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## An overview of the Mesolithic in the northwest Atlantic and inland area of the Iberian Peninsula

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### ABSTRACT

This paper reviews the Mesolithic in the northwest Atlantic and inland area of the Iberian Peninsula and it is considered in the overall context of the rest of the Peninsula. The Cantabrian Mountains are the northern boundary of the study area, which excludes the adjoining coastal area. In addition to the geographical, geological and environmental settings, the chronology and human remains are also reviewed, paying special attention to the specific characteristics of each of the main sites. The primary faunal, plant remain, bone and stone industry - including raw material supply, technology and typology - features of the main settlements are also presented. All of the above allow us to discuss the similarities and peculiarities of the Mesolithic of this area in relation to other regions of the Peninsula.

### 1. Introduction

The aim of this paper is to review the Mesolithic in the northwest area of the Iberian Peninsula and place it within its Peninsular context. The northern slope of the Cantabrian Mountains and its coastal area (the classic distribution of Asturian sites) are excluded in the present review. The reason for doing so is that, from a general point of view, this northern slope area is better known (e.g. [Arias et al., 2021](#); [Clark and Barton, 2022](#)) than the other lesser-known areas we wish to address in more detail.

The choices of sites presented here (section 2), was made taking into account those levels with extensive assemblages that have been studied from a typological (comparable with other assemblages) and technological point of view, and/or with radiocarbon dates that allow us to confirm their Mesolithic origin. We believe that it is important to have a homogeneous and clearly-defined series of assemblages studied from a techno-typological point of view, that allows us to establish the Mesolithic characteristics of this particular area. For this reason, we have chosen not to include some of the sites in Galicia and northern Portugal assigned to unclear phases (Upper Palaeolithic - Epipalaeolithic or Mesolithic; Late Pleistocene - Early Holocene), or those assemblages that have a small number of remains or whose studies have not yet been

published in full. Consequently, the geographical framework of this paper focuses mainly on the administrative boundaries of Galicia and the province of León (both in Spain).

#### 1.1. Geographical and geological context

The north-western quadrant under study has a very diverse and contrasting geography, made up of different mountain ranges and sierras, peneplains, inland basins and sedimentary plains at different altitudes ([Fig. 1](#)). The Cantabrian Mountains represent the northern boundary with an east-west orientation and a maximum altitude of 1800–2200 m a.s.l., although in the Picos de Europa, in the north-eastern extreme of the demarcated area, the altitude exceeds 2500 m a.s.l. The river system crosses this chain in a general north-south direction, forming part of the tributaries of the Duero River basin to the south and the Sil River to the west. During Last Glacial Maximum, numerous glaciers arose in the area, occupying a large part of the valley headwaters on the southern slopes ([Redondo Vega et al., 2014](#)). The mountain environment, which is characteristic of the extreme north, gives way to the Meseta environment more gradually than on the steep northern slope, with a flattened landscape and gentle relief forms, characteristic of the Duero basin (750–800 m).

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To the west, the Galaico-Leonese Massif and the eastern (Ancares, Courel) and south-eastern Galician mountain ranges have peaks around 1500–2000 m tall and demarcates (together with the Cantabrian Mountains) one of the inland basins, the one corresponding to the Bierzo comarca (500 m a.s.l.). The Sil is the main river in this area, running NE-SW. Terra Chá (Lugo) is a large plain (450–600 m) framed between the Northern Galician Sierras and the Galician Meridian Ridge. The Miño River runs in an N-S direction through this area and progressively becomes narrower until it forms a deep and narrow canyon, where it finally meets the Sil River, following a NE-SW direction. To the north, the Sierra del Xistral (1056 m) is a natural route that connects A Terra Chá with a large coastal plain (Rasa Cantábrica, 20 m a.s.l.). The Galician coastline is approximately 1500 km long. The western (Atlantic) shores are characterised by deeply indented coastlines resulting from a slow land subsidence movement that has created a peculiar waterscape, the so-called *rías* (Galician fjords) which are elongated, deep, steep-sided sunken valleys (González-Gómez de Agüero et al., 2019).

From a geological point of view, the delimited area includes the Iberian Massif and the inland Cenozoic Basins (the Duero basin and the Vilalba or Bierzo depressions, among others). The former is a large outcrop of Precambrian and Paleozoic rocks that has been divided into several geological zones (Pérez-Estaún et al., 2004) and those present in the delimited area are (from west to east): the Tras-os-Montes Galicia Zone; the Central Iberian Zone; the Asturoccidental-Leonesa Zone; and the Cantabrian Zone. In the first two zones, which include the western sector of the area under review, there is a prevalence of granites, quartzites and schists, together with small calcareous areas located on the eastern margins. In the remaining area, which affects the central sector of the Cantabrian Mountains (north and northeast of León), there mainly are limestone formations with siliciclastic intercalations.

## 1.2. A brief history of research

Research on the Mesolithic in the study area has taken different paths over the years, and all known data are concentrated in certain areas, with large imbalances and wide information gaps (Fig. 1). In the south of

the Cantabrian Mountains, this period has so far only been observed in the limestone area closest to the change of slopes in the Cordillera itself, and in the easternmost sector, in the area around the Picos de Europa. Three sites have been documented here, all in caves: El Espertín, La Uña and La Braña/Arintero (Neira Campos et al., 2006; Vidal Encinas and Prada Marcos, 2010). Archaeological work was carried out in the first two from 1991 until 2004. The Mesolithic levels present in these two caves (both of small dimensions) have been interpreted as seasonal occupation sites that would have been frequented by hunter-gatherer groups during warmer periods. La Braña/Arintero Cave contains a funerary assemblage with two individuals, but no areas with other uses have yet been identified in this cave.

To the south of the Cordillera, the Duero basin is not a favourable environment for the location of potential open-air sites due both to the absence of environments that allow the preservation of these contexts (caves or shelters) and as a result of different post-depositional processes, including intense agricultural activity, which may have altered or destroyed such remains. In any case, although sets of open-air lithic industries belonging to other chronological periods (Early Palaeolithic, Recent Prehistory) (Fuertes-Prieto et al., 2018) have been found, Mesolithic materials have yet to be identified in this area.

Two main categories of Mesolithic sites have been observed in the Galician area. On the one hand, in coastal environments, there are a series of stations with macrolithic industries similar to those of the Asturian along the southern coast, and at the easternmost point of the northern coast of this geographic area (Llana Rodríguez, 1990; Ramil Soneira and Pena Puentes, 1992; Ramil Rego et al., 2016). On the other hand, sites with non-macrolithic industries have been documented elsewhere, mostly inland but also on the coast. Recent research has collected the main characteristics of the most significant sites (Ramil Rego et al., 2021).

Since the 1970s, around 30 Mesolithic sites have been located (test pit recognition) mainly at Sierra del Xistral (north of Lugo), such as the sites of Xestido or Curro Vello (Ramil Rego, 1995; Ramil Rego et al., 2016). Those settlements took place in the open or were sheltered by granite outcrops, and this is also the reason why their stratigraphies are

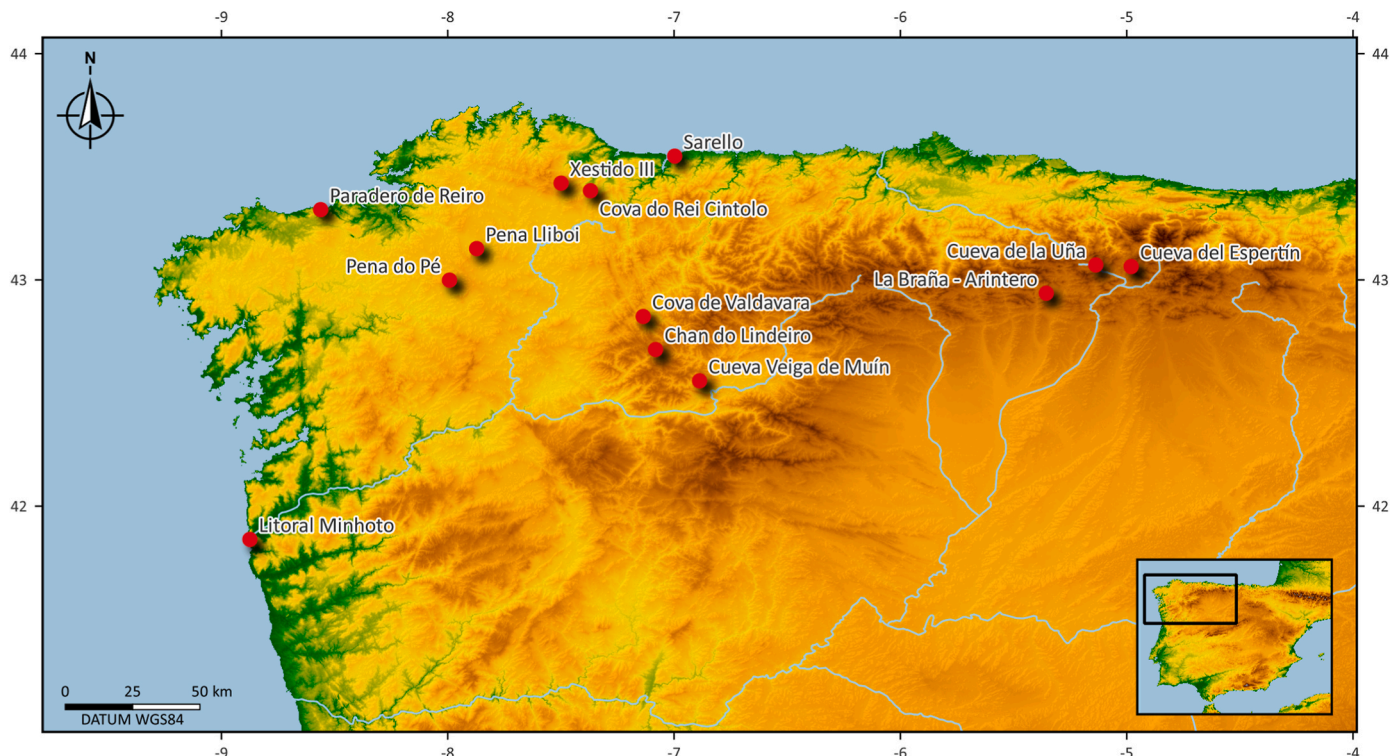


Fig. 1. Location of the main sites cited in the text.

linked to edaphic structures (Ramil Soneira and Ramil Rego, 1996). Although the attribution of some of these settlements to the Mesolithic may be hindered by the lack of radiocarbon dating, the characteristics of the lithic industry and the palaeoenvironmental and edaphic studies carried out on the test pits, and their correlation with the analysis of peat bogs in the area, clearly point to this period (Ramil Rego, 1992; Ramil Rego et al., 2016). In the Xistral area we will focus on the site of Xestido III (which will be described in section 2). There are other sites, such as Abrigo 29 (Ramil Rego et al., 2016) or Chan da Cruz (Ramil Soneira et al., 1991; López Cordeiro, 2003), that are not discussed here due to the small number of lithic remains or the need for a more detailed publication of the lithic assemblages.

In the Sierra de O Bocelo (east of A Coruña), some sites with lithic remains on the surface that could date to the late Pleistocene or early Holocene have been identified (Cerqueiro Landín, 1991). In this area, the site of Pena do Pé is worth noting, although radiocarbon dates are not yet available for it.

Finally, in recent years some occupations linked to this period have also been identified in caves in the eastern part of Lugo, within a karstic context (de Lombera Hermida, 2011).

Those lithic assemblages located both in western Asturias, such as Sarello (Ramil Soneira and Pena Puentes, 1992) and in the Litoral Minhoto (O Rosal, A Guarda, Caminha and Viana do Castelo) that are techno-typologically compatible with the Asturian present a special problem. Their lithic industries are mostly documented in surface deposits containing numerous boulders, which indicates the absence of a stratigraphic context. For almost 100 years, attempts have been made to define these lithic assemblages chronoculturally within the Ancorian (Serpa Pinto, 1928), Pre-Asturian (Jalhay, 1925) or Camposanquian (Fontes, 1925) periods, with inconclusive results. On the southern Galician coast, some attempts to locate stratigraphic sites from this period have failed. Several sites yielded macrolithic industries on their surfaces, which, once excavated, were assigned to different periods of the Recent Prehistoric period (Cano Pan and Vázquez Varela, 1986; Cano Pan, 1990). On the northern Portuguese coast, the work of J. Meireles (1992, 1993–94) has provided some stratigraphic data that allowed him to identify a macrolithic industry developed from the end of the Last Glacial Maximum, and which would culminate in Mesolithic times. A thorough review of the macrolithic industries of the Minhoto Littoral, with its tens of thousands of remains found across a number of museums in the northwest of the Iberian Peninsula, as well as the field research projects taking place there, will allow for a chronocultural characterisation to be made of these archaeological deposits.

Some sites are known in northern Portugal, such as Prazo (Monteiro-Rodrigues, 2011: 183–214), Vale da Cerdeira 1 (Xavier et al., 2022), Olga Grande 6 (Aubry et al., 2017) or Terraço da Foz do Medal (Gaspar et al., 2016), which have been attributed to both the Upper Palaeolithic-Mesolithic and the Mesolithic-Neolithic transitional periods. As we do not have assemblages that can be unambiguously attributed solely to the Mesolithic, nor lithic collections that allow comparison with other sites, we cannot take them into account for the time being.

## 2. The sites

This section describes the most significant sites from this period based on published studies of lithic collections, or on anthropological evidence analysed and dated at this time. In addition, other sites with Mesolithic dates or materials characteristic of this time period are also included, although in some cases the contexts are very limited.

### 2.1. La Uña (Acebedo, León)

The cave of La Uña is located 1200 m a.s.l. in a mountainous area in the middle of an open valley at the head of the Esla River. It is located on the southern slopes of the Cantabrian Mountains, but close (<5 km) to

the Ventaniella mountain pass, which connects the Ponga Valley, to the northern slope. It was discovered in 1991 and archaeological work carried out there between 1992 and 2004 during four field seasons (Neira Campos et al., 2012; 2016; Herrero-Alonso et al., 2021a). It is a very small limestone cave (~18 m<sup>2</sup> and hardly 1.5 m in height) and therefore could not have held a very large group of individuals. The excavation identified a total of four archaeological levels with some stratigraphic issues in the upper levels due to bioturbations. To circumvent this problem, only the parts with the greatest stratigraphic integrity in Levels III and IV have been selected for the present study. They are both dated to the Mesolithic by three AMS radiocarbon dates (Neira Campos et al., 2012; 2016). Two charcoal samples were obtained from a hearth found in Level III. The sample from Level IV is also a charcoal from a combustion area, but the hearth structure was disturbed and therefore not preserved.

### 2.2. El Espertín (Burón, León)

The El Espertín site, at 1230 m a.s.l., is located in a mountainous area in the southern part of the Cantabrian Range. It is a limestone cave situated in an enclosed fluvial valley of the Orza River, a tributary of the Esla River. *A priori*, El Espertín is not located on any of the direct routes from the mountain passes (Pontón pass being the nearest), despite the watershed being 3.5 km as the crow flies. It was excavated extensively between 1991 and 1997. The cave is only a little larger (25 m<sup>2</sup>) than La Uña and thus equally unsuitable for a large group of individuals. Two levels were identified by the excavation, of which only Level II was archaeologically fertile and contained the Mesolithic occupations (Neira Campos et al., 2004; Neira Campos and Fuertes Prieto, 2009). Two radiocarbon dates, both from animal bones, come from this level. The first (Gif-10053) is a conventional C14 date from the base of the level, while the second (Beta-193760) is an AMS C14 date from the top of the level.

The caves of La Uña and El Espertín are located close to the southwest side of Picos de Europa which, with altitudes above 2500 m a.s.l., form the central and highest massif of the Cantabrian Range. Both sites are located at the headwaters of the Esla River, one of the most important tributaries to the right of the Douro River, and very close to the routes that provide access the north slope through mountain passes.

### 2.3. La Braña/Arintero (Valdelugeros, León)

The Cave of La Braña-Arintero is located in an abrupt limestone massif at an altitude of 1489 m a.s.l., on the southern slopes of the Cantabrian Mountains, at the headwaters of the Curueño River. Two human skeletons were discovered inside the cave during its exploration by a group of speleologists in late 2006 (Vidal Encinas et al., 2008; Vidal Encinas and Prada Marcos, 2010). Owing to the potential risks the remains were exposed to (e.g. being disturbed or damaged by people who had found about the discovery), they needed to be collected immediately. The bones and other exogenic material found with them (mainly charcoal) were collected in a controlled manner. The sediment on which one of the individuals (known as Braña-2) was resting was also collected for analysis. In the case of the other individual (Braña-1), no sediment could be collected as the remains lay directly upon the calcite floor of the cave.

Access to the area where these finds were unearthed is difficult from the present cave entrance, as it is necessary to use alpine techniques to climb some 4 m up a nearly vertical flowstone wall and, almost immediately afterwards, descend an 8 m pit down to the opening of a narrow passage which leads to the rest of the cave, through a series of larger chambers and passages sloping both up and down. The Braña-1 individual was found at the beginning of this passage. Braña-2 was located at the base of the pit, about 4 m below where the first individual was found, and 12 m below the top of this pit.

This difficult access suggests that another entrance existed and was



used in prehistoric times, and which is now blocked. This theory is supported by the finding, in an even deeper part of the cave, of a brown bear skeleton (*Ursus arctos*), whose radiocarbon dating has shown it to be contemporary with the human remains (Fernández Rodríguez, 2010). The two human individuals have also been radiocarbon dated by AMS (Vidal Encinas et al., 2008).

#### 2.4. Paradero de Reiro (Arteixo, A Coruña)

Paradero de Reiro is located on the Atlantic coast and was discovered in 1969 while extracting aggregates, which revealed a fossilized peat bog that contained lithics and some faunal remains (Ramil Soneira, 1973). It was an open-air site located on the marine coastal margin, next to a small watercourse, at 8 m a.s.l. The area's topography provides good protection against the predominant south-west rainfall and north-east winter winds. The site is placed at the far end of the coastal arch of ancient marshes and was connected to a flat littoral platform. Stratigraphically, Paradero de Reiro is a unique case in the Galician Mesolithic, with its archaeological evidence found in a 20 cm thick fossil peat level, laid on saprolite and covered by a dune. A peat sample was dated by radiocarbon (Saá, 1985).

#### 2.5. Pena Lliboi (Guitiriz, Lugo)

The settlement, at 461 m a.s.l., was found under a set of granite boulders, which formed a cavity over 30 m<sup>2</sup> with the rocks visible on the present-day surface. It is found inland and was discovered in 1991 after carrying out some archaeological survey over a 3 m<sup>2</sup> area (López-Felpeto and Llana Rodríguez, 1997; Villar Quinteiro et al., 1997). The site presents a 1.20-m-deep stratigraphic sequence, with three edaphic formation cycles. Most of the evidence was found at the organic level from the second cycle (2A), which is c. 20 cm thick. This level coincides with an increase in phosphorus and carbon concentrations (Martínez Cortizas and Moares Domínguez, 1995).

#### 2.6. Xestido III (Abadín, Lugo)

Xestido III is an open-air site discovered in 1985 during a survey project of Sierra del Xistral (Ramil Soneira et al., 1994). The site is at the bottom of a valley, among peat bogs, in a mountainous massif that rises between a vast inland plain to the south and the coastal plain to the north, close to a narrowing of the natural pass. It is on a small knoll rising between two active peat bogs, in the northern mountains, at 614 m a.s.l. The excavation covered 40 m<sup>2</sup> and took place in 1985, 1986 and 1991.

This site shows a simple sequence, 40 cm thick, and it presents two edaphic cycles. The archaeological evidence is concentrated in the organic level of the second cycle (2Ah), the thickness of which ranges between 5 and 14 cm. The chemical and pollen analyses have shown the existence of an intense activity area, connected to an adjacent resting area, where the number of lithics is noticeably smaller and the presence of polypodium spores (a fern linked to the formation of a mulching layer) is extremely higher. A simple basin hearth was discovered at the site and a charcoal sample was radiocarbon dated from this structure (Ramil Soneira et al., 1991). There is a fine lithic collection from this site (Ramil Soneira et al., 1991; Villar Quinteiro, 1997).

#### 2.7. Chan do Lindeiro (Pedrafita do Cebreiro, Lugo)

The cavity known as Sima do Chan do Lindeiro or Sima del Uro (1080 m a.s.l.) corresponds to a karst system consisting of a large vertical fracture associated with a small doline and a main gallery. It was located in 1981 by speleologists, and within it human and faunal bone remains were found (Vaquero-Rodríguez et al., 2017). These remains correspond to a human individual and three aurochs (*Bos primigenius*). The accumulation of bone remains is interpreted as the result of a fall

linked to a catastrophic event involving a sinkhole collapsing into a deep cave gallery. This would have given rise to a trap for both animals and humans circulating through the affected surface. An association between these remains has been suggested, and it has even been proposed that it might be connected with the process of domesticating aurochs (Grandal-d'Anglade and Vidal Gorosquieta, 2017). There are three radiocarbon dates from different aurochs (Gurke et al., 2021) and two radiocarbon dates from different human bones (Serrulla Rech and Sanín Matias, 2017).

#### 2.8. Other sites

A Cova de Veiga de Muín (Corullón, León) is a small limestone cavity located in El Bierzo, next to the Selmo River, a tributary of the Sil River, at 460 m a.s.l. and 10 m above the river bed. Four test pits were dug during two archaeological seasons between 2020 and 2022, which allowed us to detect archaeological material within a stratigraphy, but the levels observed have been altered by a number of natural and biological processes. This has led to materials from different periods becoming mixed within the same context. The archaeological material consists mainly of animal remains (especially macromammals), ceramics (Recent Prehistoric) and lithics. In addition to some sporadic visits to the site at certain points time during Recent Prehistory, the typo-technological features of the lithic industry indicate human presence during the Mesolithic. Given that the material is still under study, it is only possible to provide preliminary data on this site.

Valdavara 1–2 (Becerreá, Lugo) is located in the karstic system of the Vegadeo formation on the outskirts of the town of Becerreá. It is on the right bank of the Narón River, at 600 m. a.s.l. and about 120 m high over the valley. It is situated on the outer slope between Valdavara cave (or Valdavara 1) and Valdavara 2 (fissure below the cave). The excavation began in 2008 and three main layers were recorded (Vaquero-Rodríguez et al., 2011). Level C (9–33 cm) yielded an archaeological assemblage, although not very rich, has been attributed to the Macrolithic Mesolithic or Mesolithic of Notches and Denticulates based on the radiocarbon dating of two bone samples, and also based on the general features of the lithics.

The Rei Cintolo Cave (Mondoñedo, Lugo) is located in the karstic system of the Vegadeo formation, near Mondoñedo. It is situated on the slope of Couto do Rei (330 m a.s.l.) next to the Valiñadares River. It is a large and well-known cave, with a complex karstic system made up of large chambers and numerous galleries. Part of the sedimentary filling of these chambers has been removed since the 19th century. In 2002, a series of test pits were dug in different areas (Villar Quinteiro, 2007). In a small one (S3) (46 cm deep) carried out in an interior gallery, called 'Camarin', a bone assemblage was found at a depth of 15–25 cm, C14 dated to the Mesolithic. The sedimentological features were homogeneous and there were no artefacts associated with the faunal remains.

Pena do Pé (Toques, A Coruña) is sheltered by granite block and is found at 706 m a.s.l., in a transitional zone between the upper peneplain of the Sierra and an inland valley. It was discovered in 1989 during a survey, and a 1 m<sup>2</sup> and 55 cm deep test pit was dug, but not exhausted (Cerqueiro Landín, 1991). The stratigraphy is altered by a burrow in the intervening area, and there are lithics present (N = 378) along the entire excavated section. Ceramic fragments of a contemporary nature were found in the upper part (up to 20 cm), unrelated to the lithic assemblage. No other archaeological material was recovered. The lithic assemblage has a homogeneous, microlithic appearance, with an abundance of flakes, although there are some laminar-like blanks. The retouched material is not very abundant (N = 19), but almost half of the pieces correspond to microliths (geometric and points). Although the context is heavily altered and the study is presented as preliminary, it may be possible to assign this assemblage to the Mesolithic, pending the extension of the intervention to an undisturbed area and the completion of the lithic study.

**Table 1**

Available Mesolithic radiocarbon dates for the study area. Calibrated from INTCAL20, OxCal v4.4.4 (Reimer et al., 2020; Bronk Ramsey, 2021).

Site	Level/context	Sample	Reference	C14 BP	Cal BC (95,4%)	Source
La Uña	III	charcoal	Beta-193758	6280 ± 80	5471–5031	Neira Campos et al., 2012
La Uña	III	charcoal	Beta-193759	6150 ± 40	5215–4960	Neira Campos et al., 2012
La Uña	IV	charcoal	Beta-242627	7010 ± 50	5990–5757	Neira Campos et al., 2016
El Espertín	II	bone	Gif-10053	7790 ± 120	7030–6439	Neira Campos et al., 2004
El Espertín	II	bone	Beta-193760	7080 ± 40	6057–5847	Bernaldo de Quirós y Neira, 2008
La Braña	1	human	Beta-226472	6980 ± 50	5982–5741	Vidal Encinas et al., 2008
La Braña	2	human	Beta-226473	7030 ± 50	6015–5789	Vidal Encinas et al., 2008
La Braña		<i>Urus arctos</i>	Beta-254603	6900 ± 50	5895–5669	Fernández Rodríguez, 2010
Paradero de Reiro		peat	CSIC-508	6590 ± 70	5638–5382	Saá (1985)
Xestido III		charcoal	GrN-16839	7319 ± 160	6471–5850	Ramil Soneira and dir, 1991
Chan do Lindeiro	CL-07	human (occipital)	Ua-13398	7995 ± 70	7071–6656	Serrulla y Sanín, 2017
Chan do Lindeiro	CL-23	human (tibia)	Ua-38115	8236 ± 51	7458–7077	Serrulla y Sanín, 2017
Chan do Lindeiro	CL-68	<i>Bos primigenius</i>	Ua-38454	8297 ± 59	7515–7086	Gurke et al. (2021)
Chan do Lindeiro	CL-69	<i>Bos primigenius</i>	Ua-38114	8311 ± 60	7525–7090	Gurke et al. (2021)
Chan do Lindeiro	CL-85	<i>Bos primigenius</i>	Ua-38455	8111 ± 59	7326–6830	Personal comm. A. Grandal
Valdavara 1-2	C	bone	Beta-257850	8920 ± 50	8271–7873	Vaquero-Rodríguez et al., 2011
Valdavara 1-2	C	bone	Beta-259199	8890 ± 60	8249–7808	Vaquero-Rodríguez et al., 2011
Cueva do Rei Cintolo	Camarín, S3	bone	Lyon-2731 (OxA)	7735 ± 60	6683–6456	Villar Quinteiro, 2007

### 3. Chronological and environmental framework

The available dates for the areas covered in this paper are listed in Table 1. Some of them were obtained from levels with an abundant and significant archaeological record, while others are linked solely to anthropological remains and finally to some more meagre contexts. The period covered is from the last quarter of the 9th millennium BC to the end of the 6th millennium BC (c. 8300 - 5000 cal BC), although the precision and distribution of the radiocarbon dates are uneven (Fig. 2). The earliest dates are from Valdavara 1–2. Then there is the series from Chan do Lindeiro, with the aurochs dated to the second half of the 8th millennium, and the human remains the same and also to the first half of the 7th millennium BC. Assuming that the two human dates correspond to a single individual (Grandal-d' Anglade and Vidal Gorosquieta, 2017), the overlap between the two occurs at the end of the 8th millennium BC. One of the dates from of El Espertín and that from the Cueva del Rei Cintolo fall in the first half of the 7th millenium BC. Then comes the date from Xestido, in the second half of the 7th millennium BC, which would coincide, at least for part of its calibration interval, with the 8.2k event. Thereafter, in the first third of the 6th millennium BC, there are four dates corresponding to sites in the Cantabrian area: La Braña/Arintero, the old level in La Uña (Level IV) and the second of the El Espertín dates. The date from Paradero de Reiro falls in the middle of the 6th millennium BC. Finally, the most recent level at La Uña (Level III) is dated to the last third of the 6th millennium BC. Although this was the time when the Neolithic had already arrived in the Iberian Peninsula, these dates for the last quarter of the 6th millennium BC are consistent with the final Mesolithic period in the Cantabrian Range. Here, the Neolithization process took place later (from about 5000 cal BC) than in the rest of the Iberian Peninsula (Fano et al., 2015; Cubas et al., 2016).

The least precise dates are mostly in the first half of the interval shown (c. 8300-6000 cal BC), due to both the large deviations of two of the dates (Gif-10053 and GrN-16839) and the flattening of the calibration curve from c. 8000 BP (c. 6900 cal BC) onwards.

A palaeoclimatic framework based on the analysis of several peat bogs and other limnic deposits, both coastal and continental, is available for the study area. These bogs and deposits have provided a complete palaeopolynological sequence covering approximately the last 50,000 years (Iriarte-Chiapusso et al., 2016; Muñoz Sobrino et al., 1996, 2005; Ramil Rego et al., 1996a).

This sequence has made it possible to document that, in the moments preceding the Mesolithic occupation of the Serra do Xistral, the pollen records indicate the presence of a strong increase in the percentage of tree pollen, with a landscape dominated by deciduous forests (oak and hazel, followed at a distance by birch and holly) and a progressive evolution towards an oceanic climate. At the same time as the Mesolithic

occupation, there was a series of deforestation episodes attributed to the activity of these human groups (Ramil-Rego, 1992). This activity may have been linked to the transformation of dense forests into pastures and scrubland, which favoured the presence of game species in the territory.

The time interval falls entirely during the Holocene, from its Early to Middle periods (Iriarte-Chiapusso et al., 2016). The general climatic improvement, due to an increase in temperature and humidity, is characteristic of this period. This is reflected in the expansion and configuration of the forest, which becomes the predominant landscape. However, there were occasional intervals of climatic worsening, such as the 8.2 ka event, which is reflected in some oscillations in the tree line, and which eventually stunted the development of deciduous forests in some mountainous areas. The second Holocene stage represented, the Middle Holocene (8200-7000 cal BP), following the 8.2 ka event, corresponds to the Climatic Optimum, a period of maximum temperatures.

### 4. Anthropological record

The anthropological remains recovered in these sites correspond to three individuals, all adults, two in La Braña/Arintero and one in Chan do Lindeiro (Table 2).

The remains from La Braña/Arintero are in a very good state of preservation due to the stable environmental conditions of the cave. The arrangement of the two individuals practically in situ has allowed for a fairly complete recovery of the bones of both skeletons to be made, including those smaller in size and more fragile (thyroid cartilage). Having said that the facial portion of the La Braña-2 individual is missing due to recent fractures, perhaps related to its discovery. Although La Braña-1 is slightly younger and slightly taller (Table 2) (Prada Marcos, 2010), they are both adult males.

This assemblage was interpreted as a funerary context due to the anatomical connection of La Braña-1 and its placement in a foetal position (left lateral decubitus position with the legs bent towards the front of the body) next to La Braña-2. Although the latter was not anatomically connected, an equally intentional placement of the body has been proposed, which would not have been maintained due to the reduced dimensions of the space (the bottom of a pit), the processes of decomposition in an empty space and other post-depositional processes (flooding of the bottom of the pit). All of these factors may have affected the distribution of the remains, as well as possible trampling alterations (breaking of facial bones) and removals provoked by the discovery.

This primary double funerary context in a deep area of the cave is characterised by the arrangement of the individuals on the surface, without any actual burial. Although not very common, there are other examples of Mesolithic funerary contexts in the Cantabrian area involving surface depositions of the body, such as the man from Tito

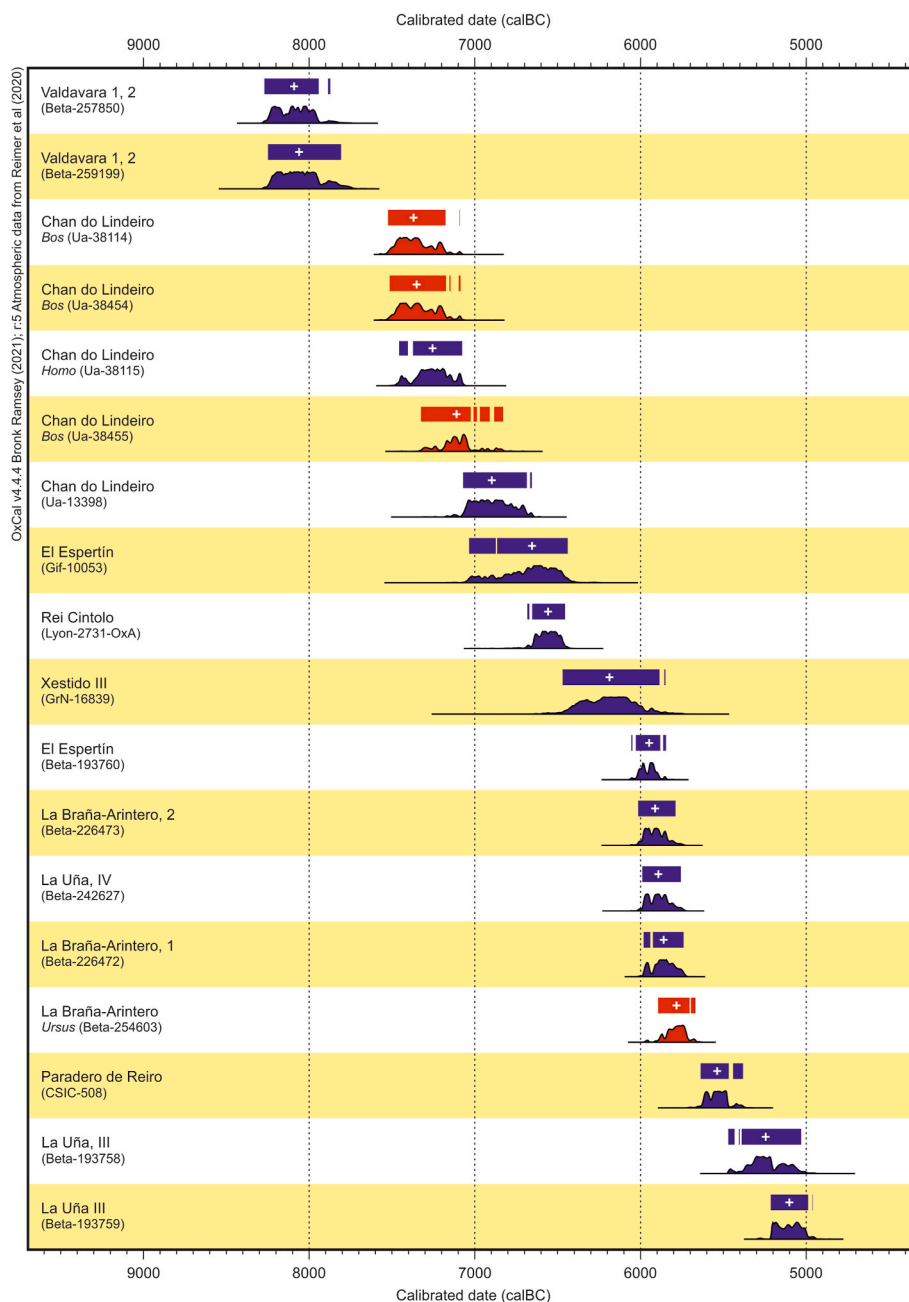


Fig. 2. Mesolithic dates for the study area. Palaeontological remains are shown in red.

Table 2

Generic characteristics of the anthropological remains available for the study area.

	Sex	Age	Height (cm)
La Braña - 1	Male	30–35	170.5
La Braña - 2	Male	40	166.5
Chan do Lindeiro	Female	Young adult (20–40)	153.0

Bustillo (Drak et al., 2008), and also decomposition in an empty space in an enclosed environment, such as Tomb 2A from Los Canes (Drak et al., 2020).

The few remains associated with both individuals included ochre and charcoal fragments. These were much more abundant in La Braña-2. The anthracological study (Carrión, 2010) revealed a different pattern in the species associated with each person, pine (*Pinus nigra-sylvestris*) in the

case of La Braña-1, and juniper (*Juniperus* sp.) in the case of La Braña-2. The meaning of these different associations and whether it could be related to the burial ritual or more practical issues linked to the lighting of the interior is unknown.

No grave goods were found, except for a set of 24 perforated red deer atrophic canines, which are only associated with La Braña-2 and will be discussed in the section on the bone industry.

Genetic analyses (Sánchez-Quinto et al., 2012; Olalde et al., 2014) determined that the two individuals were siblings, assigning them to the mitochondrial haplotype U5b (U5b2c1), one of the most frequent in Mesolithic populations from other areas of Central and northern Europe, and also present in other individuals from Iberia (such as in the Aizpea rock shelter), indicating great genetic uniformity among these European Mesolithic populations. In contrast, there is less affinity with the Neolithic population, although a proportion of La Braña-1 ancestors was found in Neolithic Iberia (Olalde et al., 2018). Other findings from the

genetic analysis include brown hair, dark skin and light (blue) eyes, a combination not present in current European populations, but recognised in other Mesolithic individuals, e.g., Cheddar Man (Brace et al., 2019).

The individual from Chan do Lindeiro has been identified as a female and its context is different from that of La Braña as it was found with no funerary context in a deep cave gallery associated with a collapsed sinkhole (Grandal-d'Anglade and Vidal Gorosquieta, 2017). The skeletal fragments were scattered among the collapse debris and completely disarticulated. The individual is not complete. It has been partially recovered and the remains are fractured in some cases (Serrulla Rech and Sanín Matías, 2017). There are around twenty skeletal remains including several cranial fragments that allowed the skull to be reconstructed, albeit without the facial bones and the mandible. No other human remains, artifacts or lithic tools were found here. The only other findings at the site are the remains of three aurochs. Genetic studies have determined that the woman belongs to haplotype U5b (González-Fortes et al., 2017) and is genetically closer to the Magdalenian female from El Mirón (Cantabria) than to the males from La Braña-Arintero (Olalde et al., 2019).

### 5. Artefact record

#### 5.1. Lithic industry

The Mesolithic contexts with lithic remains are not associated with anthropological remains and represent most of the sites described in section 2. Some of them have radiocarbon dates that have allowed for the development of the Mesolithic in the area to be dated, with no discrepancies between the different geographical areas considered or with the dates from the anthropological remains.

##### 5.1.1. Raw material

Due to the various geological contexts in which they occur, the use of the different types of raw materials for lithic production in the above-mentioned sites is very uneven. Firstly, the sites in the extreme northwest (Galicia) are located in the Tras-os-Montes Galicia (Paradero de

Reiro), Central Iberian (Pena Lliboi) and Asturoccidental-Leonesa (Xestido III) geological zones, where metasedimentary and igneous rocks are abundant. In these deposits, quartz is the most abundant raw material, representing 70%–88% of the total (Fig. 3), followed by quartzite and chert, which is present in lesser quantities. The Cantabrian sector, by contrast, consists primarily of carbonate sediments (limestones and dolomites) and, to a lesser extent, siliceous sediments (shales and sandstones), together with layers of Armorican quartzite, which form the Cantabrian Zone. From an archaeological perspective, radiolarite and quartzite are predominant in this area, with the sum of these three materials representing 99.5% of the total at El Espertín and 85–88% at La Uña (Herrero-Alonso et al., 2020; 2021c). Finally, the Veiga do Muín site is located between the two areas, but within the Asturoccidental-Leonesa Zone, and therefore shows a predominance of quartz, similar to the Galician sites.

Raw material provenance studies vary according to the material. In the case of quartz, a mineral with almost identical texture and composition, determining its origin is a complex task. To date, it has not been possible to differentiate quartz by origin in any of the geological zones. However, it is a material that occurs in all geological zones in the north of the Iberian Peninsula, both in isolated mineralisation and in dykes, making it highly ubiquitous. Within this group, in Galicia, the quartz reef and the milky quartz predominate. It is documented a distinguishing use of the variants of quartz due to their particular morphostructural features which determine their mechanical response. Therefore, the variants with greater isotropy (milky quartz and crystal quartz) were used to make objects which required a better mechanical response, such as geometrics, backed bladelets and narrow dihedral burins.

Regarding quartzite, in recent years work has been published in the Cantabrian region describing the different types of quartzite that can be grouped based on their texture (Prieto et al., 2021). However, although the context in which the quartzites were collected can be inferred, it has not yet been possible to determine their provenance.

In conclusion, there are currently no specific studies on the provenance of the quartzite, or quartz, although we can assume that they are materials that occur throughout the study area and would have been part of the local materials available in the surroundings of the sites for

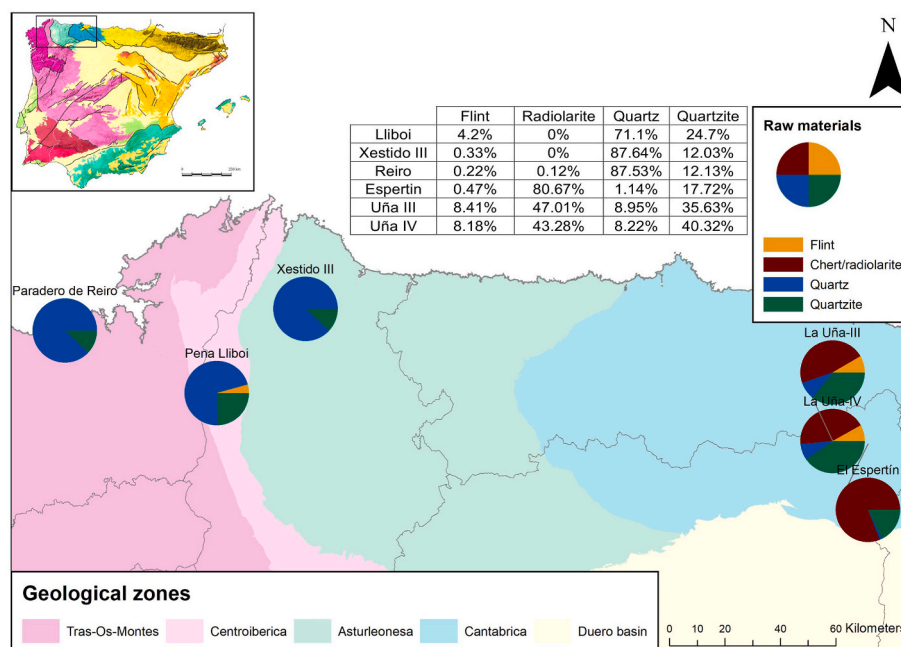


Fig. 3. Distribution of raw materials in general groups (quartz, quartzite, chert and radiolarite, and flint) in the lithic assemblages of the sites mentioned. The quartz group includes quartz and crystal quartz. El Espertín (N = 12869), La Uña III (N = 4769), La Uña IV (N = 4757), Lliboi (N = 3152), Xestido III (N = 923), Paradero de Reiro (N = 1348).



humans to make use of (Ramil Soneira and Ramil Rego, 1996; Herrero-Alonso et al., 2020).

Cherts and radiolarites are more frequent in the Cantabrian area, but they can also be found in the Central Iberian Zone (de Lombera Hermida et al., 2016). Several studies have been carried out in the last fifteen years to identify chert and radiolarite in geological formations of the Cantabrian Zone (Herrero-Alonso, 2018; Herrero-Alonso et al., 2021b). In these studies, several types of these materials (e.g. Alba radiolarite, Fito chert and Portillas chert) were defined and described based on their texture, mineralogical and geochemical composition. In addition, their occurrence in archaeological sites was verified. Geographical information on their distribution, availability and suitability for knapping has also been provided. Both chert and radiolarite are widespread groups in La Uña and El Espertín (Fig. 3), and are also present in small numbers in Veiga do Muín. The latter would be from the middle Iberian Zone, as opposed to the Cantabrian.

On the other hand, flint is scarce in these archaeological assemblages (<0.5% in Xestido, Paradero de Reiro and El Espertín, 1% at Pena do Pé, and about 4% in Pena Lliboi), which is linked to its low availability as a local resource. As an exception, there is 26% of flint in Valdavara 1–2 (Vaquero-Rodríguez et al., 2011), although the assemblage is very small, and levels III and IV at La Uña, where it accounts for almost 10% of the total, although originating from different areas (Herrero Alonso, 2018; Herrero-Alonso et al., 2020). The flint types associated with the Mesozoic-Cenozoic basin of Oviedo, where the Piedramuelle (Corchón, 1993) and Piloña flints are found (Tarrío et al., 2013), come from the north. In addition, there are also other varieties from the northeast, from the Basque-Cantabrian basin (Tarrío et al., 2016), such as Flysch, Treviño, Urbasa, Urganian or Monte Picota flint.

Specific work on the identification of raw materials has allowed to make a fairly accurate assessment of the origin of the materials found in El Espertín and La Uña (Herrero-Alonso et al., 2020). A distinction has been made between local (<30 km), regional (30–120 km) and tracer (>120 km) materials (Tarrío Vinagre et al., 2016). Furthermore, different patterns of uptake and management have been identified depending on the varieties present at these particular sites (Herrero-Alonso et al., 2020; 2021a). In general, the abundance of raw materials at both sites is inversely proportional to the distance from the sources, with some exceptions. Among the regional varieties found at La Uña, Piedramuelle flint (70 km in a straight line) is more abundant than Pendueles chert (55 km), and in Level III, Flysch flint (>165 km) is more abundant than any non-local variety. In El Espertín, the scarcity of Fito chert (18 km) is striking, in contrast to the abundance of Las Portillas chert (20 km), which is more abundant, although it can be found at a similar distance.

In Galicia, flint is scarce and its presence has been documented in some outcrops and workshops north of Lugo in relation to thermal activity and not far (20 km) from Xestido (Ramil Soneira and Ramil Rego, 1996), as well as other isolated outcrops in relation to alteration processes and other contexts (de Lombera Hermida et al., 2016). However, the use of flint was less common during the Mesolithic, when quartz was more popular, in contrast to what happened in this area previously during the Magdalenian (Ramil Soneira and Ramil Rego, 1996; Ramil Rego, 1997).

### 5.1.2. Lithic technology

The different types of raw material, and above all the most abundant in the local context, largely determine the type of technical management found in the various sites. The predominance of quartz in Galicia is directly linked to the use of flexible methods for obtaining mainly flakes, although rock crystal also allows the production of bladelets. The prevalence of chert/radiolarite in the León deposits allows for a greater development of laminar methods.

From a general point of view, two reduction targets have been identified: the production of flakes and the production of laminar blanks. Flakes predominate in the assemblages, but with significant

differences between Galician sites, where the series studied range from 75% to 85% (Ramil-Rego et al., 2021), and Cantabrian sites, where flakes range from 40% to 60% depending on the raw material (Herrero-Alonso et al., 2020). The importance of quartz in the former must be considered. In Galicia, blades are represented in small numbers and a strong preference was noted for bladelets (<20%) made of crystal quartz or flint, despite their small presence within the series. At La Uña and Espertín, the laminar production on the local lithologies is around 10–25% in chert and radiolarite, but much lower in quartzite (5–8%) and quartz (<4% only in La Uña).

A great command of the technique and deep knowledge of the raw material is observed. The technical gestures were precise and efficient, using operating sequences which could be variable and flexible according to the mechanical response of the lithic resource, especially in the case of crystal quartz in Galicia, whose exploitation was made obliquely to the hexahedron, coinciding with its natural fracturing lines (Ramil Soneira and Ramil Rego, 1997). This procedure has been identified also at La Uña (Herrero-Alonso et al., 2021a). The production of the debitage products in Galician sites got away from any precious capriciousness, opting for pragmatism, in other words, involving the minimum amount of but maximum use of the raw material, and minimum effort (Ramil-Rego et al., 2021). Besides the opportunistic exploitation of the natural edges or fracture planes, prismatic cores were shaped when the raw material and the matrix allowed them to do so.

In Level C at Valdavara 1–2 the lithic assemblage is scarce (N=175). The predominant quartz assemblage is knapped by expedient reduction sequences to produce flakes. Reduction methods are employed on flint for the production of elongated blanks (Vaquero-Rodríguez et al., 2011).

Raw material management according to purpose is also well established procedure in the Cantabrian area sites, especially on raw materials other than quartz, which is poorly represented in La Uña and El Espertín, though it has been identified at La Uña following a bipolar operational scheme (Herrero-Alonso et al., 2021a). The technological study has been able to discern four main categories of production sequences at these sites (Neira Campos and Fuertes Prieto, 2009; Herrero-Alonso et al., 2020; 2021a). Unipolar prismatic methods are applied mostly to obtain laminar blanks, as there are other chaînes opératoires exclusively linked to flake production, as well as a more flexible or non-formalized one. Plaque nodule and centripetal/discoid chaînes are specifically applied when producing flakes on quartzite and radiolarite, and are only found at El Espertín. Within the prismatic sequences (unipolar reduction and a quite well-developed prior roughing out), four operational modalities have been differentiated and the pyramidal and 'formal prismatic' ones (frontal exploitation) are exclusively linked to standardized blade/bladelet production on chert, radiolarite or flint varieties.

As for the knapping techniques, direct percussion with hard and soft hammer have been identified, the latter more closely with laminar production. The application of indirect percussion or pressure has not been identified, at least not in a discriminant way, in either of the sites (La Uña or El Espertín).

The initial reduction processes are linked to the initial morphology of the nodules. In the case of blocks of bedded chert/radiolarite in primary position (Alba radiolarite and Fito chert), the original prismatic shape of the blocks is suitable for prismatic-type sequences. Natural edges on the blocks are used to start the reduction process. In this case of rounded subspherical cobbles, different schemes were identified, employing roughing out strategies of different intensities.

Regarding the blanks obtained, the general size is small, less than 40 mm in maximum dimensions for the Galician sites (Ramil Rego et al., 2021), which is similar to the León sites, although in those some quartzite and quartz (only in La Uña, Level III) pieces have been found to go up to 60–70 mm. Their values show wide variations, but with a concentration between 15 and 35 mm long and 10–20 mm wide, with the quartzite pieces and the quartzes with less isotropy being the ones that show greater variability. As for La Uña, the flake sizes are mostly



between 10 and 20 mm long and 5–20 mm wide, although the variability is quite high, especially in terms of the quartz and quartzite, which usually present larger formats (13–22 mm long and 10–20 mm wide). Laminar production is continuous and at La Uña is concentrated on bladelets about 5–8 mm in width (Herrero-Alonso et al., 2021a). At El Espertín, the production of laminar blanks is differentiated in certain sequences, but clusters around 6–9 mm. There is a slight diachronic decrease in the average width of laminar blanks: c. 9.5/9.6 mm in older assemblages (LU-IV and Espertín) and 8.5 mm in La Uña Level III. The retouched flakes and blade/bladelets are systematically larger and there are more laminar blanks and flint items within the retouched assemblage.

### 5.1.3. Lithic typology

The most important sites dealt with here (section 2) have been studied by applying the typology developed by Forte (1973), which makes it easier to compare these series with other assemblages. In general, the high diversity of the types represented is noteworthy, but the predominant groups vary according to areas.

In Galicia, the general characteristics are: a great presence of notches and denticulates (especially in Pena Lliboi and Xestido III); great variability in the frequency of endscrapers, burins (the most important group at Paradero de Rei) and borers; and very low values in the case of backed blades. Backed blades are unevenly represented, and are most abundant at Pena Lliboi. Geometrics are rare (<5%, except at Paradero de Rei, <10%), the most common being trapezoidal microliths and segments (Fig. 4). Besides abrupt retouching, the appearance of simple bifacial retouching at Xestido III geometrics must be highlighted (Fig. 4: 3).

In the León sites, the groups of notches and denticulates, and bladelets predominate. Notches and denticulates group predominates at El Espertín, whereas bladelets are the most abundant at La Uña. There are minor differences between the three assemblages (La Uña's Level III and IV, and El Espertín's level) in terms of other typological categories. In some cases, they are similarly represented in both levels at La Uña and less frequently at El Espertín, as in the case of burins, truncations, borers and backed blades. On the other hand, sometimes there are greater similarities between La Uña's Level III and El Espertín, as in the case of pieces with continuous retouching (diverse group), geometrics and microburins, which are not very common in La Uña's Level IV. However,

in all cases the presence of geometrics is small, always accounting for less than 5% of the total (Fig. 5). Triangles and trapezes appear in all three levels, although the former are more common at El Espertín. Two other elements at La Uña point to a later Mesolithic phase than at El Espertín: although abrupt retouching is the most common of the geometrics at both sites, simple bifacial retouching (double bevel) only occurs at La Uña (for example: Fig. 5, Level III: 9, Level IV: 1); and segments are present in the most recent level at this cave (Level III).

The other typologically-relevant category of Mesolithic assemblages is that of the bladelet microliths. Several small double-backed points were found in Level IV at La Uña that remind us of the kinds found in assemblages such as Aizpea, in the western Pyrenees (Alday and Cava, 2009). The presence of other types is also worth highlighting, such as several convex-backed points, whose morphology, especially those from Level IV at La Uña, look very much like Azilian points, whereas those found in Level III or at El Espertín are much more slender.

The León sites have been attributed to the “Mesolithic with geometrics” (Neira Campos and Fuertes Prieto, 2009; Neira Campos et al., 2016) due to the perceived differences concerning the Geometric Mesolithic in other areas of the Iberian Peninsula. This is due to the low presence in these series of geometric elements (<5%), which are elements with a greater representation in Geometric Mesolithic assemblages. For example, taking the data from some sites in the eastern Cantabrian area (upper Ebro valley), such as Mendandia III-inf, Atxoste IV or Aizpea (Alday and Cava, 2009), we can see that the geometric group in these assemblages ranges between 14 and 30% (Fig. 6).

Comparing the sites in León with those in Galicia, notches and denticulates and diverse groups are present in a significant way; burins are more common in Galicia, whereas backed bladelets are less frequently encountered, except at Pena Lliboi. Otherwise, geometrics are equally represented in low frequencies.

At Pena do Pé, burins are also common and the presence of microliths (9 out of 19 retouched pieces), especially geometrics (4) and points, is noteworthy (Cerqueiro Landín, 1991). The geometrics have mainly simple or flat retouches and, to a lesser extent, abrupt retouches.

At Veiga do Muín, the presence of laminar blanks (mostly bladelets) in the lithic assemblage, as well as some geometric microliths, allows us to identify a Mesolithic phase at the site. However, we cannot be more specific at the moment.

At Valdavara 1–2, Level C, there is only a general reference to the

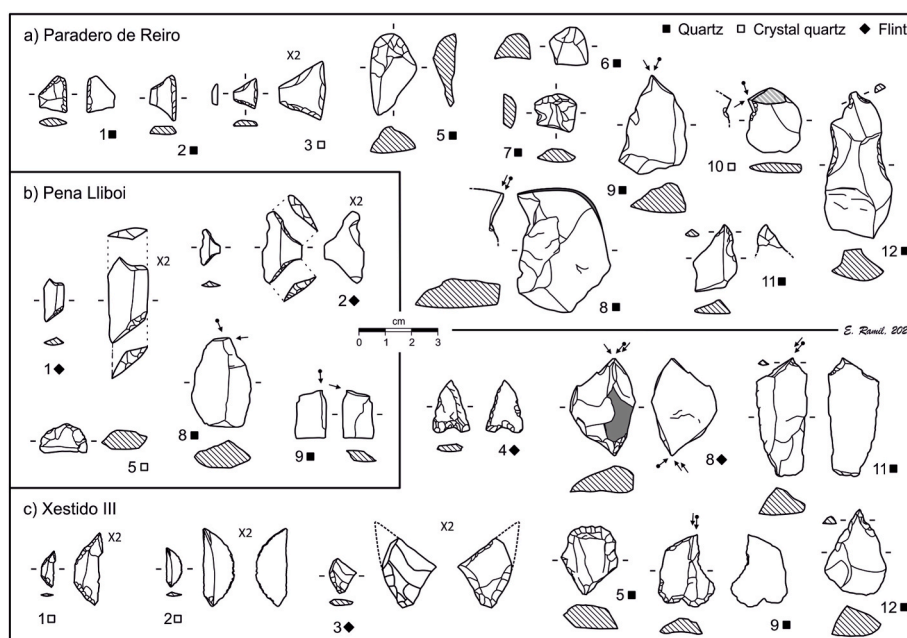


Fig. 4. Lithic industry (microliths and tools) from Galician sites. Lithic industry: 1–3: geometrics; 4: arrowhead; 5–7: endscrapers; 8–10: burins; 11–12: borers.

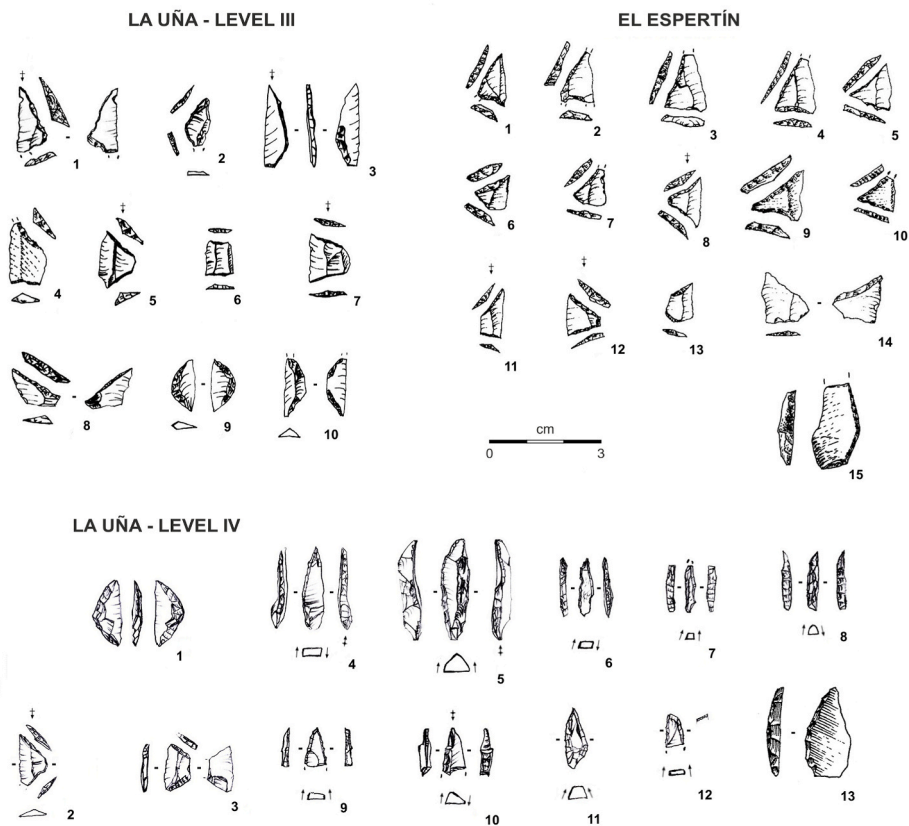


Fig. 5. Microliths (geometrics and points) from sites in León. La Uña, Level III: triangles (1-3), trapezes (4-8), segments (9-10). El Espertín: triangles (1-10), trapezes (11-14), backed point (15). La Uña, Level IV: triangle (1), trapezes (2-3). Double backed points (4-12), backed point (13). Simple bifacial retouch (double level) or compound retouch: La Uña-III: 3, 8, 9, 10; La Uña-IV: 1, 3.

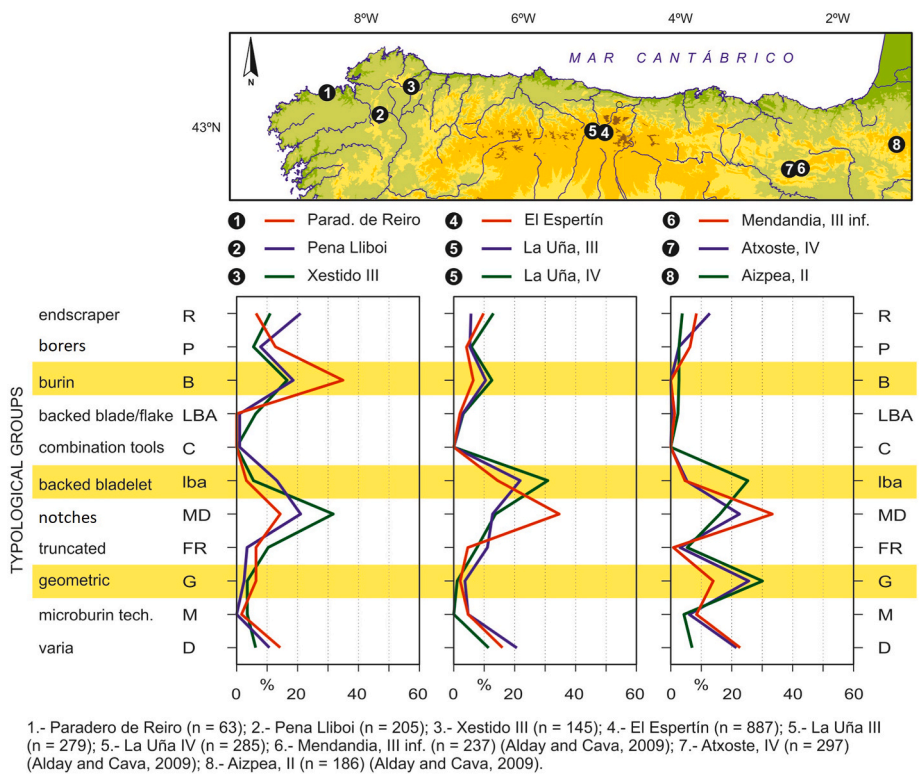


Fig. 6. Comparison of the typological groups of the retouched assemblages within the different areas.

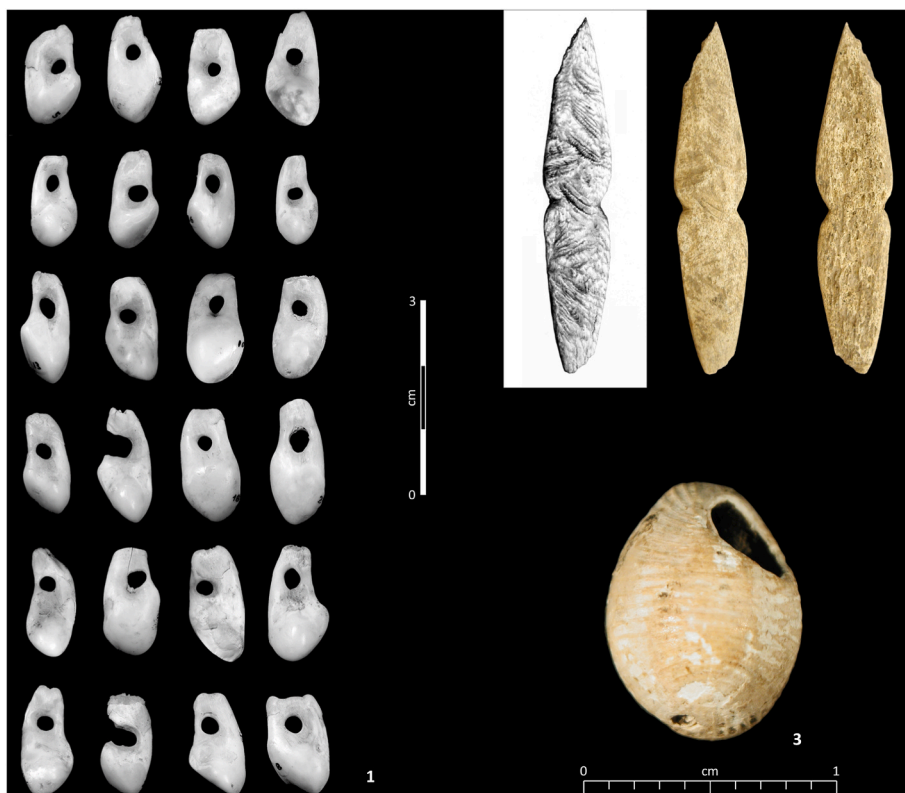


Fig. 7. Bone industry. 1: Perforated red deer atrophic canines from La Braña/Arintero (Photo by A. Tapia). 2: Hook from El Espertín. 3: Perforated seashell (*Trivia* sp.) from El Espertín.

retouched material available (Vaquero-Rodríguez et al., 2011), with no typological description for the time being. The retouched artefacts are rare on quartz and show atypical and irregular retouching, with a tendency towards denticulated forms. The retouched pieces on flint are characterised by Upper Palaeolithic types such as burins and bladelets with marginal retouching. The general characteristics of the assemblage have been attributed to the Macrolithic Mesolithic or Notches and Denticulates Mesolithic.

## 5.2. Bone industry

At El Espertín, the industrial implements of animal origin that were discovered are rare but of great interest. They comprise a straight hook made of antler (Fig. 7: 2), double pointed and with lateral notches in its central part (Bernaldo de Quirós and Neira, 2007–2008); a small perforated seashell (*Trivia* sp.) (Fig. 7: 3) (Neira Campos et al., 2004); a chisel on a diaphysis fragment; and a fragment from a pointed hook made from antler.

In Level III of La Uña cave, four bone fragments with different types of incisions were found. One of them has five parallel lines with deep, wide incisions. The second also has three wide and deeply incised lines, one of which has a small triangular lateral incision. The third fragment, measuring approximately 1 cm<sup>2</sup>, has a motif on one side consisting of a series of parallel lines forming two groups interrupted by another group of parallel lines oblique to the previous line set; the other side has only one group of parallel lines. In both cases, the motifs are very fine and shallowly engraved.

The fourth piece is part of a scapula found in several fragments scattered in different sectors. It also has a geometric motif made up of several straight lines, two pairs of which converge to form two Vs that are inscribed into each other.

At La Braña/Arintero, a set of 24 perforated red deer atrophic canines was found (Fig. 7: 1), the largest collection of its kind for

Mesolithic contexts on the Iberian Peninsula (Rigaud et al., 2010). The 24 perforated teeth belonged to 23 male red deer, most of which were adults. The drilling was performed using the same technique for all (first scraping and then rotation with a lithic point), but there are differences in the gestures, with the exception of the only pair of canines from the same individual, which would have been perforated by the same hand. The lateralised wear patterns of the perforation indicate that the canines would have been sewn or tied on one side rather than suspended. Consequently, these elements are interpreted as pieces sewn onto the clothing of the La Braña-2 individual. These are objects of a personal nature and the fact that they are associated only with this individual opens up the possibility that they contain an additional social and symbolic meaning for these populations, both in terms of the status of this man within the group, as well as the exchanges of this type of hunting items that took place between Mesolithic hunter-gatherer groups, and their relationships. The occurrence of this type of pendant is more common in central and northern Europe than in the Mediterranean area (Rigaud et al., 2010).

## 6. Faunal and plant resources

The acidity of the soils of most of the territory of present-day Galicia (except the calcareous areas of the eastern sierras and specific contexts with anaerobic conditions on the coast) has prevented the conservation of organic matter. Thus, Epipalaeolithic/Mesolithic faunal assemblages are practically non-existent in this part of the northwest, although the climatic improvement that occurred during the Holocene would have favoured the movement of fauna and human groups towards the mountainous areas, which would have been impossible to access during much of the glacial period.

In this respect, despite a significant number of sites with similar chronologies located in well-surveyed parts of the northwest, such as the Serra do Xistral in Lugo (Ramil Soneira and Ramil Rego, 1996), the lack

of conservation of bone remains makes it impossible to offer any kind of data about the faunal composition of these assemblages. The only exception is the coastal settlement of Paradero de Reiro. The small number of faunal remains is insufficient for an overall assessment, but allows us to document the presence of red deer (*Cervus elaphus*, NISP=4), roe deer (*Capreolus capreolus*, NISP=1) and wild boar (*Sus scropha*, NISP=6) (Fernández Rodríguez, 2011), as well as fish vertebrae. The mammal remains are representative of species characteristic of temperate woodlands, best represented in the north of the Peninsula from the early Holocene (Marín-Arroyo, 2013).

Ballan wrasse (*Labrus berglyta*) and porgy (*Pagrus pagrus*), as well as Chondrichthyes vertebrae, have been identified among the ichthyofaunal remains (Ramil Rego et al., 2021). They are carnivorous and demersal osteichthyes which inhabited the bottoms of a rocky substrate, a reflection of open sea fishing which suggests some littoral conditions similar to current ones in the site surroundings. It is a pattern similar to the one documented in the Iberian Peninsula for this period, which recorded an increase of porgy from the Magdalenian and an increase of labrid fish throughout the Holocene (Morales Muñoz and Roselló Izquierdo, 2006; Gabriel, 2011). The presence of chondrichthyes was not documented again in the archaeological record of the Iberian northwest until the end of the Roman period (González Gómez de Agüero, 2014), although it was recurrently present in peninsular Mesolithic sites, such as the shell midden of Toledo in Portugal (Gabriel, 2011).

On the other hand, the mammal remains found at the inland site of Veiga do Muín (the study of which is currently in its preliminary phase) are dominated by the same species mentioned above, mainly red deer and wild boar, but also roe deer. The presence of carnivore remains, among which the badger (*Meles meles*) appears to stand out, is considered to be a reflection of the use of the cave as a burrow by this species rather than the result of anthropogenic activity. Having said this, the definitive interpretation will need to be based on the results obtained from the assemblage's taphonomic analyses.

Similarly, the small assemblage of bones from Level C at Valdavara 1/2 (8 remains identified) indicates the hunting of red deer and roe deer, including in this case at least chamois (*Rupicapra rupicapra*), whose presence is explained by the location of the cave, in an area at a higher altitude than those mentioned above, and in an environment where rocky outcrops and valleys are present (Vaquero-Rodríguez et al., 2011).

The small bone sample (27 remains) from Test Pit 3 (S3) in the 'Camarín' area of the Rei Cintolo cave, radiocarbon dated to the middle of the 7th millennium BC, is dominated by the remains of large bovids (Villar Quinteiro, 2007). Although the morphological analysis does not allow us to assign them specifically to aurochs (*Bos primigenius*) or domestic cattle (*Bos taurus*), the chronology of the group points to the wild species. In addition, three of these bones show evidence of anthropogenic activity (butchery marks), in a deposit where no other material suggest so. In this context, the recovery of three upper incisors (I3 left) from a canid (*Canis lupus/Canis familiaris*) is considered significant. This is an unusual assemblage in which three specimens of this species are represented by a single anatomical element. In contrast to bovids, the presence of already domesticated dogs in Iberia dates back to the Magdalenian (Hervella et al., 2022) and has been identified more significantly in the Atlantic Mesolithic (Pires et al., 2019).

The results that have been obtained from the north-eastern part of the province of León, on the southern slopes of the Cantabrian Mountains, are particularly interesting. The faunal analyses carried out at El Espertín and partially at La Uña indicate that hunting strategies focused on medium-sized ungulates, reflecting the environment in which they were found.

At El Espertín, the characteristic species of high and steep areas (chamois and goat, in that order) were the focus of Mesolithic hunting activity. Wild boar (*Sus scrofa*) is also an important source of meat, reflecting the increase in forest cover that characterises this period. Red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and even hare (*Lepus*

sp.) are less represented, given cervids' preference for less abrupt areas and clear woodlands, suggesting that the area where meat resources were sought must have expanded towards the more open valley areas that can be found in connection with the upper basin of the Esla River. The sample studied includes, in smaller numbers, other species whose relationship to human activity may be more problematic. Thus, among others, the anthropic contribution of some bovine dental remains seems clear, which, considering the chronological framework indicated, should be assigned to aurochs (*Bos primigenius*), and the same could be said for the marmot (*Marmota marmota*) remains. The situation is less clear for the various documented carnivores (wolves, foxes, wildcats, badgers and other mustelids), although the use of hides and the consumption of meat from these species cannot be ruled out, the lack of butchery marks on the remains does not allow us to determine this with certainty. What cannot be ruled out is human activity in relation to the accumulation of several brown bear (*Ursus arctos*) remains in the cave, given their location and state of preservation. The subsistence of the group living in this cave would have also include, as far as animal resources are concerned, the exploitation of freshwater fishes (salmonids), of which both vertebrae and scales have been recovered. The large percentage of infantile and juvenile chamois and ibex remains (among other species), including a foetus, indicate a seasonal use of El Espertín cave during a warm period of the year.

At La Uña cave, although the archaeozoological study is not complete, some remains of caprids (*Rupicapra rupicapra* and *Capra pyrenaica*), cervids (*Capreolus capreolus* and *Cervus elaphus*) and trout (*Salmo trutta*) have been identified (Fernández Rodríguez et al., 2015). Bearing in mind the altitude and possibilities for the occupation of the site, a seasonal use of the cave during warmer times of the year can be proposed.

At the cave of La Braña/Arintero, the associated faunal remains correspond to ornaments: a set of 24 atrophic canines of red deer (*Cervus elaphus*), perforated at the root. Besides the potential symbolic significance of these pieces, it is clear that their presence shows that this species was hunted.

Without a direct association with the archaeological context, part of the anatomically connected skeleton of a brown bear (*Ursus arctos*) that died of natural causes was also found at La Braña/Arintero cave (Fernández Rodríguez, 2010). As was the case with the aurochs (*Bos primigenius*) from Chan do Lindeiro, their possible association with human remains in the same subterranean space may just be a coincidence, as no clear evidence of anthropogenic action has been documented on these remains, and their presence may correspond to accumulation processes resulting from natural events. The radiocarbon dating of the La Braña bear shows that it arrived in the cave at the same time as the humans were present there, which has allowed us to defend the idea of the existence of another access to the cave, different to the one used today.

In terms of the use of plant resources, the collection of hazelnuts (*Corylus avellana*) at Xestido III is documented by the presence of macro remains (charred pericarps) (Ramil-Rego et al., 1996b).

The anthracological analysis of the charcoal found at El Espertín has revealed the presence of hazelnut (*Corylus* sp.), chestnut (*Castanea* sp.), pine (*Pinus* sp.), two species of oak (*Quercus* cf. *pyrenaica* and *Quercus robur/petraea*), arbutus tree (*Arbutus unedo*) and juniper (*Juniperus* sp.) (Neira Campos et al., 2004).

## 7. Discussion

The Mesolithic is very unevenly represented in the area covered in the present review (which can partially complement the recently updated data available in Clark and Barton, 2022). In León, the sites are concentrated in the north-eastern corner of the province, in the heart of the Cantabrian Mountains, south-west of the Picos de Europa. The three caves are situated at a minimum altitude of 1200 m a.s.l. and reach heights of almost 1500 m (La Braña/Arintero). These caves are located



near the natural passes that connect the two slopes and are interpreted, at least in the case of La Uña and El Espertín, as seasonal dwellings during the warm months of the year. We should not forget that, at present, there are no Late Upper Palaeolithic (specifically Magdalenian) sites in this inland and mountainous area of the Cantabrian mountain range. This increase in seasonal Mesolithic activity takes place in addition to the presence of other sites characterised as Epipalaeolithic or Mesolithic in the Picos de Europa area, such as La Mina Cave, 938 m a.s.l. (Arias Cabal, 1996) or La Calvera, 1120 m a.s.l. (Díez Castillo, 2005). All these occupations of the mountainous interior from the Epipalaeolithic onwards took place in a changing climatic context, with the onset of the Holocene and the reduction of snow levels and glaciation in the area. Glacial traces on the southern slopes of this area of the Cordillera can be traced to about 1120 m a.s.l. at the headwaters of the Esla and 1100 m at the headwaters of the Porma (Redondo Vega et al., 2014). The dating of archaeological assemblages discussed in this paper indicate the majority of the occupation episodes took place after the 8.2 ka event.

In Galicia, the number of Mesolithic sites is greater and their location more varied, from mountainous contexts of a certain altitude, such as Chan do Lindeiro (1080 m); to others of more moderate relief in the Sierra del Xistral (450–600 m); to the coastal area, although there is a bias towards the eastern third of Galicia. In contrast to the Cantabrian area, the Mesolithic occupation in this region could be a continuation of the earlier presence that has been noted for the Late Upper Palaeolithic (Magdalenian) at Valdavara 1 cave (Vaquero-Rodríguez et al., 2011) and in the Villalba area (Lugo) in several sites such as Pena Grande or Fervedes II (Ramil Soneira and Ramil Rego, 1996). It could be argued that there is a lack of dates corresponding to the Epipalaeolithic, but we must take into consideration the limited record of radiocarbon references, the difficulties of preserving organic materials due to the acidity of the soils and the presence of other sites whose techno-typological characteristics match those of the Epipalaeolithic (Ramil Soneira and Ramil Rego, 1996).

Given the series of radiocarbon dates available, there is a diachronic difference between Galicia and León. In the former, the data cover almost the whole detected interval from about 8200 cal BC, although there is a gap of about 200 years between the Valdavara dates and the earliest dating of the Chan do Lindeiro female. In the north-eastern part of León, most of the dates are after the 8.2k event, except one sample from El Espertín.

Perhaps the best-known and most cited category of evidence is the anthropological record from the areas studied. This is because of the impetus given to genetic studies in recent years. The individuals from La Braña/Arintero (especially La Braña 1) and Chan do Lindeiro have provided an excellent source of data for assessing the genetic characteristics of the Mesolithic populations of the northern peninsula and comparing them with other European and Iberian individuals, both synchronically and diachronically (Olalde et al., 2019; González-Forbes et al., 2017). At Arintero, the genetic uniformity detected with regard to other European Mesolithic individuals and the reduced phylogeographic structure have been highlighted. This genomic signal would be characteristic of Upper Palaeolithic hereditary populations, but has also been identified in Iberian Neolithic populations (Olalde et al., 2018). Furthermore, individuals from these two sites were related to the two European hunter-gatherer genomic legacies identified in the Iberian Peninsula during the Holocene. Although there seems to be a mixture, Chan do Lindeiro would be closer linked to the Moita do Sebastião (Portuguese Mesolithic) and El Mirón (Magdalenian) legacies, whereas La Braña 1 would be closer to the Canes 1 and Villabruna (Epigravetian, western hunter-gatherers) legacies (Villalba-Mouco et al., 2019).

The funerary context of La Braña/Arintero fits in perfectly with the funerary manifestations that have been identified in the Epipalaeolithic and Mesolithic periods of Cantabria (Arias, 2012). It also corresponds to the period of the highest frequency of these types of manifestations, in the first half of the 6th millennium BC, coinciding with Los Canes

(Asturias), El Truchiro (Cantabria) and Aizpea (Navarra, Western Pyrenees).

The domestication interpretation put forward for Chan do Lindeiro do not stand from an archaeological, palaeontological or chronological point of views. The origin of this assemblage is linked to surface materials that fell into a sinkhole, and only the dating of the remains allows us to establish a synchrony between them that does not justify them belonging to a single event. The association of these remains may be purely coincidental, given the lack of a detailed description of the topographical setting of the remains. In short, the spatial relationship of these remains does not imply causality in their deposition. At La Braña/Arintero, the presence of a bear in an area of the cave not far from the funerary context described does not imply a relationship between the two. On the other hand, the dating of the aurochs at Chan do Lindeiro, which is set around 7500–7000 BC, precedes the presence of domestic animals in the Iberian Peninsula by at least a millennium, i.e. around the mid-6th mill. cal BC at sites on the Portuguese Atlantic coast (Davis et al., 2018), which we can consider to be more immediately adjacent to the northwestern area of Iberia. Moreover, the genetic affiliation of the oldest domestic cattle from Galicia analysed so far (of Chalcolithic chronology) reflects an exogenous introduction, with no link to the aurochs from Chan de Lindeiro (Gurke et al., 2021). Furthermore, the strontium isotope analyses, used as evidence for the distant origin of these aurochs from the site of their discovery and their possible close relationship with the Mesolithic woman at Chan do Lindeiro (Vidal-Gorosquieta et al., 2016; Grandal-d'Anglade and Vidal Gorosquieta, 2017), have not been made available, so it is difficult to establish the distance of origin of these animals. Other possible criteria, such as the smaller size of this species, have been evaluated for other Mesolithic records and considered a possible consequence of hunting pressure from hunter-gatherer communities during periods of perceived increased exploitation of available resources (Davis and Mataloto, 2012). Therefore, we can state that at present there are no data to justify an interpretation of the large bovids at Chan do Lindeiro as domestic fauna.

The sites that have lithic assemblages that are sufficiently numerous and that have been studied by criteria that allow them to be compared are La Uña, El Espertín, Xestido III, Pena Lliboi and Paradero de Reiro. Their typological characteristics allow us to place them in the context of the Peninsular Mesolithic, considering also the peculiarities of the collections from the Cantabrian area, especially their low percentage of geometric pieces (Arias and Fano, 2009). This has led us to put forward the idea of a 'Mesolithic with geometry' (Neira Campos and Fuertes Prieto, 2009), rather than a Geometric Mesolithic as defined in other areas of the Peninsula. This phase is generally characterised, in the Basque Country, the Ebro Valley, Levante and Portugal, by a geometric frequency ranging from 20 to 30%, sometimes reaching 40%, although some levels may have more discreet proportions (10–18%) (Alday and Cava, 2009; Martí et al., 2009; Utrilla et al., 2009; Carvalho, 2009). This phase is also parallel and comparable to the European Second Mesolithic, characterised by the spread of blade industries and trapezes (Marchand and Perrin, 2017). A characteristic feature of this geometric phase, both in Europe and in some sites on the Iberian Peninsula, is knapping by means of indirect percussion and/or pressure, a technique that has not yet been detected in the Cantabrian levels. However, in the assemblages analysed here, there is evidence of laminar and microlaminar use, as well as the use of the microburin technique. The predominant width of the laminar products from La Uña and El Espertín (6–9 mm) and their diachronic variation is comparable to that described for La Cocina (Martí et al., 2009). It is also worth noting the presence of simple bifacial retouching (double bevel) in the geometric microliths from Xestido and La Uña.

In the case of Valdavara 1–2, the absence of geometric pieces, as well as the characteristics of the scarce lithic industry and the dating, justify its tentative ascription to the Mesolithic of Notches and Denticulates (Vaquero-Rodríguez et al., 2011). This has been defined in a chronology preceding the Geometric Mesolithic, especially in the Mediterranean

area and the Ebro valley (Alday, 2006).

On the other hand, the recovery of geometric microliths at Veiga do Muín allows us to link it to the sites discussed here.

In terms of the raw materials, the use of local materials (quartz, quartzite, chert and radiolarite) is predominant, a pattern that is repeated in the behaviour of the Mesolithic groups. However, the presence of flint, in particular, seems to indicate a more distant sourcing and thus opens up the possibility of assessing the potential mobility and contacts of and between these groups. Studies on the origin of raw materials at sites in the Cantabrian region have made it possible to identify the use of materials from the northern slope, as well as the arrival of regional and trace objects, both from the north-west (flint from Piloña) and the north-east (chert from Las Portillas). Contact with the coastal zone is even confirmed by the presence of Flysch flint and a pendant made from a marine gastropod (*Trivia* sp.). These materials indicate medium- and long-distance contacts between the Cordillera and the Cantabrian coast, in excess of 150 km. It is difficult to assess the nature of these contacts and whether they reflect the territorial mobility of these groups or exchange relationships between different groups. In this respect, the percentage of flint in the two levels of La Uña (almost 10%) is remarkable. A recent statistical study of the lithic materials from these caves has shown a significant relationship between retouched pieces and non-local materials (regional or trace) in the two levels of La Uña, and no relationship for El Espertín (Neira Campos et al., 2021). This has been interpreted as a possible indicator of a shorter residence time in this small cave compared to El Espertín. The significant abundance of non-local flint retouched pieces seems to be related to the occasional stopover of groups coming from the northern slope, who would have arrived equipped with materials and tools from these areas.

## 8. Conclusions

The review of the Mesolithic evidence in León and Galicia is framed within the dynamics perceived in the Cantabrian Mesolithic, both in terms of the characteristics of the lithic assemblages and the funerary practices (Arias et al., 2021). The chronology of the broad lithic series, analysed from a typological point of view (7000-5000 cal BC), indicates a parallel development in this area. The assemblages considered in this work have similar characteristics and belong to the so-called 'Mesolithic with geometrics' (Neira Campos et al., 2016; Herrero-Alonso et al., 2020). They would be parallel to the Geometric Mesolithic of other peninsular areas and to the European Late Mesolithic. The peculiarities of the area discussed here are mainly manifested in the discrete number of geometric artefacts.

The occupation of the southern Cantabrian slope is currently perceived as beginning in an advanced phase of the Mesolithic, from around 7000 cal BC, in a very punctual way (one date for El Espertín), being much more intense from around 6000 cal BC, perhaps related to the climatic variations associated with the 8.2 ka event and the altitude of the sites. On the other hand, in Galicia, there is evidence of earlier Mesolithic periods and even sites with occupations that seem to indicate a continuity of occupation during the Late Glacial.

The study of the origin of the materials in the case of the sites from León highlights their relationship with the northern Cantabrian slope and the coast. Even the genetic analyses indicate similarities in the lineages identified in individuals from both slopes (La Braña 1 and Los Canes 1).

The occupation of the caves of León seems to be in response to seasonal stays or stopovers in this mountainous context during the milder months. The dynamics of Mesolithic occupation concerning the exploitation of different environments and resources is a subject for future analysis.

## Data availability

As this paper represents a review of a large number of sources, the

data and references for which can be found within the text and bibliography presented here.

## CRedit authorship contribution statement

**M. Natividad Fuertes-Prieto:** Conceptualization, Investigation, Resources, Data curation, Writing – review & editing, Writing – original draft. **Eduardo Ramil-Rego:** Conceptualization, Investigation, Resources, Data curation, Writing – review & editing, Writing – original draft, Visualization. **Carlos Fernández-Rodríguez:** Conceptualization, Investigation, Resources, Data curation, Writing – review & editing, Writing – original draft. **Diego Herrero-Alonso:** Investigation, Resources, Data curation, Writing – review & editing, Visualization. **Eduardo González-Gómez de Agüero:** Investigation, Resources, Data curation. **Ana Neira-Campos:** Conceptualization, Investigation, Resources, Data curation, Writing – review & editing, Writing – original draft.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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