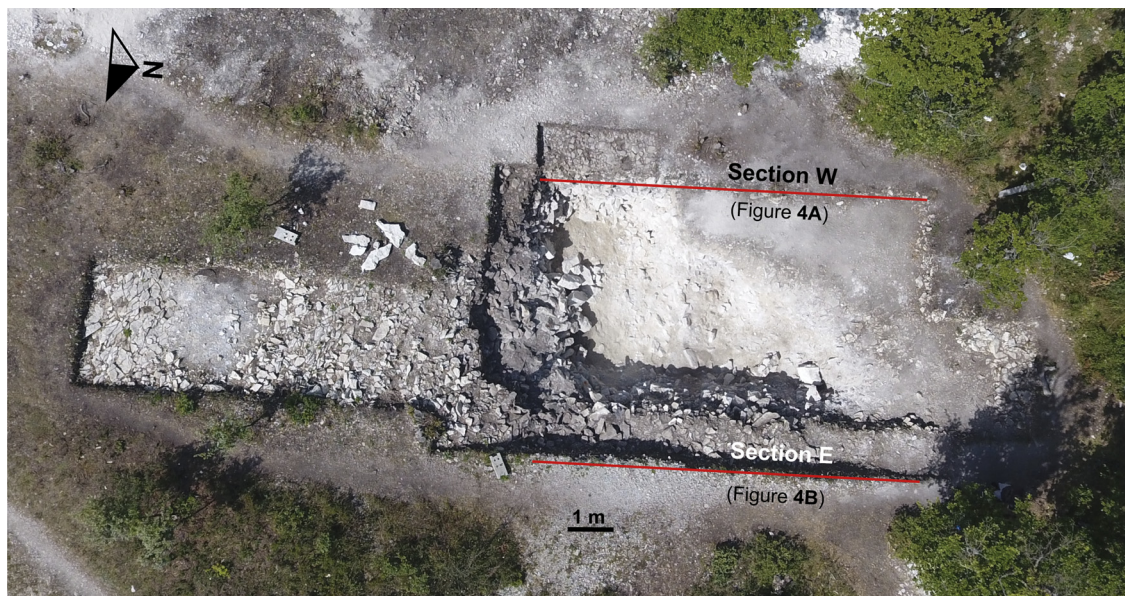
Pozarrate is a flint quarry from the Neolithic that was totally filled by a dump (Table 1). The magnitude and the disposition of the dump can be observed on LiDAR images obtained from the cartographic server Geo euskadi (resolution: 1 m/pixel). Two filling phases were identified in the quarry. The first dump is associated with the earliest extraction labors along the geologic flint layer, with orientation of N180° approximately.

In the northern part of the hill of Pozarrate, another type of exploitation covers the first linear dump. In this case, we identified eight half-moon shaped dumps. At first sight, they were ellipsoidal structures of about 25–30 m diameter which overlap from the lowest part of the hill to the top, for a section of 160 m (Figure 2). From this point, flint exploitation continues toward the East for 3–4 km, alternating trenches and dumps.

In order to determine and analyze the quarry's structure, a trench of more than 20 m length and 2 m width was dug perpendicular to the stratification, on a natural slope with a direction of N180° and a dip of 21° towards the North (Figure 3).

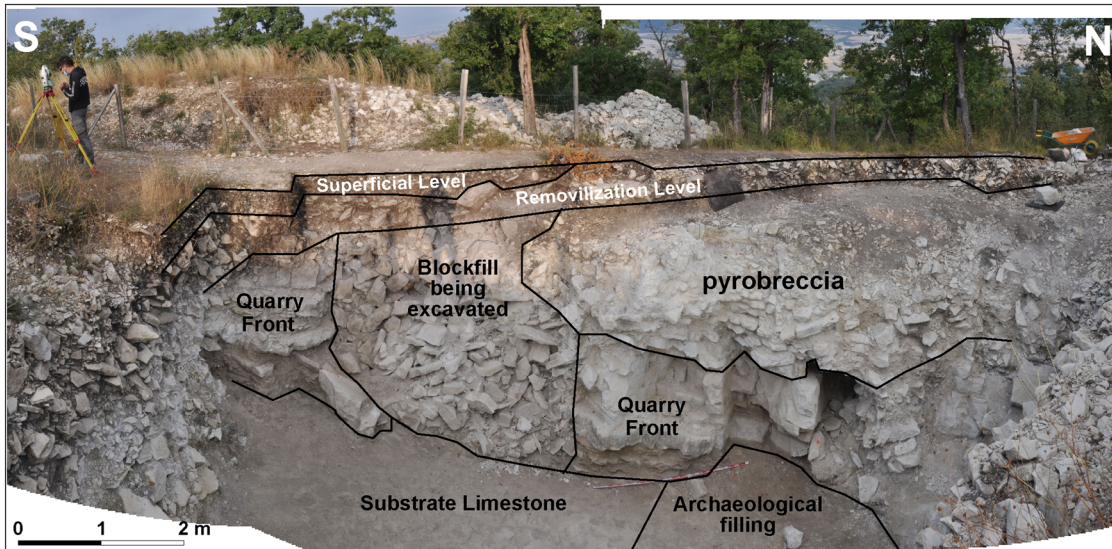
In the central trench sector, we expanded the excavation area 8 m wide to reach and clear the exploitation front in the west of the prehistoric quarry where the open front is 3 m high (Figure 3).

This mining structure is the oldest discovered until today in the Iberian Peninsula. The exploitation front presents, up to now, an irregular outline with three small anthropic cavities in the rock that preserve some remains of flint nodules on the walls. Currently we are cleaning the front and we have already

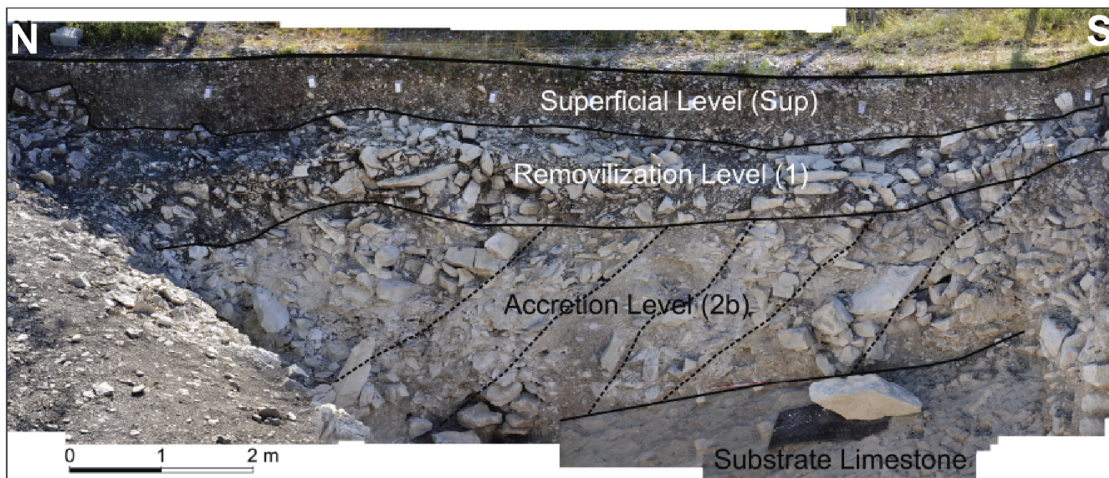


**Figure 3:** View of the excavation work carried out in Pozarrate (year 2019). The traces of the sections shown in Figure 4a and b are marked.

(a)



(b)



**Figure 4:** Stratigraphy of the Pozarrate fill: (a) (East section). Exploitation front of the Pozarrate quarry (10 min length approx.). (b) (West section). The pyrobreccia crowns the calcareous strata.

discovered 10 m in length (Figure 4a – West section). In the East cross section, a clear stratigraphy shows three layers of archaeological deposits. On the top of the West cross section, a pyrobreccia (calcareous breccia cemented by the action of fire) crowns the calcareous strata (Figure 4b – East section):

- Layer 2: The lower filling is 2.0–3.0 m thick. The sediments lay with an inclination of 40°–45° dipping towards the N. It would have been produced by the accumulation of different breccias of calcareous gravels with different granulometries produced by successive avalanches of sediment while the quarry was exploited and filled out. This is where the set of deer antlers appeared, as well as the major concentration of dolerite, both fragmented and complete maces. It shows an Early Neolithic chronology from the  $^{14}\text{C}$  dating of the samples collected from this layer. In the base of the quarry, we have discovered the rocky substrate, which dips 21° to the north. Here the flint nodules extracted by prehistoric miners were located, from which the molds of their traces remain.
- Layer 1: An intermediate filling of 0.5–1.0 m thick, that stunts the sloping stratification and is arranged discordantly in between. The blocks on it have a clear sub-horizontal orientation as it should be seen as a

layer of remobilization with a sub-horizontal arrangement. Mostly all of the ceramics, very fragmented, appeared in this layer. Six metal fragments of bronze and iron, concentrated in very specific areas have also been recovered, as well as some dolerite maces that in some cases present polished morphologies with grooving features for its hafting.

- Layer sup: An upper filling of 0.3–0.5 m thick, an edafized layer covering the whole site surface, is made up of mainly fine gravel mixed with very carbonaceous vegetal soil which would correspond to the edaphic floor that overfills the quarry's dump. Here we found a small fragment of roman ceramic classified as “terra sigillata.”

The aforementioned pyrobreccia that appears associated with the exploitation front of the quarry (Figure 4a), seems to be caused by the use of fire in the quarrying activities. Limestones decompose under the effect of heat into calcium oxide ( $\text{CO}_3\text{Ca} + \text{heat} \rightarrow \text{CaO} + \text{CO}_2$ ), commonly known as quicklime or burnt lime. In a natural way, this material when comes in contact with rain, reacts naturally with rainwater to become calcium hydroxide ( $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$ ) or slaked lime, which cements the rocky blocks generated in the extractive processes, forming the anthropic calcareous breccia. This fact is under study and verification with materials from the archaeological site.

Recently, a prospecting survey was performed with the aim to find the Neolithic open-air site which eventually help us to complete the *chaine opératoire* of Treviño flint management. In that way, we have identified “Los Cascajos” site close to Pozarrate by magnetic prospecting, revealing some structures that evidence the circular habitat structures. This new site has been excavated in the last two years (2020 and 2021) along a surface of 150 m<sup>2</sup>. By now, the main recoveries have been from Chalcolithic and Bronze periods. At the moment, there are no <sup>14</sup>C dating of the settlement, although in later campaigns we hope to find Neolithic structures, since in a survey we have collected a dolerite mace similar to those that appears in the quarry base.

## 3 The Archaeological Materials

### 3.1 The Flint

The type of flint that was exploited in Pozarrate is a very homogeneous dark brown nodular flint, without impurities (>98% silica) with very fine grain and large formats (20–30 cm in size). When it is patinated, usually presents liesegang rings with lacustrine bioclasts, mainly ostracods and characeae algae and have exceptional quality for knapping (Tarrío, 2006; Tarrío *et al.*, 2011a,b, 2014, 2016)).

As is common in flint mines, the lithic remains of Pozarrate are very abundant and add complexity to the research. The study about lithic technology in Pozarrate is based on the preliminary analysis of 13,634 pieces, with a total weight of 494.046 kg, from 2011, 2013, 2017, 2018, and 2019 field campaigns. During this work, the lithic assemblage was classified into general categories such as nodules, fragments, debitage products, cores, and retouched artifacts, in order to understand the debitage process and the flint extraction in the mine.

Divided into three archaeological layers, only 4.3% (585 pieces) of the material belong to the superficial layer, 28.3% (3,852 pieces) to layer 1, and 67.5% (9,197 pieces) to layer 2 (Table 2).

The nodules are more abundant at the surface layer, as it was the place of abandonment of the discarded material. Among all the categories, the percentage of fragments is the highest as a consequence of the natural internal planes of the nodules and the number of fractures that the pieces have suffered during the extraction and testing. The best represented products of the debitage are flakes, generally in much higher percentages than blades and bladelets. Regarding the rest of the debitage, very few elements from the beginning (crests) and maintenance (flanks, edges, core tablets, etc.) phases of the reduction sequences have been recorded.

**Table 2:** Partial quantification of Treviño flint recovered at Pozarrate (until 2019)

Layers	Nodules		Fragments		Debitage		Cores		Retouched		Total
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Layer sup	57	7.0	346	4.3	160	3.6	13	7.8	9	8.4	585
Layer 1	175	21.5	2,308	28.4	1,231	27.9	71	42.8	67	62.6	3,852
Layer 2	582	71.5	5,483	67.4	3,019	68.5	82	49.4	31	29.0	9,197
Total ( <i>n</i> )	814	100.0	8,137	100.0	4,410	100.0	166	100.0	107	100.0	13,634

The reduction scheme of the analyzed cores is organized in orthogonal parallel series. Most of the cores were abandoned with one or two removals or the platform only, as they were raw material quality testing. Although the quality of the flint from Pozarrate is good, there is evidence of an exceptional high-quality nodules. This evidence assures that the highest quality flint nodules were extracted and transported after testing apparently without any other transformation, and they were the main objective of the exploitation of the quarry. The cortex of these nodules is very thin, and its form is regularly oval (Figure 5a). These two features, together with a small size, reduce to the minimum the need of shaping. As a consequence, the evidence that remains in the quarry of this variety of flint is very scarce. Although most of the cores abandoned in the quarry were devoted to blade production, it cannot be often assured due to the dimensions of the last removals, which are more or less long flakes. 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. This means that even if there is no direct evidence from a workshop until now, the reduction process could occur sometimes the nearby not in a systematic way. The scarcity of the cores and by-products compared with the total number of pieces suggests testing of nodules on the site, with an occasional production of blanks (mostly flakes) and transporting of nodules of better quality to knapping workshops outside Pozarrate (Figure 5).

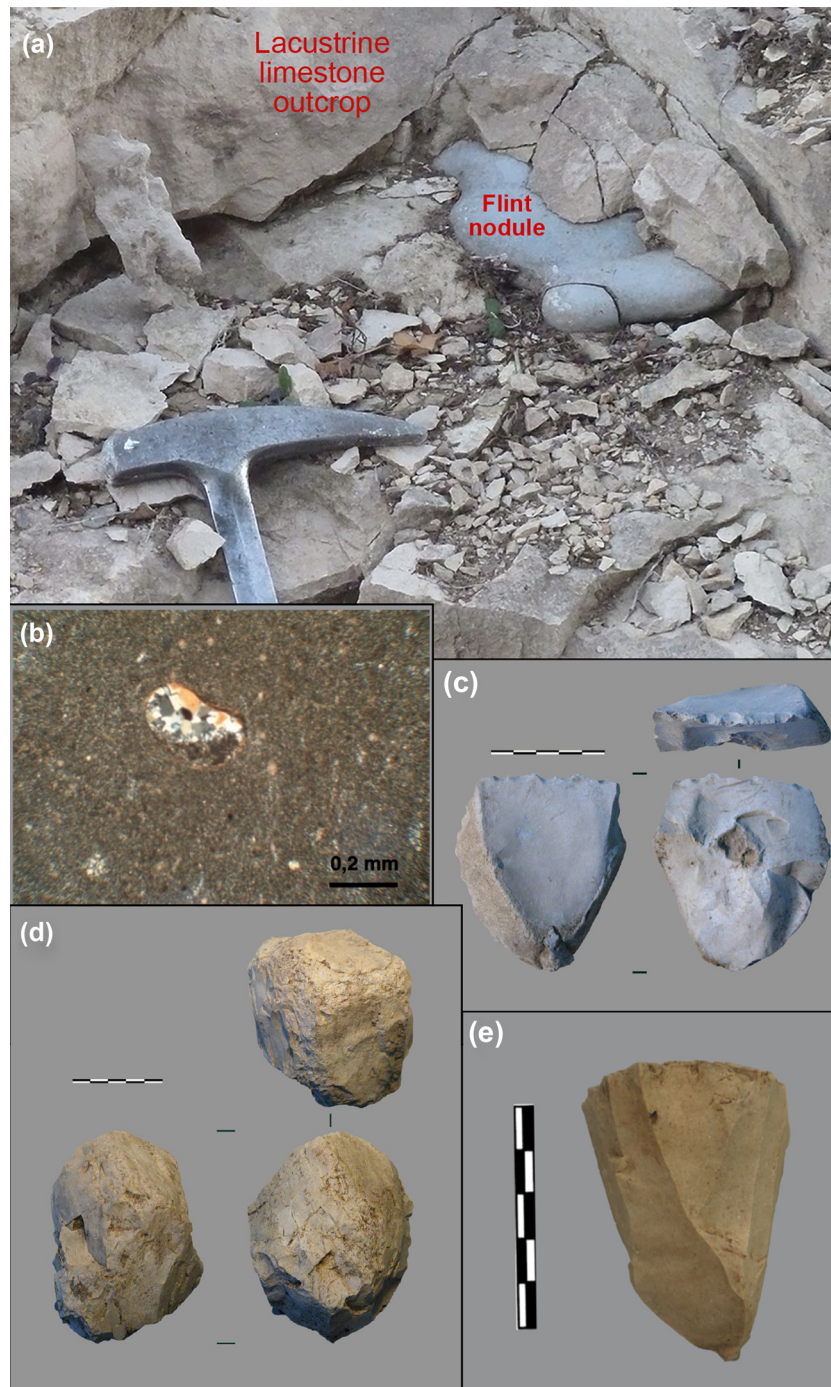
Among the retouched pieces, scrapers, notches, and denticulates are the most common type, probably to be used on wood and antler mining-tools' maintenance and other opportunistic tasks at the quarry. They show post-deposition alterations such as trampling (McBrearty, Bishop, Plummer, Dewar, & Conard, 1998). It is interesting to observe that 10% of the blanks of the configured tools show obtuse angles at the basal butt, possibly linked to percussion with mining hammer stones during nodules extraction. Finally, there is evidence of alternate becs, a recurring tool on regional Neolithic assemblages.

The most abundant flint, as expected, is the one that appears in the mine itself, with some variability between types. However, during the study, other varieties of flint have been identified that appear in other local and exceptionally regional formations of much lower quality for the knapping in extremely low quantities <0.1% (*sensu* Tarrío et al., 2016).

### 3.2 The Dolerite

Dolerite mining hammer stones make up a large portion of the archaeological sets found on the Sierra de Araico-Cucho. There are two collections of these materials, coming from different contexts: (1) surface findings around Sierra de Araico-Cucho -known as "Estavillo Collection," and (2) the archaeological assemblage recovered at Pozarrate excavations, along all its sequence. These tools, whose nearest procurement outcrop is about 10 km, were probably selected for Treviño flint extraction activities due to its hardness, toughness, and availability.

The Estavillo assemblage collected in surface at the Sierra de Araico-Cucho, are composed by approximately fifty items that show evidence of standardized modification and much more polishing features than the Pozarrate assemblage. In addition, it has strong morpho-technical similarities with other hammer stones from metalliferous prehistoric mining environments from Iberia, such as the Chalcolithic sites of Sierra del Aramo, Cerro Minado (Blas Cortina, 2007–2008; Delgado Raack, Escanilla Artigas, & Risch, 2014; Rafel,



**Figure 5:** (a) Outcrop of the nodular flints exploited at the mines, with very fine cortex, included in the poorly consolidated lacustrine-palustrine limestones. (b) Thin section of flint with an ostracod. (c) A wedge – a retouched product that is related with the mining activity of nodules extraction. (d) A core turned into a hammer. (e) Pyramidal core.

Montero Ruiz, Soriano Llopis, & Delgado Raack, 2016), etc., so they could belong to a post-Neolithic period. By contrast, the dolerite items recovered from the archaeological quarry of Pozarrate show features more commonly found within other similar Neolithic assemblages (Consuegra, Gallego, & Castañeda, 2004; Goldenberg, Maass, Steffens, & Steuer, 2003). At the site, the dolerite set is made of mainly raw dolerite fragments with generally two or three notches presumably to help its hafting. Only a dolerite hammer stone with signs of polishing has been recovered in the superficial layer.



At the moment, the weight of total archaeologically recovered and inventoried dolerite items at Pozarrate exceeds 52 kg. Most of them have been spatially located with respect to the archaeological quarry fronts at the time of its recovery. In a preliminary analysis, more than 550 elements have been inventoried, of which 15 are complete hammer stone tools, with another 22 big fragments of hammers. These two fractions represent approximately 45 kg (86% of the total recovered dolerite). Other remains are made up of small flakes and minor fragments, possibly generated during the use of these instruments in the extraction of flint.

At least ten of the identified hammer stones show signs of technical configuration, presumably for their hafting. Therefore, Pozarrate dolerite assemblage do not show a great pattern of technological modifications (generally notches and picketing) to adapt lithic blanks to hafting and mining. Some tools present general shapes achieved by trimming, while others show some notches in specific points of the rock. In the case of notches, they were made by direct percussion and then their edges were smoothed, probably to facilitate hafting, with a non-intensive picketing and polishing. This aspect appears in other Neolithic sites in Europe, like Bad Sulzburg (Goldenberg et al., 2003) or Casa Montero (Capote, 2011; Consuegra et al., 2004).

According to the modifications described in Pozarrate dolerite hammer stones, these can be assigned to the first stages of the previously developed typologies for this mining type tools (e.g., Hunt Ortiz, 2003, p. 285; Léchelon, 2001; Pickin 1990). For now, we can provisionally classify the dolerite tools recovered from Pozarrate as unmodified or modified to adequate its shape by trimming and notching (with one, two, or more notches). However, the lack of classification of early Neolithic mining hammer stones has generated the need to create our own classification, which is at the moment in progress, as well as the 3D digitization of all the hammer stones.

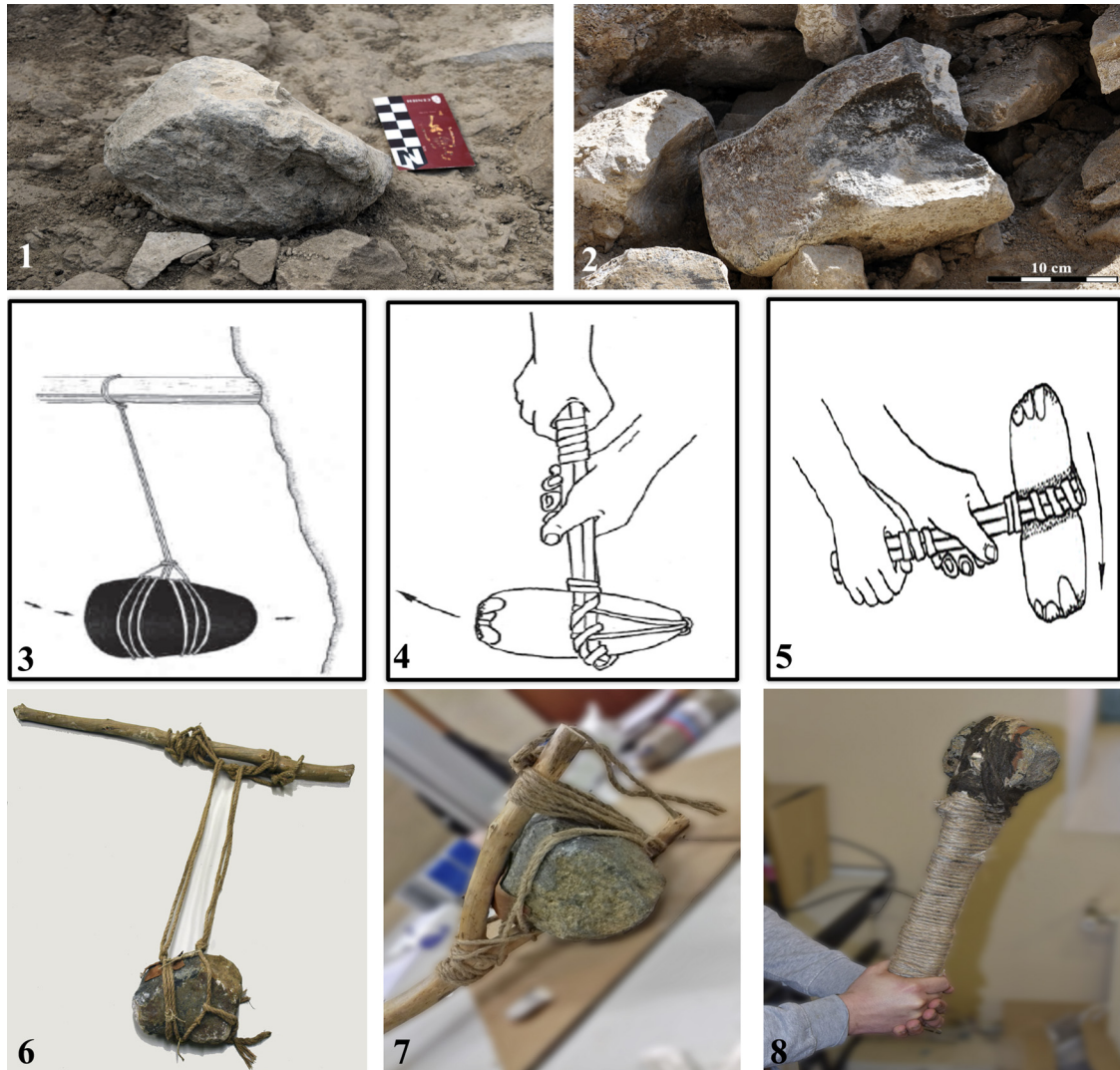
After contrasting archaeological data with ethnographic and experimental approaches to check some hypothesis about quarrying activities (Hernández, López-Tascón, Aguirre, & Tarriño, 2020), we are inclined to think that weight and affordance of blanks could determine the design of different quarrying tools, including single-end hammers, double-end hammers, rigging devices (Blas Cortina, 2007–2008; Timberlake & Craddock, 2013), etc., to conduct direct or indirect hitting (e.g., by levering-off with an intermediate antler pick) on limestone rocks, to dig out the flint cores (Figure 6).

### 3.3 The Antler

A total of 54 pieces of deer antler, generally totally fragmented, and all of them in a precarious state of conservation, have been recovered in Pozarrate. So far, only 14 items are large identifiable fragments. Due to its poor preservation, these fragments were consolidated immediately after its archaeological recovery. They present characteristics of technological modification, eliminating non-useful parts to form handles, picks, and wedges suitable for use in quarrying activities, very similar to those described, for example, in flint mines and other contexts in Neolithic Britain (Worley & Serjeantson, 2014). A preliminary study has been carried out to identify the anatomical parts recovered.

Among these materials, we can highlight some specimens due to their conservation, size, evidence of work, and information that they can provide about their functionality. The features observed on several antler remains allow us to make the following preliminary remarks:

- In one case (Figure 7(1)) it does not retain the coronet's pearls. No fracture shows signs of manipulation. The cut of basal tines and high main beam in its midpoint, removing the crown with its distal tines, an addition to the superficial polishing, the absence of burr's pearls and wear, allow us to suggest its functionality as a flintknapping hammer.
- In two cases: Figure 7(2), preserves the trez tine's base and it presents distal cut marks like so, Figure 7(3), cut marks in the distal part and possibly a third, Figure 7(4) the crown, with the distal tines, is cut at antler's high main beam's midpoint. It may correspond to a primary cut pattern. In this, the wear on the burr, absence of coronet's pearls and the cut marks of the tines very close to the main beam suggest its functionality as a flintknapping hammer.

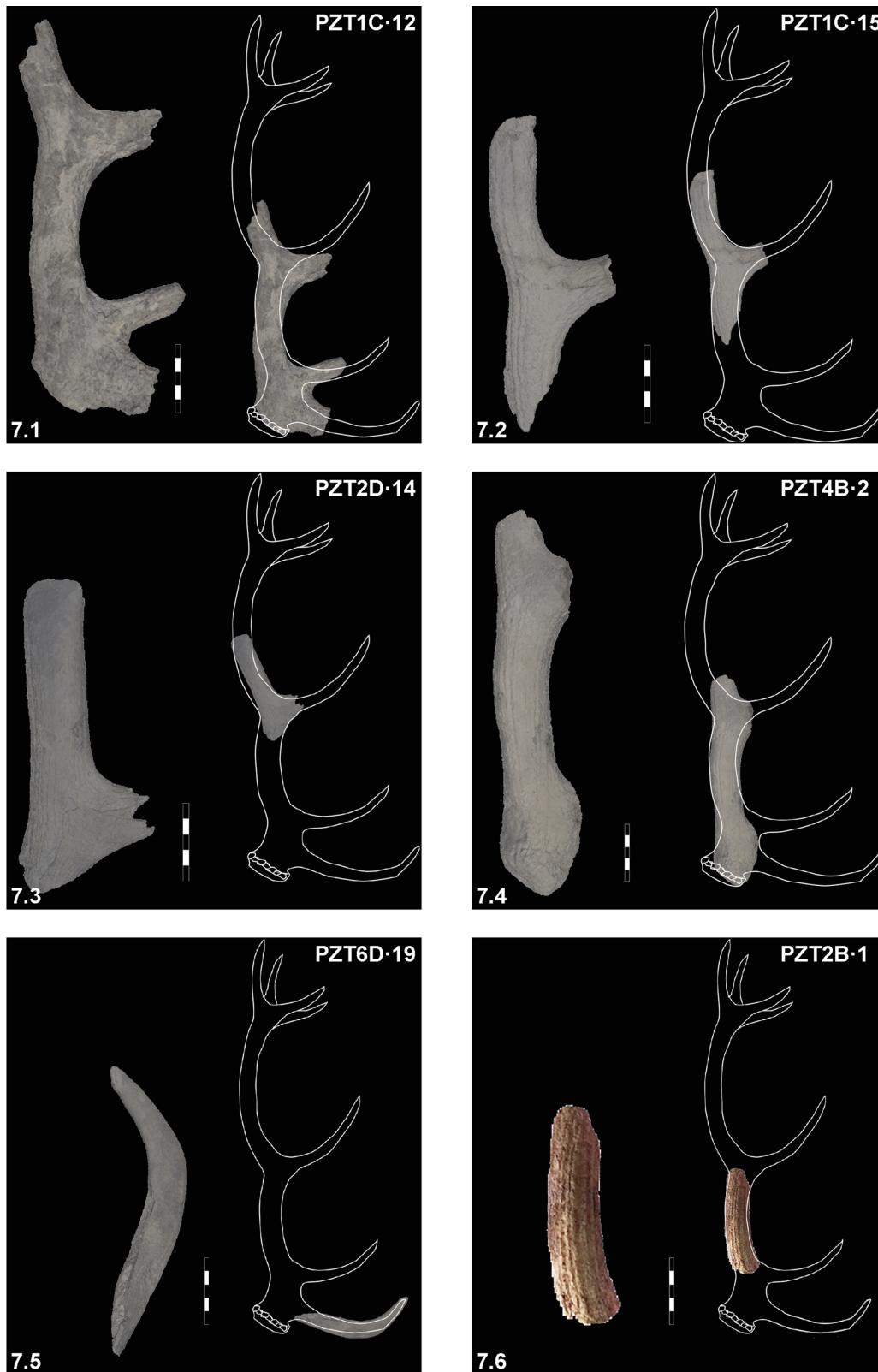


**Figure 6:** Pozarrate archaeological hammer stones on dolerite. (1–2) Two dolerite hammer stones at the time of their archaeological recovery; (3–8) different experimentally tested ways of hafting for quarrying activities, according to the dimensions of the blank: (3 and 6) a ridding device (schema from Blas Cortina, 2007–2008); (4 and 7) single-end hammer; (5 and 8) double-end hammer (schemas from Timberlake & Craddock, 2013).

- In one case, Figure 7(5) and possibly Figure 7(6), flexion fractures by bending were found, in a brow tine and a main beam fragment. The first have marks consistent with a mining tool stress pattern, and the second with use as a wedge. Figure 7(5), it presents deep longitudinal scratches on the distal external face, for which, together with the characters of the fracture, a lever work of the complete tool is inferred, hypothetically as mining pick and Figure 7(6), it has scratch marks and crushing on proximal external face, which could suggest a possible use as a wedge. It has been dated by  $^{14}\text{C}$ .

### 3.4 The Metals and Potteries

Although the two radiocarbon dates available for the moment reveal an Early Neolithic chronology for Pozarrate flint exploitation, there was also some procurement of Treviño flint in post-Neolithic times,



**Figure 7:** Anatomic provenance of antler tools recovered at Pozarrate: (7.1) Shed antler fragment. (7.2) Antler fragment from midpoint low main beam to midpoint high main beam. (7.3) Antler fragment from trez tine base to the midpoint high main beam. (7.4) Shed antler fragment. (7.5) Antler's brow tine. (7.6) Antler's main beam fragment, with a flexion fracture by bending or bevel cutting.

mainly evidenced by the presence of ceramic and metallic materials in the remobilization layer of the Pozarrate stratigraphy. An archeometallurgical study on four metal pieces found within the assemblage of Pozarrate, corresponding to three bronze sheets and one small iron blade, was carried out. As a result of SEM analysis, bronze sheets present the same chemical composition of ~89–90% copper and 10–11% selenium, while the blade is mostly pure iron. The metallography of the sheets suggest that these were probably cold-hammered worked and later annealed so that the grains recrystallized. The iron blade shows the same construction technique. In relation to its archaeological interpretation, the relatively high Sn content of the bronze sheets would suggest a late chronology, while the low-carbon iron blade is more difficult to frame chronologically. The identical chemical composition and microstructure of the bronze sheets are explained as three fragments of the same object, possibly a bracelet. The iron blade could be an object intended for personal hygiene, e.g., a razor.

We have found fragmented pottery (generally sizes less than 4 cm) that appears mainly at the intermediate layer, sometimes associated with metallic objects, also, at the upper layer, it happens to be a small piece of “Terra Sigillata.” Ceramic chronologies could range from the Neolithic to the present.

## 4 Conclusion

In light to the newest results of the fieldworks and current analysis, the main hypothesis for the interpretation of flint extraction at Pozarrate is a mixed strategy consisting, on one hand, an attack by fire evidenced by the existence of the pyrobreccia, together with, on the other hand, a mechanical extraction of limestone rock carried out by dolerite hammers and flint nodules extraction by antler quarrying tools.

The very good quality nodules, probably main target of extraction, have been collected in their entirety. There are hardly any remains of these flints among those recovered. Those of “medium” quality would have been tested and those that did not have the required quality were discarded *in situ*. A few were quarried probably to meet immediate needs and those of exceptional quality were transported off the outcrop. An in-depth analysis will contrast this hypothesis by establishing the degree of intensity of reduction in the nucleus.

In summary, we can remark that Pozarrate is a Neolithic flint mine in the north of Iberian Peninsula, which has continued exploitation since the Paleolithic to current times. We emphasize the use of dolerite and deer antlers as mining tools, together with the use of fire that has been identified in flint nodules extraction. Until now, the archaeological work has been focused only in one of the quarries (the lower).

The type of flint that was exploited in Pozarrate is a dark brown nodular flint with lacustrine bioclasts (mainly ostracods and *characeae algae*) that, when patinated, usually presents liesegang rings. Flint procured at Treviño has had a wide dispersion along the Cantabrian region in Prehistoric times. It is one of the tracer flints in the north of the Iberian Peninsula during Prehistory.

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