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ABSTRACT
The Iberian Peninsula is one of the key areas for studying the last populations of Neanderthals and the arrival in Europe of the first anatomically modern humans. In the Cantabrian region, this process can be traced in just a few sites with levels dating to the final stages of the Middle Palaeolithic and the earliest phases of the Upper Palaeolithic. One of these singular enclaves is El Cuco rock-shelter, where the sequence was initially dated by ^{14}C only to the early Upper Palaeolithic *sensu lato*. However, new studies and datings now place this archaeological sequence in the late Mousterian and the Aurignacian. In this article we present a chrono-cultural reassessment of the upper levels of El Cuco (III-V), including a study of the large mammals. Levels Vc and Vb (>43.5-40.5 ky uncal BP) date from the late Mousterian, whereas levels Va, IV and III (*c.* 36.5-30 ky uncal BP) cover an interval extending at least from the Early Aurignacian to the Evolved Aurignacian. Particularly noteworthy is the discovery in level Va of a set of decorative beads made from marine shells in a context of possible symbolic behaviour.

KEY WORDS
Mousterian,
Aurignacian,
Middle Palaeolithic,
Upper Palaeolithic,
radiocarbon chronology,
Iberia.

RÉSUMÉ

Une réestimation chrono-culturelle des niveaux III-V de l'abri sous roche d'El Cuco : une nouvelle sequence à la limite du Paléolithique moyen tardif et du Paléolithique supérieur précoce en région cantabrique (Nord de l'Ibérie).

La péninsule Ibérique est l'une des zones-clé pour l'étude des dernières populations de Néanderthales et de l'arrivée des premiers hommes anatomiquement modernes. En région cantabrique, ce processus ne peut être retracé que dans quelques sites à niveaux datant des stades de fin du Paléolithique moyen et des phases les plus précoces du Paléolithique supérieur. L'une de ces singulières enclaves est l'abri sous roche d'El Cuco où la séquence a été initialement datée au ^{14}C comme étant seulement du Paléolithique supérieur précoce *sensu lato*. Cependant, de nouvelles études et datations rapportent actuellement cette séquence archéologique au Moustérien tardif et à l'Aurignacien. Dans cet article est présentée une réestimation chrono-culturelle des niveaux supérieurs (III-V) d'El Cuco, incluant une étude de grands mammifères. Les niveaux Vc et Vb (> 43,5-40,5 ky BP non cal.) datent du Moustérien tardif, tandis que les niveaux Va, IV et III (*c.* 36,5-30 ky non cal.) recouvrent un intervalle allant au moins de l'Aurignacien inférieur à l'Aurignacien évolué. La découverte, dans le niveau Va, d'un ensemble de chapelets décoratifs faits de coquilles marines dans un contexte qui évoque un comportement symbolique possible, est particulièrement remarquable.

MOTS CLÉS
Moustérien,
Aurignacien,
Paléolithique moyen,
Paléolithique supérieur,
chronologie radiocarbone,
Ibérie.

INTRODUCTION

The extinction of the Neanderthals, the arrival of the first anatomically modern humans in southwestern Europe, and the substitution of one group by the other, constitute one of the processes that has generated the most debate in prehistoric research in recent years. The archaeological trace of this process manifests itself as the substitution of the industrial complexes of the Middle Palaeolithic (MP) by those characteristic of the Upper Palaeolithic (UP), the former associated with the Neanderthals and the latter with anatomically modern humans (AMH). The exclusiveness or otherwise of the modern human behaviour of *Homo sapiens*, the authorship of the transitional industries (such as the Châtelperronian), and the presence of symbolic behaviour among the Neanderthals are among the diverse issues discussed in the study of this process. Likewise, the debate also touches upon questions ranging from the origin of the laminar industries to the birth of art and its ritual funerary uses.

The chronology of these technocomplexes is one of the thorniest questions in these discussions, and one of the most prominent settings is the Cantabrian coast (northern Iberian Peninsula) (Maroto *et al.* 2018). This is one of the European regions with the greatest density of archaeological sites from the period in question, contrasting with the bordering northern Submeseta (Álvarez-Alonso *et al.* 2018). The Cantabrian coast includes levels dating to the late Middle Palaeolithic (LMP) with Mousterian industries (e.g. Ríos-Garaizar 2012a, 2016) attributed to the last Neanderthal groups, Châtelperronian levels (e.g. Morales 1998; Arrizabalaga & Iriarte 2006) also ascribed, in principle, to the Neanderthals, and Aurignacian levels assigned to the first modern humans. Some of the latter, within a context of very low demographic density (Schmidt & Zimmermann 2019), have provided some of the oldest ^{14}C datings. The earliest manifestations of the Aurignacian in this region thus date to roughly 38-35 ky uncal BP at sites such as Labeko Koba, La Viña and Isturitz, establishing its lower chronological limit as around 42 or 43 ky cal BP (Szmidt *et al.* 2010; Maroto *et al.* 2012; Wood *et al.* 2014; Marín-Arroyo *et al.* 2018a).

As far as the Châtelperronian is concerned, there is ongoing debate about its origins in the Mousterian industries, whether independently at the hands of the Neanderthals or as a phenomenon of acculturation, which would imply contacts taking place between the Neanderthals and the AMH. There also continues to be debate on whether it should be assigned to the Middle Palaeolithic, the Upper Palaeolithic or to a transitional technocomplex.

Of the Mousterian sites from the LMP of Cantabria, one might mention the Sopeña rock-shelter (Pinto-Llona 2014, 2018; Pinto-Llona & Grandal-d'Anglade 2019; Pinto-Llona *et al.* 2012), La Viña rock-shelter (Fortea-Pérez 1995; de la Rasilla & Santamaría 2011-2012; Santamaría 2012), El Sidrón cave (Santamaría 2012; Santamaría *et al.* 2010; Wood *et al.* 2013), El Esquilleu cave (Baena *et al.* 2012, 2019), El Castillo cave (Sánchez-Fernández & Bernaldo de Quirós 2008), Morín cave (Maíllo-Fernández 2007), Covalejos cave (Sanguino-González & Montes-Barquín 2005, 2008), Kurtzia (Muñoz *et al.* 1990), Arrillor (Hoyos *et al.* 1999; Iriarte-Chiapusso *et al.* 2019) and Axlor rock-shelter (González-Urquijo 2008; González-Urquijo *et al.* 2005).

Châtelperronian levels include Morín cave (González-Echegaray & Freeman 1971, 1973; Maíllo-Fernández 2005), albeit not without debate (see Sanguino-González *et al.* 2005), as well as Aranbaltza (Ríos-Garaizar 2012b), Labeko Koba (Arrizabalaga 2000a, b) and Ekain (Altuna & Merino 1984; Ríos-Garaizar *et al.* 2012).

Levels have been assigned to the Proto-Aurignacian or the Archaic Aurignacian at La Viña rock-shelter (Santamaría 2012; Wood *et al.* 2014), Morín cave (Maíllo-Fernández 2002), Castillo (Marín-Arroyo *et al.* 2018a) and Labeko Koba (Arrizabalaga 2000a, b). The Old Aurignacian has been cited,

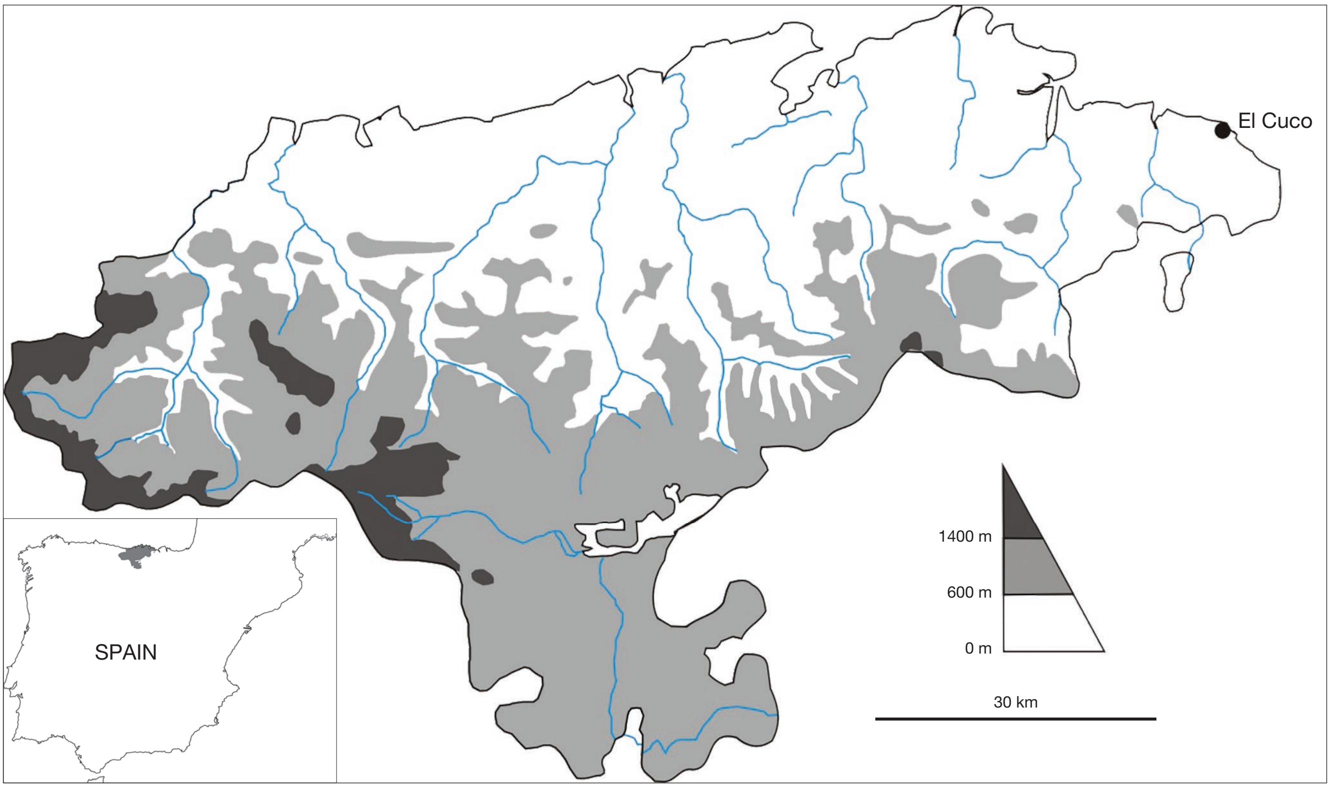

Fig. 1. — Location of El Cuco rock-shelter.

among other sites, at Labeko Koba (Arrizabalaga 2000a, b). At Lezetxiki, the presence of Old or Archaic Aurignacian culture has been mentioned (Arrizabalaga 2005). Archaic and Classic Aurignacian culture appears at Covalejos (Sanguino-González & Montes-Barquín 2008; Yravedra-Sainz *et al.* 2016), to name just a few examples.

Within this chrono-cultural context, El Cuco rock-shelter stands out as one of the most relevant sites for the study of these phases. In 2005, a test pit was carried out at the site, recording a stratigraphic sequence with two ^{14}C AMS datings that indicated the early Upper Palaeolithic (EUP) (Evolved Aurignacian and Gravettian) (Muñoz-Fernández *et al.* 2007). Subsequently, it was learnt that the samples had been obtained on bone apatite (Maroto *et al.* 2012) and that they might have been rejuvenated. The new studies and datings now being presented have led to a reassignment of the archaeological levels. The present article revises the upper levels (III-V), now assigned to the Aurignacian and the late Mousterian, bringing to light their value and significance for the study of the LMP-EUP transition. The lower levels (VI-XIV), assigned to the late Mousterian, have been revised in another article (Gutiérrez-Zugasti *et al.* 2018).

Abbreviations

AMH anatomically modern humans.

Archaeological periods

EUP early Upper Palaeolithic;
LMP late Middle Palaeolithic;
MP Middle Palaeolithic;
UP Upper Palaeolithic.

Institutional abbreviation

MUPAC Museum of Prehistory and Archaeology of Cantabria, Cantabria.

REGIONAL SETTING

El Cuco rock-shelter is located on the Cantabrian coast (northern Iberian Peninsula). It falls within the municipality of Castro Urdiales, which belongs to the autonomous community of Cantabria (Spain). Cantabria is situated in the central part of the Cantabrian coast between Asturias and the Basque Country, and it borders on the Cantabrian Sea to the north and the northern Meseta to the south.

In addition to certain characteristics common to the northern part of the Iberian Peninsula, two major geological groupings can basically be identified in Cantabria: 1) an area that forms a rectangle with the fringe of the western coast as far as Santander and that, from there, expands to cover the eastern half of the region, with a broad prevalence of Cretaceous terrain; and 2) the rest, which extends over the western area except for the previously mentioned coastal area, with terrain dating to the Jurassic (the basins of the Rivers Saja, Besaya and Nansa) and the Carboniferous (the basin of the River Deva), with Carboniferous limestones (Picos de Europa) and shales and sandstones (Liébana).

Fig. 2. — El Cuco rock-shelter (photo: Pedro Rasines del Río).

The frequency of karstic landscapes in the regional geography fosters the development of caves and rock-shelters, many of them used as places of habitation from the Palaeolithic onwards. Another factor that has determined the human habitat of the area is its intricate orography. The Cantabrian Range runs west-east. A set of Mesozoic deposits was folded by the Alpine orogenesis, giving rise to a complex mixture of limestone crests emerging from shales, clays and sandstones. Fluvial action on these folds produced complex valleys running north-south, with rapids flowing down them to coves and estuaries, opening up corridors that linked the coastline with inland valleys and gave refuge to the earliest human populations. From north to south, basically three relief units can thus be distinguished: 1) the valleys close to the coast, traversed by rivers as they flow into the sea, which have been the preferred areas of human habitat since the Palaeolithic; 2) further inland, the mid-level sierras, with altitudes of around 1.000 m a.s.l., separating medium and high valleys; and 3) at the boundary with the Meseta, high mountains, reaching altitudes in places greater than 2.000 m a.s.l.

The present-day climate of Cantabria, which is of an Atlantic type, varies with altitude and distance from the coast, with notable differences in rainfall and temperature between the coastline and the mountainous regions (from 1981-2010: mean annual temperature, 12.87°C; mean annual precipitation, 1209 mm).

EL CUCO ROCK-SHELTER

The site and the immediate vicinity

El Cuco rock-shelter is located, together with El Cuco cave, in the municipality of Castro Urdiales (Fig. 1). It is situated at the foot of a cliff comprising massive limestones and calcarenites from the Lower Cretaceous (Fig. 2), with rudists, corals, bryozoans and foraminifera (mainly orbitolinids); it occupies a rocky face at the base and southernmost point of the mountain known as “Alto de San Andrés”. Its UTM coordinates (time zone 30-ETRS89) are: X = 481.400, Y = 4.804.220, Z = 20 m a.s.l. The distance to the present-day coastline is roughly 350 m.

There are various caves with archaeological sites on this mountain and in the immediate vicinity. Particularly noteworthy are *Urdiales* cave (Montes-Barquín *et al.* 2005) and El Cuco cave (Muñoz-Fernández *et al.* 2007), which preserve important manifestations of the cave art of the Upper Palaeolithic.

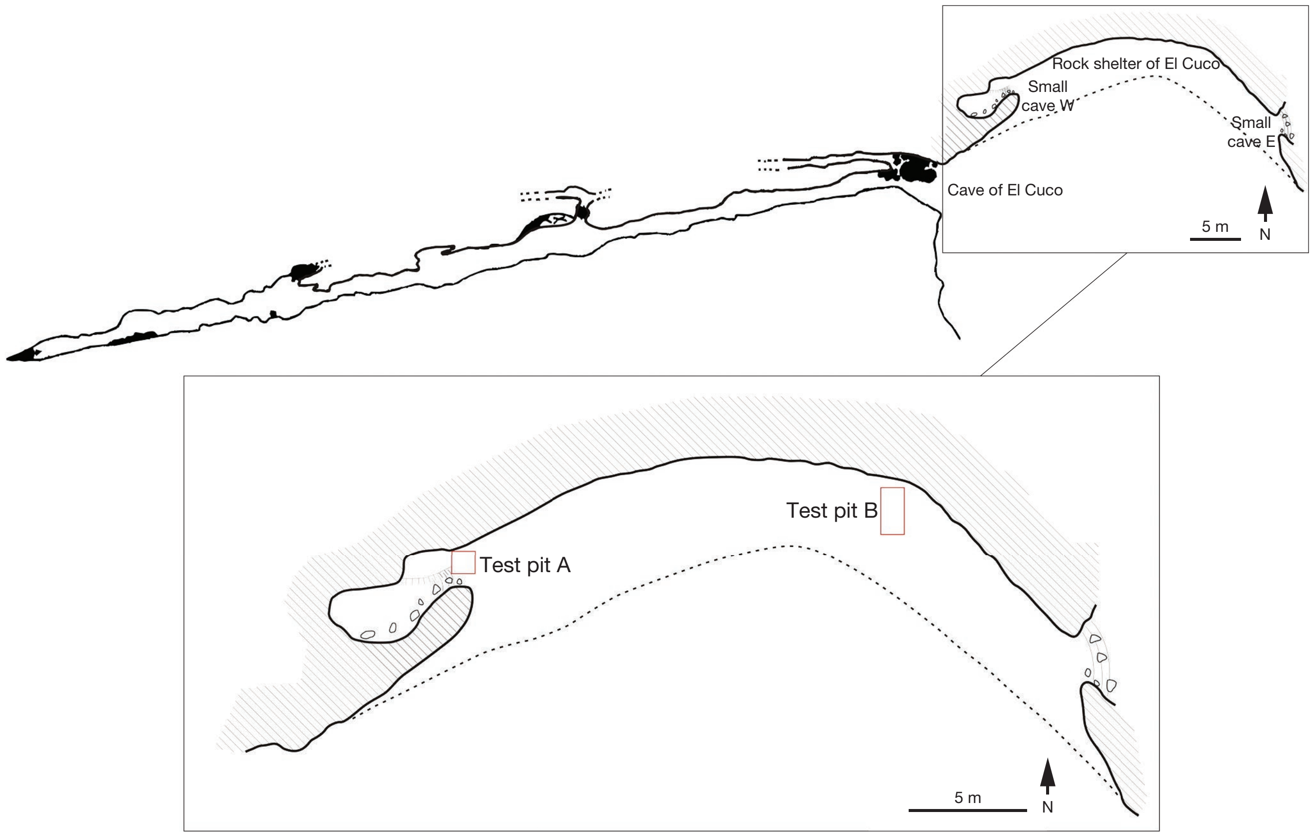

FIG. 3. — Topographical survey of the cave, rock-shelter and *covacha* (small cave) of El Cuco. Position of test pits **A** and **B** in El Cuco rock-shelter.

In El Cuco cave, situated just a few metres from the rock-shelter of the same name (Fig. 3), an imprecise archaeological record of the Upper Palaeolithic, including Solutrean lithic industry, has also been discovered, as well as remains of a post-Palaeolithic shell midden.

El Cuco rock-shelter is 34 m in length and forms an arc with an overhang ceiling, reaching an average depth of some 5 m. Currently, the surface of the shelter has the form of a flat platform bordered to the south by a recent stone wall more than two metres high, with its back to the sediments of the site.

At the western end, between the cave and rock-shelter of El Cuco, there is a small cave known as the Covacha de El Cuco. This small cave is just 6 m in length and does not exceed 2.5 m in width. At its entrance, the ceiling is roughly 2 m high, decreasing towards the inside until it is wholly filled with sediments. The back of the cave is very close to El Cuco cave, with which it may possibly have been linked.

Likewise, at the eastern end another small cave is situated, with a downward trajectory (Fig. 3).

El Cuco rock-shelter is located in an environment of urban expansion in which there are various archaeological sites. The appearance of archaeological material on the surface suggested the presence of a site whose potential and characteristics called for exploration and assessment. For this reason, in October and November 2005, two archaeological test pits were performed, under the supervision of Pedro Rasines and with the participation of Emilio Muñoz, José Manuel Morlote, Silvia Santamaría, Helena Paredes and Enrique Gutiérrez.

THE ARCHAEOLOGICAL INTERVENTION AND THE STRATIGRAPHY

The intervention at El Cuco rock-shelter consisted in carrying out the two archaeological test pits, which were respectively designated – from W to E – test pit A and test pit B (Fig. 3). This was done using the stratigraphic method of Cartesian coordinates, establishing the same level 0 for both. Moreover, the levels were subdivided vertically into 10 cm spits.

Test pit A, measuring 1 m × 1 m, was carried out in the inner part of the western cave, reaching a level of -220 cm from the top of the uppermost level. Thirteen archaeological levels were found, which were designated from the top down using capital letters.

The more eastern test pit (test pit B), measuring 2 m × 1 m, was conducted in the rock-shelter itself. This attained a depth of 254 cm, though without yet reaching the bedrock. Fourteen archaeological levels were identified, which were designated from top to base with Roman numerals.

The material found on the field campaigns in both the test pit was studied independently, since the small surface area excavated, the distance between them, and the differences in their sedimentological composition have as yet precluded the establishment of a clear stratigraphic correlation between them. The sediment was dry-sieved, and the material was carefully selected, washed, classified, inventoried and labelled appropriately. Both test pits yielded a great density of material, above all lithic items.

Table 1. — Distribution of the number of identified specimens (NISP) of molluscs and crustaceans.

Level	NISP
III	237
IV	18
Va	38
Vb	12
Vc	14
Total	319

In addition to other more superficial and recent remains, two fundamental cultural horizons can be distinguished in the stratigraphic sequence: the early part of the Upper Palaeolithic and the late Middle Palaeolithic.

The upper part of the sequence has disappeared as a result of historical anthropic activity. Even so, the altered remains of a Holocene shell midden can be seen, adhering to the wall of the rock-shelter due to calcite precipitations and situated 120 cm above the current floor. This circumstance, as well as the evidence of the Upper Palaeolithic in the adjacent El Cuco cave, leaves open the possibility that there might have been occupations in these periods, now disappeared.

The surface levels, I and II, of test pit B show recent anthropic alterations and a mixture of Palaeolithic with other subsequent material. Levels III and Va are assigned to the Aurignacian. The Mousterian sequence starts from level Vb, extending as far as level XIV, the final level excavated to date (Fig. 4).

The present article is concerned solely with levels III, IV and V of test pit B. These are very rich in lithic industries but are largely lacking in fauna and industry on hard animal materials. Especially noteworthy is the discovery of decorative elements in level Va.

Level I

Level I is roughly 23-33 cm thick. It is made up of surface materials mixed up with abundant medium-sized limestone blocks, which disappear towards the southern section. The sediment, which is powdery, consists of mud of a light brown shade.

Level II

Level II, which is 5-15 cm thick, is only continuous in the northern section and part of the eastern section. It contains yellowish-coloured clays. It contained various fragments of iron slag, possibly the remains of a dry forge from historical times.

Level III

Level III, which is 20-30 cm in thickness, is formed by brown-pink muds with frequent small-sized limestone blocks and a few medium-sized ones. The blocks are more frequent in the western section. This level yielded the most numerous lithic assemblage, comprising more than 20.000 items, as well as a few uncharacteristic items of bone industry.

Level IV

Level IV, which is just 1-9 cm thick, contains greyish-brown muds and a few small limestone blocks, extended in the northern portion. It yielded a limited lithic series, frequently – as a result of its low thickness and development – in contact with sublevel Va.

Level V

Level V is subdivided into three sublevels: “a”, “b” and “c”.

Sublevel Va

Sublevel Va is 15-23 cm thick and consists of a matrix of compact yellowish brown muds.

Sublevel Vb

Sublevel Vb, which is 5-18 cm thick, shows yellowish-brown muds and small limestone blocks.

Sublevel Vc

Sublevel Vc is 12-28 cm thick and made up of light and dark brown muds.

Level VI

Starting from level VI – a crust of residue with intercalated blocks of limestone, located only in the northern half of the test pit – the Mousterian sequence continues (levels VI-XIV), as described in other articles (Gutiérrez-Zugasti *et al.* 2018; Rasines del Río *et al.* 2018).

Remarks

The excavation of two test pits of limited extension that do not reach the base of the stratigraphy, the difficulties in achieving reliable datings, the need to pursue a more in-depth study of the archaeological material, all these factors are obstacles that prevent us from providing a complete vision of the site at present. In spite of this, the present paper offers a preliminary approach to the upper levels and demonstrates the potential of this site for research into the LMP-EUP transition and the process of change from the last Neanderthal populations to the earliest AMH on the Cantabrian coast.

Palynology

Generally speaking, the quantity of pollen grains found is fairly low, although there is a predominance of the herbaceous stratum, with a certain variety of taxa, in all the levels.

Level III

The palynological record of level III is very sparse, with the scarce presence of just a few taxa being detected. Among these, herbaceous taxa are prevalent: Asteraceae (Liguliflorae and Tubuliflorae), *Urtica* (Linnaeus, 1753), *Plantago* (Linnaeus, 1753), Chenopodiaceae, *Rumex* (Linnaeus, 1753) and Boraginaceae. The arbustive stratum is represented by Rosaceae, and the arboreal stratum by *Salix* (Linnaeus, 1753) and *Ulmus* (Linnaeus, 1762). Among aquatics and spores, monoletes and triletes are identified. Furthermore, some non-pollen microfossils are found, classed numerically as follows: T351, T369, T368 and T306.

Level IV

The arboreal stratum of level IV includes the presence of *Pinus* (Linnaeus, 1753), *Corylus* (Linnaeus, 1753), *Juglans* (Linnaeus,

TABLE 2. — Distribution of the minimum number of individuals (MNI) of marine molluscs.

	Levels					
Taxa	III	IV	Va	Vb	Vc	Total
Acanthocardia sp.	1	–	–	–	–	1
Patella vulgata (Linnaeus, 1758)	4	–	–	–	–	4
Patella intermedia (Murray, 1857)	3	–	–	–	–	3
Patella sp.	14	1	–	2	1	18
Littorina littorea (Linnaeus, 1758)	8	–	1	–	–	9
Littorina obtussata (Linnaeus, 1758)	–	–	5	–	–	5
Littorina sp.	–	–	1	–	–	1
Phorcus lineatus (da Costa, 1778)	6	–	–	–	–	6
Nucella lapillus (Linnaeus, 1758)	2	–	–	–	–	2
Turritella sp.	1	–	–	–	–	1
Ostrea edulis (Linnaeus, 1758)	1	–	–	–	–	1
Antalis sp.	1	–	18	–	1	20
Total	41	1	25	2	2	71

1753), *Ulmus* and above all *Salix*. The arbustive stratum has Rosaceae, Cistaceae and Ericaceae, whereas in the herbaceous stratum one finds Asteraceae (Liguliflorae and Tubuliflorae), Papaveraceae, Saxifragaceae, *Urtica*, *Plantago*, Poaceae and Chenopodiaceae. Among aquatics and spores, monoletes and triletes are detected. Again, non-pollen microfossils are also identified, classed as T-351, T-225 and T-368.

Level Va

The pollen record of level Va is extremely sparse. The presence of *Pinus*, Asteraceae (Liguliflorae and Tubuliflorae), *Plantago*, Poaceae, monoletes, triletes, *Glomus*, T-351 and T-368 can be detected.

Level Vb

Level Vb has the highest frequency of *Pinus* in the sequence. It is accompanied by *Quercus* deciduous and *Betula*. In the arbustive stratum one finds Cistaceae, and in the herbaceous stratum Asteraceae-t, *Plantago*, Poaceae, Chenopodiaceae and Fabaceae. Moreover, there are monoletes, triletes, T-315, T-351 and T-368.

Level Vc

In level Vc, there is a minimal presence of *Pinus, Corylus, Salix*, Rosaceae, Cistaceae, Asteraceae-t, *Plantago*, Poaceae, monoletes, triletes, *Glomus*, Concentriciste, T-351 and T-368.

Remarks

Although the scarcity of pollen precludes a detailed analysis, the data point to a glacial environment with a landscape dominated by meadows of herbaceous plants of the Asteraceae type. This suggests cool, relatively dry conditions with certain somewhat milder oscillations permitting the growth of small forest masses (Ruiz & Gil 2007).

TABLE 3.— Distribution of the minimum number of individuals (MNI) of pulmonate molluscs in level III.

Taxa	No.
Cepaea nemoralis (Linnaeus, 1758)	1
Cochlostoma sp.	1
Cryptomphalus aspersus (Müller, 1774)	1
Helicella itala (Linnaeus, 1758)	1
Oestophorella buvinieri (Michaud, 1841)	1
Pomatias elegans (Müller, 1774)	3
Total	8

MALACOLOGY AND SEAFOOD GATHERING

Nineteen taxa are identified, 13 to species level (gastropods: *Littorina littorea* (Linnaeus, 1758), *Littorina obtusata* (Linnaeus, 1758), *Phorcus lineatus* (da Costa, 1778), *Nucella lapillus* (Linnaeus, 1758), *Patella vulgata* (Linnaeus, 1758) and *Patella intermedia* (Murray, 1857); bivalves: *Ostrea edulis* (Linnaeus, 1758); land snails: *Cepaea nemoralis* (Linnaeus, 1758), *Cryptomphalus aspersus* (Müller, 1774), *Helicella itala* (Linnaeus, 1758), *Oestophorella buvinieri* (Michaud, 1841) and *P. elegans* (Müller, 1774); crustaceans: *Pollicipes pollicipes* (Gmelin, 1789)) and six to genus level (gastropods: *Littorina* sp., *Patella* sp. and *Turritella* sp.; bivalves: *Acanthocardia* sp.; scaphopods: *Antalis* sp.; land snails: *Cochlostoma* sp.) (Tables 1-3) (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013).

Level III has the greatest concentration of specimens (NISP = 237, MNI = 51). Species of the genus *Patella* are the most abundant (41.2% MNI), followed by *Littorina littorea* (15.7% MNI) and *Phorcus lineatus* (11.8% MNI). Bivalves are represented by *Acanthocardia* sp. (2% MNI) and *Ostrea edulis* (2% MNI); gastropods by *Nucella lapillus* (3.9% NMI) and *Turritella* sp. (2% MNI); scaphopods by *Antalis* sp. (2% MNI); crustaceans by *Pollicipes pollicipes* (3.9% MNI); and land snails by *Cepaea nemoralis* (2% MNI), *Cochlostoma* sp. (2% MNI), *Cryptomphalus aspersus* (2% MNI), *Helicella itala* (2% MNI), *Oestophorella buvinieri* (2% MNI) and *Pomatias elegans* (5.9% MNI).

Only in the case of marine malacology is a quantitative approach possible. Although fragments of marine malacofauna are recovered from all the levels, the findings – both in terms of the quantity of remains and variety of species – are concentrated within level III, where nine species are identified, with a predominance of *Patella vulgata*, possibly on account of its nutritional relevance (Table 2). All the marine species in level III could have been gathered as food, except for *Acanthocardia* sp., *Nucella lapillus*, *Turritella* sp. and *Antalis* sp., which may possibly have been collected for decorative use, as recorded at other sites of the Upper Palaeolithic.

The scarce remains of pulmonate molluscs are found in level III (Table 3). Caves and rock-shelters are among the natural habitats of land snails, and their occurrence may be due to natural causes. Only the presence of *Cepaea nemoralis* hints at nutritional use, without ruling out a purely natural origin.

The representation of molluscs in levels IV, Vb and Vc is more or less token, with one or two specimens of *Patella* sp. per level and one specimen of the genus *Antalis* sp. in Vc.

Table 4. — Results on elemental analysis (%C and %N) from ungulate bones from El Cuco rock-shelter.

No.	Sample ID 14C	Weight g	%C	%N
02	–	3.274	3.06	0.24
03	Cuco 08	3.655	5.49	1.22
04	–	3.858	3.14	0.47
05	–	3.617	2.19	0.03
06	–	3.579	2.25	0.09
07	–	5.065	2.42	0.17
08	Cuco 09	5.126	3.97	0.71
09	–	5.438	2.27	0.05
10	–	4.650	2.53	0.06
11	–	5.727	2.99	0.44
12	Cuco 10	5.365	3.38	0.52
13	–	5.218	2.49	0.11
14	Cuco 11	5.507	3.72	0.63
15	Cuco 12	5.616	3.53	0.58
16	–	5.431	1.86	0.09
17	–	5.085	2.75	0.26
18	–	5.279	2.16	0.17
19	–	5.474	2.46	0.07
20	–	5.157	2.35	0.12
21	–	5.555	2.45	0.11
22	–	5.161	1.89	0.09
23	–	4.978	1.67	0.08
24	–	5.418	2.14	0.05
25	–	5.700	1.98	0.04
26	–	5.548	3.26	0.26
27	–	5.675	1.87	0.07
28	Cuco13	5.120	4.43	1.00
29		5.362	2.22	0.24
30	–	5.167	3.19	0.33
31	–	5.393	1.77	0.06
32	–	5.618	2.54	0.34
33	–	5.574	1.72	0.04
34	–	5.465	2.62	0.17
35	–	4.902	2.18	0.15
36	–	5.595	1.79	0.06
37	–	5.709	2.40	0.05
38	–	5.423	1.87	0.04
39	–	5.408	2.44	0.08
40	–	5.655	2.51	0.03
41	–	5.837	1.92	0.08
42	–	5.336	1.88	0.12
43	–	5.167	2.22	0.17
44	–	5.859	2.28	0.10
45	–	5.287	1.85	0.12
46	–	5.109	1.99	0.15
47	Cuco 14	5.787	5.42	1.36
48	Cuco 15	5.561	3.97	0.83
49	–	5.096	2.70	0.41
50	–	5.225	2.63	0.14
51	Cuco 16	5.560	3.37	0.66
52	–	5.428	1.61	0.03
53	–	5.995	2.44	0.09
54	–	5.605	1.88	0.15
55	–	5.194	1.98	0.16
56	–	5.328	2.21	0.13
57	–	5.242	3.23	0.34
58	–	5.841	1.89	0.20
59	Cuco 17	5.560	3.03	0.56
60	–	5.819	2.91	0.23
61	–	5.388	1.79	0.12
62	–	5.201	1.60	0.01
63	Cuco 18	4.955	3.01	0.52
64	–	5.442	2.47	0.09
65	–	5.190	2.21	0.18
66	–	5.494	2.62	0.19

In level Va, the specimens are limited to three taxa, *Littorina littorea, Littorina obtusata* and *Antalis* sp., with traces of anthropic intervention. The presence of these taxa can perhaps be associated with the practice of symbolic behaviour. This finding calls for a more detailed discussion, which will be undertaken in Decorative items.

In the case of the marine fauna, there is no doubt about the anthropic character of the accumulation. In the early part of the Upper Palaeolithic, the sea level was several dozen metres lower than at present, so the coastline may well have been several kilometres to the north of its current location. The shells must have thus been brought by humans from the coast to the rock-shelter, since there are no other predators that transport shells so far away from the coast. In the case of the decorative items, the human modification of the shells and the sedimentary context in which they were found underscore the role of humans.

MATERIAL AND METHODS

A study was undertaken of levels III, Va, Vb and Vc of test pit B of El Cuco rock-shelter, carried out in 2005. The archaeological material is housed in the Museum of Prehistory and Archaeology of Cantabria (Museo de Prehistoria y Arqueología de Cantabria, MUPAC).

Radiometric dating

Obtaining reliable dates was one of the most difficult aspects of the study of this site. The bone record is less numerous than at other sites of the same period, but above all the unusual taphonomic conditions of the location adversely affected the preservation of bone collagen and thus seriously hampered dating by the ^{14}C method. Initially, a dating by ^{14}C AMS was carried out on a bone sample from level III at the Centrum voor Isotopenonderzoek (Rijksuniversiteit Groningen, the Netherlands), but this subsequently proved to be problematic.

To obtain radiocarbon dates from bones from temperate environments a collagen level of more than 1% is required. The percentage of carbon in the sample should be between 30% and 50% of the sample weight, since higher or lower values may be indicative of contamination or degradation. Further, the C:N atomic weight ratio should be in the range of 2.9-3.5 (van Klinken 1999). Samples showing higher ratios may have been contaminated with exogenous carbon, whereas lower ratios may indicate degradation. In both cases, the samples can be rejected. The total nitrogen percentage of the bone is considered a suitable indicator of the good preservation of the collagen. When the N content of the bone exceeds 0.7%, roughly 70% of bones have enough collagen to be dated by ^{14}C (Brock *et al.* 2010a, 2010b, 2012). In circumstances such as the present, where it has been difficult to obtain valid samples, a threshold N content of >0.5% has also been used in attempting radiocarbon datings (Wood *et al.* 2014).

The task of finding bone samples at El Cuco that could be dated by ^{14}C was an arduous one. With a view to establishing whether there was enough collagen in the bone to obtain a dating by ^{14}C AMS, an elemental analysis was performed

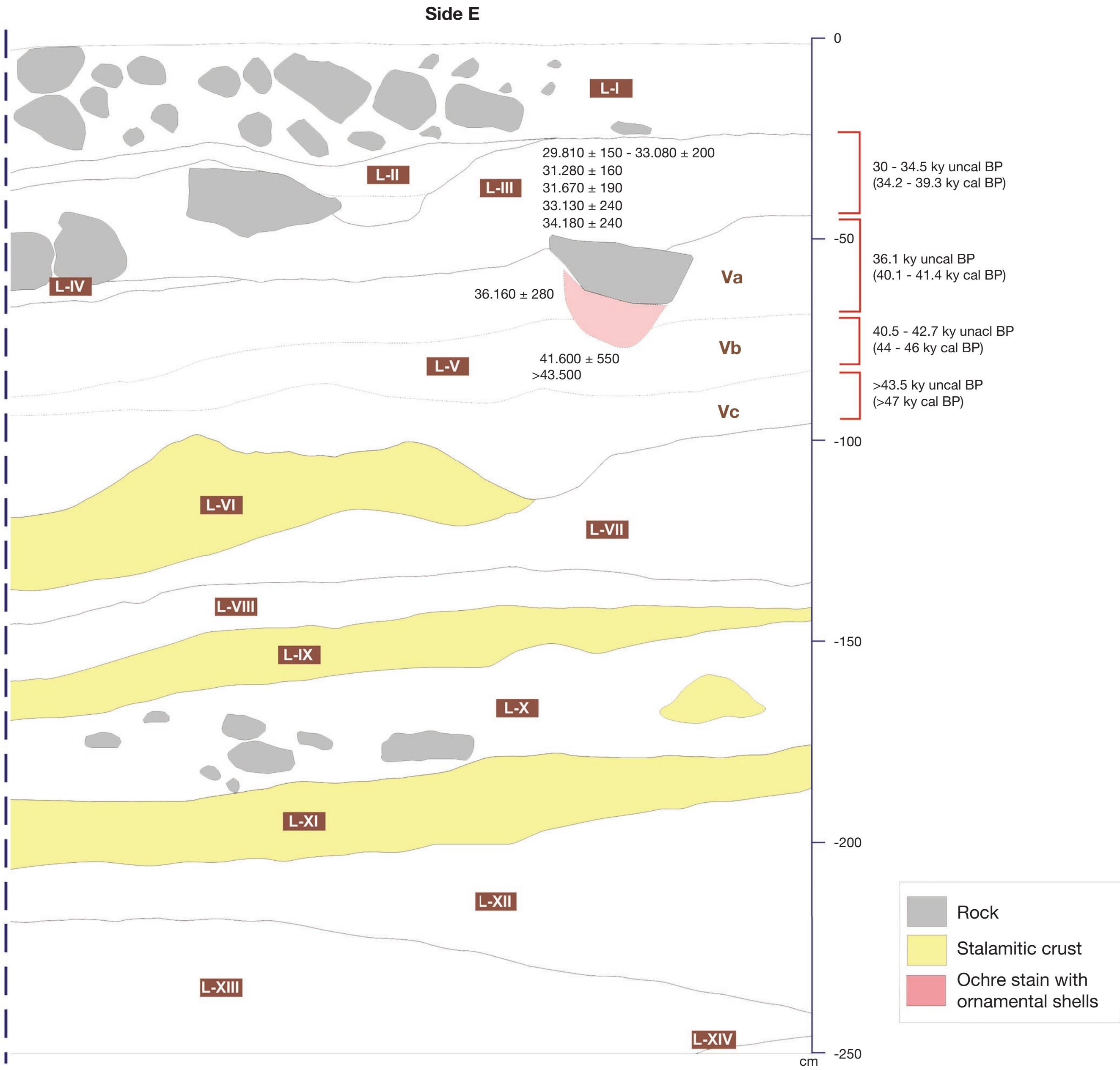

FIG. 4. — Stratigraphic sequence (E section) and dates of test pit B of El Cuco rock-shelter.

for N content. This elemental analysis was carried out on a series of 65 bone samples from levels III to V. The elemental analysis of organic composition (N, C) of these samples was undertaken at the *Serveis Tècnics de Recerca de la Universitat de Girona* (UAQiE). The samples were processed in a Perkin Elmer EA2400 series II elemental analyser. The detection limits were 0.72% for carbon and 1.20% for nitrogen.

Those samples with N values >0.5% were dated by ^{14}C AMS at the Beta Analytic Laboratory (Miami, United States). In order to select a pretreatment, a double analysis was first carried out on a single bone sample, applying on the one hand ultrafiltration (UF) and on the other hand the more traditional method of collagen extraction in an acid/alkali/acid bath (CEAAA).

The discrepancy between the results obtained in this double dating of sample CUCO-19 by ^{14}C AMS using two different pretreatments may be due – according to the laboratory – to the presence of contamination in the collagen extracted. The disparity in the results from the samples pretreated by UF and by CEAAA may thus indicate the existence of two distinct ^{14}C traces in the collagen extracted prior to the UF. This would suggest that there is a contamination in the collagen extracted and the UF is concentrating it, since the bone can only show one ^{14}C trace at the instant the living organism dies. This implies that the date obtained by CEAAA should be considered the minimum age, or the real age in the optimum case.

The option recommended by the laboratory, which we followed in the rest of the datings, was to apply a rigorous

TABLE 5. — New radiocarbon dates on bones and shell from El Cuco rock-shelter and samples that failed.

Sample ID	Lab. ref.	Level	Spit	Material	Taxa	Pretreat.	Date BP	δ13C 0/00	C:N	Date cal BP ± 2σ
Cuco 08	Beta-472943	III	4	Bone	Ungulate	CEAAA	33080 ± 200	–19.9	3.3	38050 - 36506
Cuco 09	Beta-470597	III	4	Bone	Ungulate	UF	29810 ± 150	–20.2	3.2	34207 - 33652
Cuco 09	Beta-470596	III	4	Bone	Ungulate	CEAAA	31280 ± 160	–20.0	3.2	35567 - 34775
Cuco 10	Beta-472944	III	5	Bone	Ungulate	CEAAA	31670 ± 190	–20.5	3.3	36045 - 35085
Cuco 11	Beta-472945	III	6	Bone	Ungulate	CEAAA	34180 ± 240	–20.6	3.3	39313 - 38201
Cuco 12	Beta-472946	III	6	Bone	Ungulate	CEAAA	33130 ± 240	–20.7	3.3	38202 - 36526
Cuco 13	Beta-472947	Va	9	Bone	Ungulate	CEAAA	36160 ± 280	–20.6	3.3	41427 - 40174
Cuco 14	Beta-472948	Vb	9	Bone	Ungulate	CEAAA	>43500	–20.8	3.3	–
Cuco 15	Beta-472949	Vb	9	Bone	Ungulate	CEAAA	41600 ± 550	–20.3	3.3	46064 - 44070
Cuco 16	Beta-472950	Vb	9	Bone	Ungulate	CEAAA	>43500	–20.8	3.3	
Cuco 17	Beta-472951	Vc	11	Bone	Ungulate	CEAAA	No collagen	–	–	–
Cuco 18	Beta-472952	Vc	11	Bone	Ungulate	CEAAA	No collagen	–	–	–

CEAAA treatment up to the point where the reaction slowed down when just enough collagen was obtained for the AMS dating. In this way, the sample was reduced to the minimum size but the possibilities of eliminating any contamination were maximized.

LARGE MAMMALS

An advance of the large-mammal study was published in Castaños & Castaños (2007). This is now extended and reinterpreted.

The skeletal remains were classified anatomically and taxonomically, thus determining the absolute frequency (n) and relative frequency (%) of the number of identified specimens (NISP) and of unidentified specimens (NUSP), the minimum number of individuals (MNI) and their relative frequency in the levels. Likewise, the weight (W) of the identified material (ident.) and unidentified material (no ident.) were calculated, as well as the degree of fragmentation. The biometric analysis was carried out following the classic methodology of von den Driesch (1976).

MATERIAL CULTURE

The lithic industry was analysed from a techno-typological point of view. It is not the aim of the present paper to carry out a detailed study of the lithic materials but simply to characterize the technocomplexes pertaining to each level, revising their initial assignation.

The raw materials were classified with the naked eye or by magnifying glass as required, distinguishing the allochthonous flint in accordance with Tarriño (2006). The rest of the categories were classified in basic terms (quartzite, quartz, sandstone, limestone, etc.).

The technology was characterized on the basis of the cores, the products and the chipping debris, using the most standardized nomenclature for technical systems (blade, microblade, Levallois, discoidal, etc.). The typological analysis used the standardized types (burin, scraper, retouched blade, Dufour bladelet, racloir, denticulate, notch, etc.) in conjunction with the analytic approach (Laplace 1972).

A study was made of the decorative elements from level Va, manufactured using marine mollusc shells, thus extending the study already in existence (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013) and interpreting it in greater depth in the light of the new archaeological context.

RESULTS

Some preliminary results have already been published (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013). However, the progress made suggested the need to undertake a broad revision, in particular with regard to the chronology and cultural ascription of the archaeological levels, which show an older chronology and techno-cultural assignation than originally thought.

CHRONOLOGY

In the batch of 65 bone fragments where the percentage nitrogen was analysed, eleven were found (16.92%) where it was greater than 0.5%, raising hopes that they might preserve enough collagen to be dated using ^{14}C AMS (Table 4). Accordingly, an attempt was made to date a dozen samples (two from one bone) from four levels (III, Va, Vb, Vc) (Table 5). Two samples, those from level Vc, had % N <0.57 and could not be dated as they did not preserve the necessary collagen, although others with similar nitrogen levels, from level III, did provide dates.

The unsuccessful datings from level Vc preclude any greater chronological precision than what is provided by its stratigraphic position beneath (i.e., older than) level Vb.

Beneath this sequence, the nearest level dated so far is level X, with two samples of *Patella vulgata* dating to 46.2 and 42.3 ky uncal BP respectively (Gutiérrez-Zugasti *et al.* 2018).

For level Vb, just a single dating has been available up to now, obtained on a bone sample, of 49.500 ± 3.900 (OxA-X-2640-11), to which a range of 55.276-42.816 cal BP is ascribed (95% probability). Comparing this with the NGRIP GICC05 record, this suggests that it accumulated during GS13, prior to GI12 (Marín-Arroyo *et al.* 2018a). However, it is not specified what depth or spit the sample corresponds to, and it shows a high standard deviation. By the same token, its age contradicts other, more recent dates, obtained in lower levels on samples of *Patella vulgata*. Level X, spit 20, thus has two dates of 42.350 ± 700 uncal BP (OxA-27196) (45.666 ± 619 cal BP) and 46.200 ± 650 uncal BP (OxA-27115) (49.571 ± 718 cal BP). A dating from level XII (spit 22) yields >43.5 ky uncal BP (Beta-382681), and another from level XIII (spit 24) yields 46.400 ± 800 (OxA-30851

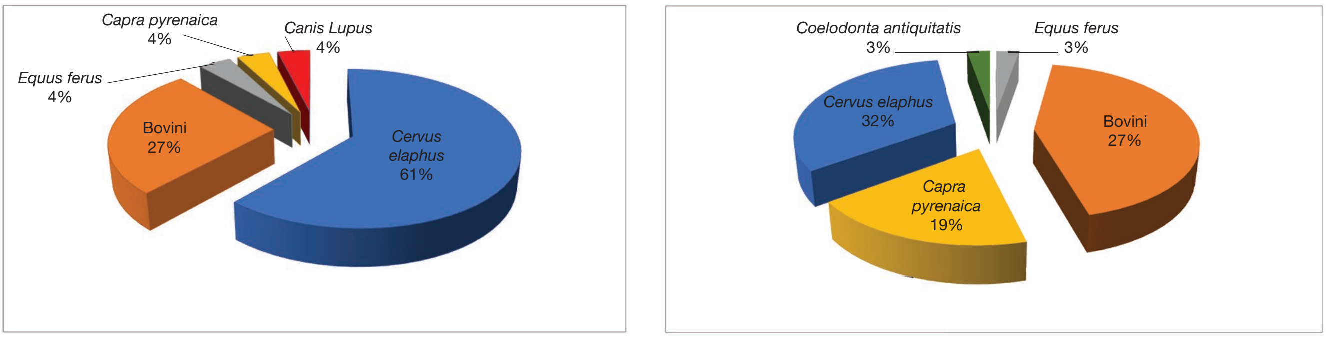

Fig. 5. — Graphic of relative frequencies of MNI of large mammals in levels III and Vc.

XIII) (Gutiérrez-Zugasti *et al.* 2018) (49.799 ± 891 cal BP). As we shall see below, moreover, this dating from level Vb is considerably older than those we ourselves obtained for this same level. For all these reasons, we consider it to be an unreliable dating, and its real value may possibly lie close to the most recent limit of its range of error.

From Level Vb we obtained three dates, which are consistent with one another. These situate its lower limit beyond 43.5 ky uncal BP and its upper limit at roughly 42.7-40.5 ky uncal BP (46-44 ky cal BP). Consequently, level Vc might be located after 43.5 ky uncal BP. Whatever the case, both level Vb and level Vc fall within the time range of the late Mousterian.

Level Va has a single dating of 36.1 ky uncal BP (41.4-40.1 ky cal BP), which places it in the Old Aurignacian.

We do not have specific datings for level IV, but its stratigraphic position between level Va and level III, and the dates attained for these, allow it to be situated roughly around 36-34 ky uncal BP (41-39 ky cal BP). This would thus correspond to the Old Aurignacian or Classic Aurignacian periods.

For level III, without specifying the spit, a date of 35.050 ± 650 has recently been published (OxA-32502), with a range of 45.498-32.544 cal BP (95.4% probability). This would place it at the boundary between the regional Proto-Aurignacian and the Old Aurignacian, tending towards the former (Marín-Arroyo *et al.* 2018a, b).

By contrast, we obtained from Level III six datings, two of which were achieved on the basis of samples from the same bone, pretreated with CEAAA and UF. These are distributed among spits 4, 5 and 6 and are stratigraphically consistent with one another. These datings yield results of roughly 34.5-30 ky uncal BP (39.3-34.2 ky cal BP), thus pertaining to a period from the Classic Aurignacian to the Evolved Aurignacian. In the case of the bone with two datings, and unlike what occurred at other sites, the sample pretreated with UF provided the most recent dating, as has also been found to occur in other cases, such as Sopeña (Pinto-Llona & Grandal-d'Anglade 2019).

The stratigraphic development thus shows a continuous deposit of fertile archaeological levels, without any hiatuses or sterile strata intercalated. The dates (*c.* 36.5-30 ky uncal BP) (*c.* 41-34 ky cal BP) of the Aurignacian levels (III-Va) can be taken to be compatible with a more or less continuous habitat from the Old Aurignacian to the Evolved Aurignacian. The dates (>43.5-40.5 ky uncal BP) (>46.5-44 ky cal BP) of the Mousterian levels (Vb-Vc) point to one of the final phases of the Mousterian on the Cantabrian coast. It is interesting to emphasize that in spite of the notable continuity in the stratigraphy a chronological gap of roughly 4 kyr (*c.* 40.5-36.5 ky uncal BP) (*c.* 44-41 ky cal BP) can be seen between the two cultural horizons (LMP-EUP) (Fig. 4; Table 5).

An overall assessment of the results places the upper levels (III-V) of El Cuco rock-shelter within a time interval running from roughly >43.5-30 ky uncal BP (>47-34 ky cal BP). Accordingly, the stratigraphic sequence embraces the final stages of the Middle Palaeolithic and the beginnings of the Upper Palaeolithic and thus includes the phase known in the literature as the "transition", marking the change in population from the final Neanderthal settlements to the earliest *Homo sapiens*.

Table 6. — Number of identified specimens (NISP) and number of no identified specimens (NNISP) and their relative frequencies of several levels.

	III	IV-Va	Va	Vb	Vc	Total
NISP	28	5	2	15	38	88
%NISP	1.4	1.3	1.6	2.3	1.6	1.6
NNISP	2002	381	126	647	2312	5468
%NNISP	98.6	98.7	98.4	97.7	98.4	98.4
Total	2030	386	128	662	2350	5556
%Total	36.6	6.9	2.3	11.9	42.3	

Large mammals

Most of the faunal remains come from large mammals. The remains belonging to other vertebrates are very scarce: a few bones from birds, fishes (above level IV), some evidence of small mammals and malacology. The large mammal assemblage is composed of 5.556 remains unevenly distributed between the different levels. The richest samples are from levels III and Vc. The fraction that could be identified to taxonomic level oscillates between 1.3% and 2.3% with an average value of 1.6% of the total recovered remains (Table 6). The large mammal assemblage is very fragmented, probably due to a mixture of human activity and post-depositional processes. This explains the low proportion of identified remains (Castaños & Castaños 2007).

Fig. 6. — Lithic industry from level Vc at El Cuco. Mousterian: **A**, Levallois flake; **B**, **C**, long flakes; **D**: proximal fragment of laminar flake; **E**, convergent denticulate (Tayac point); **F**, denticulate; **G**, convex transverse denticulate; **H**, transverse side-scraper (direct retouch) and transverse denticulate (inverse retouch); **I**, transverse denticulate; **J**, notch and denticulate; **K**, convergent denticulate (Tayac point); **L**, convergent side-scraper; **M**, notch and denticulate; **N**, denticulate and side-scraper; **O**, bilateral denticulate; **P**, denticulate; **Q**, transverse denticulate; **R**, distal fragment of denticulate on laminar flake. Scale bars: 3 cm.

All the remains identified, except for an upper wolf incisor from level III, belong to ungulates. There are five species: horse (*Equus ferus* Linnaeus, 1758), large bovids (*Bos* Linnaeus, 1758/*Bison* Hamilton Smith, 1827), red deer *(Cervus elaphus* Linnaeus, 1758*)*, Iberian wild goat (*Capra pyrenaica* Schinz, 1838) and woolly rhino (*Coelodonta antiquitatis* Blumenbach, 1807). Red deer and large bovids are the dominant species, with samples of similar size. Third is the Iberian wild goat, and both the horse and the woolly rhino are present with a single item each (Table 7). The intense fragmentation and

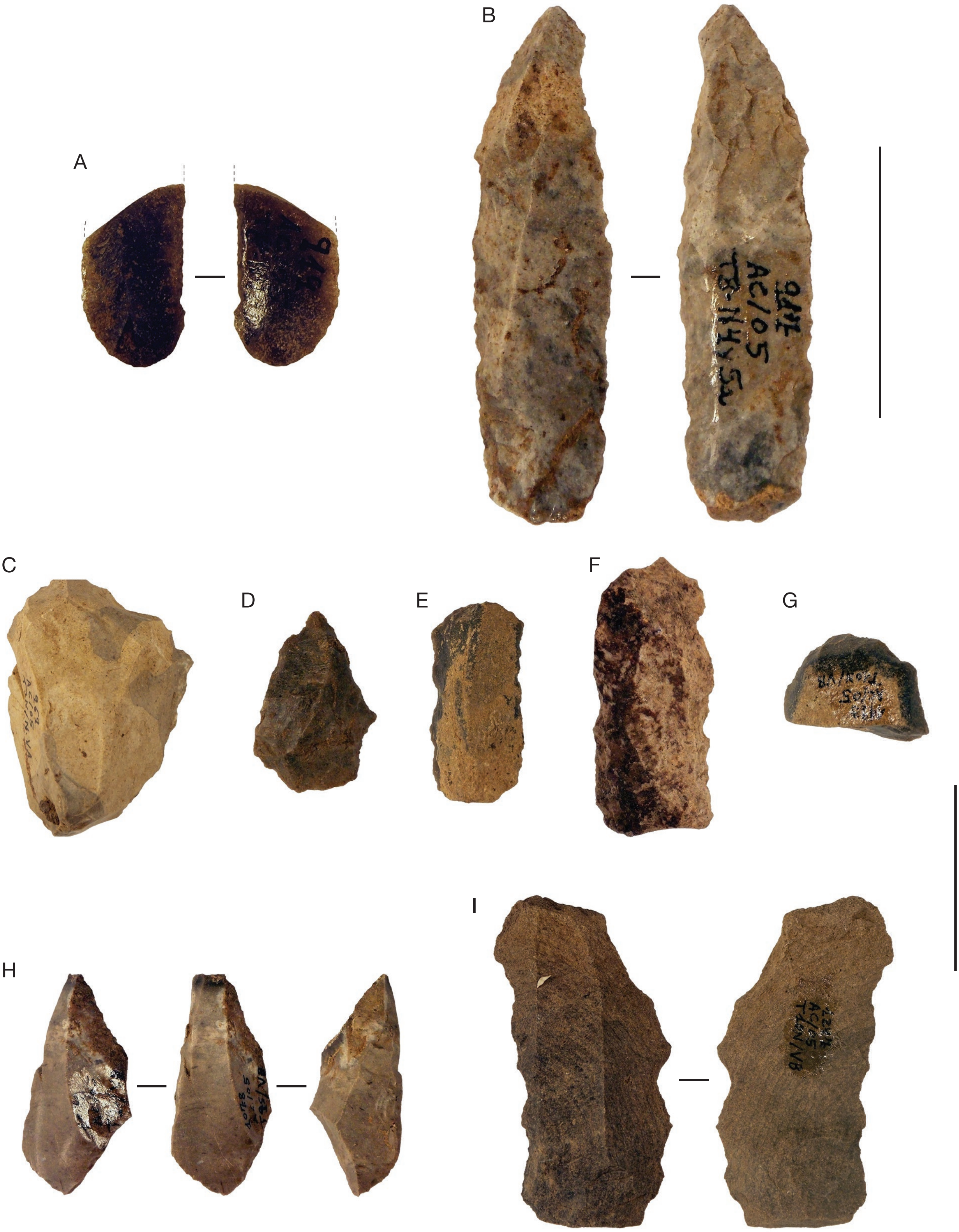

FIG. 7. — Lithic industry from levels Va and Vb at El Cuco: **A**-**F**, level Va, Aurignacian; **G**, **H**, level Vb, Aurignacian; **I**, and Mousterian. **A**, proximal fragment of Dufour bladelet (inverse retouch); **B**, large Dufour bladelet on burned flint (alternate retouch); **C**, carinated shouldered end-scraper; **D**, bec; **E**, end-scraper on retouched blade; **F**, distal fragment of retouched blade; **G**, end-scraper on flake; **H**, double burin on a break; **I**, bilateral denticulate. Scale bars: A, B, 2 cm; C-I, 3 cm.

some human footprints indicate that the bone fragments are the result of the hunting activity of the human groups that successively occupied the site.

In level III, deer is the most abundant species, as is frequently the case in many Upper Palaeolithic deposits in the Cantabrian fringe. In level Vc the relative frequencies of large bovids and red deer are balanced, but this datum is not significant considering the small sample size (Fig. 5).

Lithic industry

El Cuco rock-shelter displays a remarkable density of lithic elements (level III >20.000; level IV-Va >5.000; level Va >4.500; level Vb >4.400; level Vc >12.000), with an overwhelming predominance of flint as the raw material (level III >97%, level IV-Va >95%, level Va >97%, level Vb >98%, level Vc >98%), and a very modest presence of other raw materials: quartzite, lutite, ophite, limestone, rock crystal, quartz, sandstone and others in token quantities. Worthy of note is the presence of Flysch-type flint (Upper Cretaceous), the nearest outcrop of which is Kurtzia (*c.* 20 km to the east of El Cuco).

Level Vc

Analysis of the lithic remains of level Vc suggests that they pertain to a Mousterian industry showing characteristics similar to what was found in levels VII-XIV (Gutiérrez-Zugasti *et al.* 2018).

The raw materials show a substantial predominance of flint. Of a total of 12.360 remains recovered, 98.8% of them are made of flint (Muñoz-Fernández *et al.* 2007). There are also examples of quartzite, sandstone, ophite and quartz, among others. There are diverse varieties of flint, the most abundant of which is the Flysch-type flint of the Upper Cretaceous. This originates from Kurtzia, some 20 km to the east of El Cuco. Another variety is the Eocene flint that outcrops at Virgen del Mar, 50 km to the west. A third variety is more local and stems from the limestones of the Lower Cretaceous (Tarriño *et al.* 2015). In very large measure, the materials can be considered local in origin: Kurtzia falls within this range, and the remains from Virgen del Mar are scarce.

The most diagnostic technology is Levallois, but the possible presence of discoidal technology as well cannot be ruled out. The products obtained are flakes and blade-like flakes (some of the blade-like flakes having previously been classified as blades).

As far as the configuration of retouched tools is concerned, there is a predominance of denticulates, notches and racloirs (lateral and transverse; convex, rectilinear and concave). There are some points, but there are no tools of an Upper Palaeolithic type (tools previously classified as scrapers are here reclassified as racloirs, and burin blows are reclassified as fractures). The supports are varied: as well as the Levallois-type fracture products (flakes and blade-like flakes), there are thick flakes (cortical and non-cortical), which are often small in size (less than 3 cm in length), non-thick cortical flakes (some with a natural backed knife morphology), flake fragments and chipping debris (Fig. 6).

Level Vb

The analysis of the lithic remains of level Vb encountered a clear problem. These remains correspond to two different industries: one of them Mousterian and the other Aurignacian. As we have seen, the chronological data indicate a Mousterian chronology. To be able to assess this problem, it is necessary to recall the context of these materials.

Level Vb is a thin level of variable thickness; in an extension of 2 m it varies between 5 cm and 18 cm.

The archaeological excavation was a test pit, the first carried out at the site.

The overlying level Va contains Aurignacian industry.

The contact between levels Vb and Va is diffuse.

Accordingly, two (not mutually exclusive) possibilities may be pointed out:

The presence of factors (such as bioturbation, diagenesis) that may have introduced elements from level Va into level Vb.

Errors in the excavation that may have assigned elements from level Va to level Vb.

In the northern sector of the test pit, spit 10 corresponded equally to either level, and the archaeological materials were in contact with one another. It seems plausible to assume that for either or both of the above-mentioned reasons there was a transfer of material from level Va to Vb. Future excavations of the site will reveal whether level Vb is Mousterian, as we propose, or whether it presents a mixture of diverse materials.

A total of 4.474 lithic remains were recovered, more than 98% of which are of flint (Muñoz-Fernández *et al.* 2007). In spite of the difficulties that this entails, it can be ventured that the “Mousterian industry” is comparable to that of level Vc and the “Aurignacian industry” to that of level Va.

The Mousterian industry is exemplified by the presence of Levallois-type flakes and blade-like flakes, as well as denticulates, notches and racloirs (Fig. 7).

The Aurignacian industry is illustrated by Dufour bladelets, nosed scrapers, retouched blades and burins, as well as two unipolar bladelet cores (Fig. 7).

Levels III and Va

The industry contained in levels III and V was initially attributed to the Gravettian. This diagnosis was influenced at the time by the dating of level III, which was subsequently found out to be possibly erroneous (and which we have confirmed as erroneous in the present work). The presence of microblade technology (with the exception of level Vc) corroborated that it belonged to the Upper Palaeolithic, but the fact that there were no clearly characteristic backed blades resulted in the diagnosis being of a rather unusual Gravettian, given the absence of La Gravette points and Noailles burins and the presence of a number of Dufour bladelets (Rasines del Río & Muñoz-Fernández 2012).

Level Va (or IV-Va). The raw materials are the same as those described above for the Mousterian levels, and their proportions are very similar. Flint is the only significant raw material, amounting to more than 96% of the total (Muñoz-Fernández *et al.* 2007).

Fig. 8. — Lithic industry from level III at El Cuco. Aurignacian: **A**, mesial fragment of Dufour bladelet (inverse retouch); **B**, distal fragment of Dufour bladelet (alternate retouch); **C**, proximal fragment of Dufour bladelet (direct retouch); **D**, flattened bifacial core; **E**, blade; **F**, bec and denticulate on fragmented flake; **G**, carinated end-scraper on cortical blade; **H**, carinated end-scraper on blade; **I**, carinated end-scraper on dejete retouched blade. Scale bars: A-C, 2 cm; D-I, 3 cm.

The technical diagnostic systems are blade and microblade but they are not predominant. There may have been an important production of flakes but we have not studied it enough to be able to characterize it. The blades show diverse facets.

Dufour bladelets are present but not in abundance. In this context, it should be borne in mind that their presence is probably underestimated because the sediment was sieved without water; in the test pit, all the sediment was sieved, but dry. It is well known that the dry-sieving of sediment does not recover all the pieces, by contrast with when the sediment is sieved with water, and the smaller the items, the fewer of them are identified. The few fragments found indicate the presence both of "large", rectilinear Dufours and of "small" Dufours (by way of illustration, a width of 10 mm might separate the two categories).

Fig. 9. — Ornamental shells impregnated with ochre located beneath a limestone block. Length of each band (white or red) in the scale bar: 10 cm.

Similar proportions of burins and scrapers are recorded. Among the burins, burins on truncations are the most characteristic, but there are also some burins on fractures.

As far as the scrapers are concerned, there are flat scrapers on retouched blade and on flake (some cortical), and carinated scrapers on chipping debris (Fig. 7).

Some "perçoirs" are also identified. Secondary tools are relatively abundant: e.g. denticulates and racloirs. However, their outlines are not as clear as those from the Mousterian levels, and the retouches are not as deep. They are not the prototypical denticulates and racloirs of the Middle Palaeolithic.

In summary, the industry is not sufficiently significant in terms of the quantity and quality of items to be able to classify it precisely. It could correspond equally to the Archaic Aurignacian and to the Old Aurignacian. We have also identified, in this level, some elements of lithic industry which are attributable to the Mousterian.

Level III. The raw materials do not vary with respect to the previous levels. Flint represents roughly 97.5% of the total elements (Muñoz-Fernández *et al.* 2007).

The characteristic technical systems of this level are, in order, microblade, blade and flake production.

Bladelet cores and microblade products are very abundant, and the presence of bladelets is underestimated due to the fact, as explained above, that the sediment was dry-sieved. Some of the cores are in the process of being shaped, and others in the process of being used, indicating that production took place at the site itself. Accordingly, core-edge blades or crested blades are also found.

Most of the microblade cores are unipolar, but bipolar microblade industry is also in evidence, with cores with a subcircular outline.

Unipolar microblade cores may be on flake, blade-like flake or on fragments (if they are whole the original support cannot be made out). Their configuration is of the carinated scraper type, convex in outline, and nosed (at the end of a narrow support).

At a minimum there is a double core; a nosed core opposite a carinated scraper-type core.

Blade-like cores are less abundant. These are either unipolar or bipolar. Their morphology is slanting prismatic or flat-faced.

The flake cores preserved are bifacial, discoidal-type *sensu lato*, and small in size. Some are configured on the basis of cortical flakes. The products obtained would be of reduced dimensions.

Fig. 10. — *Antalis* sp. situated in level Va of the eastern stratigraphic section. Scale bar: 1 cm.

The larger-sized flakes could be derived from the configuration of the blade-like cores.

There is a percussor, a pebble of a subcircular and flattened outline, which presents four areas with percussion marks (three at the edges and one in the centre of one of the two faces).

As far as the configured tools are concerned, all of them are on flint.

Dufour bladelets are represented by numerous fragments. None is preserved whole, but from the widths it can be deduced that most of them are small Dufours (A <10 mm).

Burins and scrapers are well represented. Prevalent among the former are burins on truncations, although burins on fractures are also present. There are also a few dihedral burins. The supports are thick flakes and blade ends.

The scrapers can be divided into flat, carinated and nosed.

The flat scrapers are on blade ends or ends of blade-like flake. There are also some flat ones with retouched edges. Likewise, there are some lateral and some inverse.

Carinated scrapers may be on any support: blade ends (in some cases retouched), blade-like flakes, flakes, flake fragments, or chipping debris.

The nosed scrapers may be flat or carinated, on flake or on fragment. Some are very small in size. There are also some lateral and inverse ones.

Some scrapers are accompanied by notches or denticulates.

"Perçoirs" are abundant, but there is little standardization.

Some blades and blade fragments are identified. These are retouched, but none of them can be identified as an Aurignacian blade.

As regards secondary tools, the same can be said as for the previous level. Denticulates and racloirs are relatively abundant. Some are formed from other raw materials (such as quartzite). There is also a large tool made from ophite (a pebble fragment with extractions).

Finally, one should point out the presence of a bone awl measuring some 14 cm in length, even though this is not a lithic item.

In summary and by way of a chrono-cultural diagnosis, the abundant production of bladelets, the scarce presence of large blades, the production of small flakes, the abundance of "small" Dufour bladelets, and the presence of carinated and nosed scrapers (many of which are small in size) lead us to assign this industry to the Evolved Aurignacian. Even so, it should be borne in mind that the sample is from a limited

TABLE 7. — Composition (in minimum number of individuals, MNI) of the *El Cuco* rock-shelter faunal assemblage.

Taxa	III	IV-Va	Va	Vb	Vc
Equus ferus (Linnaeus, 1758)	1	–	–	–	1
Bovini (Gray, 1821)	7	3	–	8	16
Capra pyrenaica (Schinz, 1838)	1	1	–	–	7
Cervus elaphus (Linnaeus, 1758)	17	1	2	7	12
Coelodonta antiquitatis (Blumenbach, 1807)	–	–	–	–	1
Canis lupus (Linnaeus, 1758)	1	–	–	–	–
Total	27	5	2	15	37

test pit, and it is thus to be expected that future, extended excavations will verify this diagnosis (Fig. 8).

DECORATIVE ITEMS

In level Va we discovered a series of decorative elements of unquestionable interest. Not all of the set was recovered in the first campaign, and it remains to be completed with the findings of the 2016 campaign, currently under study. Nonetheless, the present article provides a summary of the results of the first campaign (Muñoz-Fernández *et al.* 2007).

The discovery in question was made in the eastern section, beneath a limestone block and within a homogeneous context characterized by an ochre stain dying the sediment (Fig. 4). It consists of a series of ornamental shells, impregnated with this colouring (Figs 9; 10), which suggests that it might be a set of beads associated with one another (Fig. 11), possibly fastened to items of leather clothing or forming part of a composite decorative element such as a necklace or a similar item. They appear in a level assigned to the Aurignacian and dated by ^{14}C AMS to 36.160 ± 280 uncal BP (41.427-40.174 cal BP) (Beta-472947), making them one of the oldest sets of ornaments found on the Cantabrian coast.

The series recovered in the 2005 campaign is made up of an exceptional accumulation of 38 remains corresponding to a minimum number of 25 individuals used as ornaments. The sample consists of one specimen of *Littorina littorea*, five of *Littorina obtusata* and one attributed to the genus *Littorina*, all of them perforated, together with 31 fragments belonging to the genus *Antalis* corresponding to a minimum number of 18 individuals (Fig. 11). In general, they are in a good state of preservation, although some shells show certain alterations such as a faint coat of calcium carbonate and/or are filled with sediment. Breaks can be seen at the apex of some gastropods and at the posterior end of the scaphopods. Some shells display small reddish, yellowish or black stains. The latter may be due to the presence of manganese (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013).

One specimen of *Antalis* sp. has a regular, oval hole that is too small to have been made by a stone or bone perforator or to thread a cord through it, so it may perhaps be due to a marine predator. The hole visible in the specimen of *Littorina* sp. also raises doubts, since it differs from the other examples of the genus in the position of the orifice and in its state of preservation, showing recent breakages. In the other specimens, the action of marine predators can be ruled out as a cause of the perforations, since they exhibit clear evidence of their human origin (Gutiérrez-Zugasti *et al.* 2013).

The perforations in the shells belonging to the genus *Littorina* are faintly coated with calcium carbonate, making it more difficult to analyse the technique used in making them. However, to judge by the absence of abrasion, scraping and sawing, the morphology of the perforations and the literature on experimental work (d'Errico *et al.* 1993; Taborin 1993; Vanhaeren & d'Errico 2003; White 2007), the perforations are likely to have been made by indirect percussion, using a small pointed object. It is possible that they were also made more regular during production in order to smoothen the outline, for they show a morphology that is rounded and regular. Even so, five of the perforations show wear and tear, probably produced by the hanging of the shell (Gutiérrez-Zugasti *et al.* 2013).

Some specimens of the genus *Antalis* were found packed inside one another, perhaps because they were fitted lengthways into one another, having been cut off at their distal end. In most specimens there is evidence of breakages caused by humans at the posterior end of the tube to broaden the section of the distal orifice and allow the cord to be threaded through for hanging. The state of preservation precludes clear identification of traces of wear. However, their regular morphology suggests that the shells were sawn using a lithic tool that cut the end of the tube. The natural opening of the anterior end of the shell is – in the specimens of a certain size, such as those with which we are concerned – broad enough to pass a cord through. Some specimens have an irregular break at the edge that could be related to how the shells were put together in a composite ornament (Gutiérrez-Zugasti *et al.* 2013). Likewise, fixing them in position may have caused semi-rounded notches, above all at the anterior end, an alteration that has been described in experimental studies (Álvarez-Fernández 2006).

DISCUSSION

The nature of this archaeological intervention as a test pit is a decisive factor to be borne in mind in assessing the studies carried out. The limited surface area excavated to date places a constraint on the quantity of material available for study. As a result of the exceptional density of remains, however, the lithic industry provides enough items to be able to consider the samples as to a certain degree representative. By the same token, it was possible to attenuate the difficulties in attaining numerical dates, described above in the Material and Methods section, by using the previous analysis of the N content of a good number of the bone samples.

The scarcity of preserved pollen in the sediment permits little more than a general qualitative assessment of the period of the last Neanderthals and the first AMH, pointing to a landscape of open vegetation with a predominance of the herbaceous stratum, a scant arbustive record, scarce representation of riverbank or aquatic elements, and a limited presence – albeit varying with level – of the arboreal stratum. This plant com-

Fig. 11. — Ornamental set from El Cuco (2005 campaign). Scale bar: 5 cm.

position suggests a glacial environment with cool, relatively dry conditions, but with certain oscillations in the course of the sequence expressing a degree of climatic instability.

The limited faunal representation likewise permits no more than a provisional account. The series does not differ substantially from what would be expected in a site from the period in question. In view of the small size of the large-mammal sample, the taxonomic variety recorded may be considered notable. Four of the taxa most commonly found in the faunal lists of herbivores from the Palaeolithic sites of the Cantabrian coast are identified: *Cervus elaphus*, Bovini, *Capra pyrenaica* and *Equus ferus*.

Another characteristic of the record is the general prevalence of the red deer (*Cervus elaphus)* (Table 7), the remains of which constitute roughly 45% of the total sample, and which is the only species present in all levels and in level Va – possibly on account of the limited size of the sample – is the only one recorded.

If the percentage frequency is calculated on the basis of bone weight, the weighting of large bovids and deer in the record changes as a consequence of the difference in size between the two species. This is particularly evident in level Vc, where Bovini exceeds *Cervus elaphus* both in number and bone weight. This may possibly be associated in some way with the chrono-cultural and anthropological change between the levels in question. This hunting pattern of prey selection is recorded from the Middle Palaeolithic on and reaches its highest levels at the end of the Upper Palaeolithic. The faunal structure of El Cuco rock-shelter as a whole fits well with the model of the Middle Palaeolithic and early Upper Palaeolithic.

In spite of the scarcity of the record, the significant proportion of remains from large-sized ungulates such as the woolly rhinoceros (*Coelodonta antiquitatis)*, large bovids (Bovini), horse (*Equus ferus*) and red deer (*Cervus elaphus)* brings the fauna of this rock-shelter suitably into line with that of other roughly contemporaneous sites on the Cantabrian coast. One of the characteristic features of samples from levels dating to the Middle and early Upper Palaeolithic is the major role played by the hunting of large-sized herbivores. This applies to almost all the Mousterian levels at sites such as Morín, Covalejos, Axlor, Arrillor and Lezetxiki (Altuna 1971, 1973; Castaños 1996, 2005) as well to others from the Aurignacian such as Labeko Koba (Altuna & Mariezkurrena 2000). As the Upper Palaeolithic progresses, the presence of large-sized animals – with the exception of the red deer – decreases, often falling to merely token levels and yielding to other, smaller animals such as the Iberian ibex (*Capra pyrenaica)*, the chamois (*Rupicapra pyrenaica* (Bonaparte, 1845)), the roe deer (*Capreolus capreolus* Linnaeus, 1758) and the wild boar (*Sus scrofa* Linnaeus, 1758).

The only carnivore identified is the wolf (*Canis lupus* Linnaeus, 1758), with a single fossil remnant in level III, even though in the lower, Mousterian levels beneath level Vc the brown bear (*Ursus arctos* Linnaeus, 1758), leopard (*Panthera pardus* Linnaeus, 1758), red fox (*Vulpes vulpes* Linnaeus, 1758) and badger (*Meles meles* Linnaeus, 1758) have been identified. Nonetheless, the limited size of the sample implies the influence of random factors that might explain the absence of species that may well have inhabited the surrounding area, not to mention the general decrease in large-sized carnivores in the Upper Palaeolithic with respect to the Middle Palaeolithic.

The scant malacological record is in line with that of other contemporaneous sites close to the present-day coastline. Level III is the only one with a representation of relative qualitative and quantitative significance, with a record of accumulated pulmonate molluscs. *Patella*, *Littorina littorea* and *Phorcus lineatus* are the prevalent marine taxa and the only ones that might be interpreted as playing a role in the diet (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013).

The discovery of the set of decorative marine shells in level Va requires a more detailed commentary. Ornamental marine shells are one of the archaeological elements that have usually been associated in Europe with the onset of the Upper Palaeolithic and with modern human behaviour. The use of manufactured shells with a decorative intent is understood to reflect a more complex symbolic capacity often assumed to be unique to *Homo sapiens* (Muñoz-Fernández *et al.* 2007; Gutiérrez-Zugasti *et al.* 2013). Even so, some publications have presented putatively ornamental marine shells manufactured by Neanderthals (Zilhão *et al.* 2010). Conversely, there is evidence of symbolic objects manufactured by AMH but associated with Mousterian industry (Bar-Yosef Mayer *et al.* 2009), Aterian industry (Bouzouggar *et al.* 2007) and MSA technologies (d'Errico *et al.* 2005, 2008).

Within the chrono-cultural context of the Atlantic front of Europe, it is not exceptional to find ochre colouring, shells and other decorative elements from the early Upper Palaeolithic onwards (Álvarez-Fernández 2006; Álvarez-Fernández & Jöris 2007; White 2007). On their journeys to the coast, the first *Homo sapiens* to inhabit the area will have collected shells with unusual or striking aesthetic qualities. Such may have also been the case with level III of El Cuco, assigned to the Evolved Aurignacian, where shell remains such as *Acanthocardia* sp., *N. lapillus*, *Turritella* sp. and *Antalis* sp. are found. Although no signs of manufacture are detected in this case, these shells could have been gathered and taken to the dwelling place not for dietary reasons but for their aesthetic qualities or as a raw material for the production of ornamentation. Even so, these tend to be isolated shells found in levels of occupation, whereas sets of several shells together tend to be limited to manufacturing workshops or to places associated with structures (as in the Aurignacian of Isturitz), refuges (as at Klissoura cave 1; Stiner 2010) or funerary contexts (as in the Gravettian of Lagar Velho; Taborin 1993; Álvarez-Fernández 2006). Accordingly, findings such as those at El Cuco are uncommon, especially in periods as old as the Aurignacian.

The set of beads made from marine shells at El Cuco was found in matrix impregnated with red ochre beneath a sizeable limestone block, in a level dated to 36.1 ky uncal BP that is in principal assigned to the Old Aurignacian, yet without completely ruling out the possibility that it might belong to the previous age.

This context suggests four interpretations: 1) a manufacturing workshop for decorative shells; 2) the use of the beads as grave goods, which would imply the presence of a interment in the nearby land; 3) the practice of some sort of ritual or simply the use of a hiding place which would entail the shells being buried and sealed off by the block; and 4) the accidental loss of the shells (Gutiérrez-Zugasti *et al.* 2013). It would seem that hypothesis 1 can be ruled out because the deposit is very limited and circumscribed within a very concrete space, and no shell ornaments are found in the process of manufacture. Verifying hypothesis 2 would require the area of excavation to be extended to the squares adjacent to the stratigraphic section where the set of shells appeared. This task was partially carried out in the 2016 campaign but without finding any evidence of a burial. Hypothesis 4 would imply the unlikely random combination of a number of decorative elements in a very small space and a singular context (an ochre stain and a limestone block). Ruling out hypothesis 1 and taking into account the unlikelihood of hypotheses 2 and 4, the features of the discovery seem rather to suggest hypothesis 3. In other words, we may be dealing with an intentional deposit, whether a simple hiding place or the expression of ritual or symbolic behaviour. This hypothesis is reinforced by the presence of the ochre colouring.

As regards the type and function of the ornament, it may be a relatively long necklace, some other type of decoration composed of different species of shells, beads attached to clothes or accessories (baskets, bags), or ornaments fixed to other elements such as blankets or leather tents. In addition to the aesthetic dimension, its function may be associated with identification among groups, social standing or ritual behaviour. The discovery at El Cuco thus corroborates the idea that decorative and symbolic elements of a marine origin were used from the early Upper Palaeolithic onwards.

The early, unsuccessful ^{14}C AMS datings yielded a more recent age for the sequence at El Cuco. For the bone sample Cuco-01, the laboratory initially reported that the measurement had failed. Subsequently, a re-analysis was carried out, giving a date of 23.400 ± 210 (GrA-32097) which in principal would be assigned to the Gravettian period (Muñoz-Fernández *et al.* 2007). Since then, it has been established that it was obtained on bone apatite. A deficiency of collagen in the bone was also found in other samples taken from the lower levels (X, XIII, XIV) that were sent to other laboratories (Gutiérrez-Zugasti *et al.* 2018).

By contrast, new ^{14}C AMS datings, obtained on bone samples with enough collagen, place the upper sequence of El Cuco between the end of the Mousterian and the Aurignacian. For the aims of the present study, we are thus dealing in particular with the final stage of the Middle Palaeolithic and the beginnings of the Upper Palaeolithic. On the Cantabrian coast, there are not many sites whose stratigraphy – like that of El Cuco – includes levels from the end of the Mousterian and the early Upper Palaeolithic. Noteworthy among those that do are Lezetxiki (Mondragón, Guipúzcoa), Labeko Koba (Mondragón, Guipúzcoa), El Castillo (Puente Viesgo, Cantabria), Morín (Villaescusa, Cantabria), Covalejos (Piélagos, Cantabria), Sopeña (Onís, Asturias) and La Güelga (Cangas de Onís, Asturias).

Sites such as Axlor rock-shelter (Dima, Biscay) or the caves at Arrillor (Zigoitia, *Álava*), El Mirón (Ramales de la Victoria, Cantabria), El Esquilleu (Cillorigo de Liébana, Cantabria) and El Sidrón (Piloña, Asturias) have yielded dates that illustrate the LMP. There are also reference dates for the EUP at La Viña rock-shelter (Manzaneda, Asturias).

Various proposals have been made for the periodization of the Mousterian on the Cantabrian coast. Ríos-Garaizar (2016) has proposed six distinct phases for the Middle Palaeolithic in the region of eastern Cantabria, ranging from *circa* 170-40 ky uncal BP. These phases would have been associated with changes in the dynamics of settlement and the use of territory, which may have been influenced by environmental changes. Other researchers, however, have not found any indicators in the lithic record – with its very significant abundance of substrate elements – that might permit the establishment of chronological hierarchies in the Mousterian (e.g. Bernaldo de Quirós *et al.* 2008).

On the Cantabrian coast, the latest Mousterian yields dates of *circa* 50-38.5 ky uncal BP (*c.* 54-42.5 ky cal BP) (Cabrera-Valdés & Bischoff 1989; Cabrera-Valdés *et al.* 1996; Maíllo-Fernández *et al.* 2001; Bernaldo de Quirós *et al.* 2008; Maroto *et al.* 2012; Higham *et al.* 2014; Ríos-Garaizar 2016). A problematic exception is El Esquilleu, whose dates are considerably more recent (Baena *et al.* 2006, 2012), although recently they have no longer been interpreted as indicators of a Mousterian age (Higham *et al.* 2014; Yravedra & Gómez-Castanedo 2014; Baena Preysler *et al.* 2019). Expressed as calibrated dates, the most recent datings of late Mousterian technocomplexes, and thus of the final Neanderthal groups in the northern Iberian Peninsula, yield ages of roughly 43-42 ky cal BP (*c.* 39-38 ky uncal BP) (Maroto *et al.* 2012), although an early end to the Mousterian has been proposed to occur *c.* 47.9-45 ky cal BP (Higham *et al.* 2014; Marín-Arroyo *et al.* 2018a), which would also contrast with the range of 40.8-39.2 ky cal BP established for the extinction of the Neanderthals in Europe (Higham *et al.* 2014).

The Mousterian levels Amk and Smk-1 of Arrillor were dated by ^{14}C AMS to an age of roughly 46-43 ky uncal BP (Hoyos *et al.* 1999) (*c.* 49.5 - 46 ky cal BP). The most recent phase, the late Middle Palaeolithic, is thought to be present in levels Lmc and Lamc of Arrillor, with lithic industry showing different technologies (Levallois and discoidal) (Ríos-Garaizar 2016). In these upper levels Lmc and Lamc, the lithic record is characterized by the use of high-quality flint and a set of tools comprising racloirs, denticulates, points and some pieces of an Upper Palaeolithic type (Saenz de Buruaga 2014). Level Lmc was initially dated to 37.100 ± 1.000 uncal BP (Ox-A 6106) (Hoyos *et al.* 1999) (41.354 ± 840 ky cal BP), but subsequently an older date of 44.900 ± 2.100 uncal BP (OxA-21986) (48.419 ± 2.148 ky cal BP) was obtained for this level, whereas level Lamc yielded dates of 45.600 ± 2.300 uncal BP (OxA-22654) (49.229 ± 2.483 ky cal BP) and >46.800 uncal BP (OxA-22654) (>50 ky cal BP) (Higham *et al.* 2014; Iriarte-Chiapusso *et al.* 2019).

At Axlor rock-shelter, the stratigraphy of the upper sequence (levels F-D) may be affected by a problem of contamination, since chronological inversions occur that have been interpreted as palimpsests (González-Urquijo & Ibáñez 2002; Ríos-Garaizar 2012a, 2016).

Level 20e of the cave of El Castillo is assigned to a typical Mousterian, exhibiting an operative chain of bladelet production. At this site, the unique presence of the "Transitional Aurignacian" has been defined in levels 18b and 18c (Cabrera-Valdés *et al.* 2005a; Bernaldo de Quirós *et al.* 2008), although we consider this to be Middle Palaeolithic industry. In level 18c, dated to roughly 40 ky uncal BP (*c.* 43.5 ky cal BP), it is argued, there are operative schemes for blade production similar to those of the Old Aurignacian (Lloret & Maíllo-Fernández 2006), lance points, hunting tools specialized for deer, and decorations with symbolic marks on a mobiliary support (Cabrera-Valdés *et al.* 2001, 2005a). In level 18b, dated to roughly 38.5 ky uncal BP (*c.* 42.5 ky cal BP), symbolic activity is said to become more intense and figurative mobiliary art starts to be produced (Cabrera-Valdés *et al.* 2005b). In neither case is the evidence sufficiently convincing, however, and a global description of these levels fits better with a Mousterian technocomplex (Zilhão & D'Errico 1999; Maroto *et al.* 2005; Zilhão 2006, among others). Moreover, it has recently been pointed out that, given the dating (35.000 ± 600 uncal BP) (39.559 ± 654 ky cal BP), the split-base lance points from the excavations carried out by H. Obermaier cannot correspond to levels 18b and 18c of the present-day excavations (Wood *et al.* 2018).

The levels from 128-130 of the cave of El Mirón (Ramales de la Victoria, Cantabria) have been attributed on the basis of numerical datings to the latest Mousterian and the beginnings of the Upper Palaeolithic. Level 130 has been dated to a range of 47.3-42.9 ky cal BP (in addition to another date beneath the limit of the ^{14}C dating); level 129 has been found to correspond to a level that is "essentially" sterile (although more than a thousand bone fragments are recorded); whereas level 128 is located between 31.7 and 31 ky cal BP, i.e., within the Gravettian chronological interval (Straus & González Morales 2003; Marín-Arroyo *et al.* 2018b).

This late Mousterian stage (LMP) has also been identified in level 11 of Morín (Maíllo-Fernández 2007) and at El Esquilleu (Baena *et al.* 2012).

At Morín, the levels ranging from 12 to 6 extend from the latest Mousterian to the Old Aurignacian. Levels 12 and 11 correspond to the end of the Mousterian. Technologically, operative schemes of unifacial and bifacial discoid conception are identified, with the production of denticulates and racloirs. An operative scheme of blade production is also identified for the manufacture of bladelets from bipolar prismatic cores. This might be termed a Denticulate Mousterian. Level 11 has been dated to 39.770 ± 730 uncal BP (GifA-96264) (Maíllo-Fernández *et al.* 2001) (43.544 ± 599 ky cal BP). Level 10, classified as Châtelperronian, displays schemes of discoidal-type flake, a more prominent blade component, a low number of Châtelperron points (4.2%), more scrapers than burins and a high percentage of substrate pieces (Bernaldo de Quirós *et al.* 2008). Even so, it should be borne in mind that according to some authors (Sanguino-González & Montes-Barquín 2005; Sanguino-González *et al.* 2005) the lithic assemblage of level 10 represents a mixture of elements from the final level of the Middle Palaeolithic and the first level of the Upper Palaeolithic.

At Covalejos, level 6 (former level H) is ascribed to the Mousterian (the laminar Levallois); level 4 (former level D) is attributed to a Mousterian context (the centripetal Levallois). Its ^{14}C dates of 41.640 + 650-530 uncal BP (GrA-23921) (45.024 ± 559 ky cal BP) (spit 2), 40.650 + 2.300-1.800 uncal BP (GrA-22814) (44.525 ± 1953 ky cal BP) (spit 1) (Rasines del Río 2005) and 43.050 + 750-550 (GrA-33811) (Maroto *et al.* 2012) (46.363 ± 739 ky cal BP) place it in the late stages of the Mousterian. Other, subsequent datings by ^{14}C, obtained at the Centrum voor Isotopenonderzoek van de Rijksuniversiteit Groningen and the Oxford Radiocarbon Accelerator Unit of the University of Oxford, and by optically stimulated luminescence (OSL), have corroborated this view. Accordingly, the final Mousterian occupations would have ranged from 42-40 ky uncal BP (Maroto *et al.* 2021).

At La Güelga, a mínimum age of 45.3 ky cal BP is indicated for the end of the Mousterian (Menéndez *et al.* 2018).

At the Sopeña rock-shelter, the contradictory results of the datings make the scenario for the final phase of the Mousterian difficult to interpret (Pinto-Llona & Grandal-d'Anglade 2019).

At Lezetxiki, levels III and IV, which have been excavated since ancient times, are referred to the MP-EUP transition, with models of raw material management and technology characteristic both of the end of the Mousterian and the Aurignacian. Interpretation was initially difficult and controversial. Neanderthal fossil remains were found at the bottom of level III, malacological remains used for decorative purposes in levels III and IVc, as well as the simultaneous presence of Levallois and microblade operative chains, at least in the units of level IV. However, this was before datings were carried out (Arrizabalaga 2006). Subsequent datings seem to indicate that the upper level was Aurignacian and the lower level Mousterian, and that material from the two levels became mixed up in the course of the excavations (Maroto *et al.* 2012).

Some levels of El Cuco, such as level VII, show micro-Levallois production (Ríos-Garaizar 2016; Gutiérrez-Zugasti *et al.* 2018). Levels Vc and Vb of El Cuco should be placed within the context of the latest Mousterian, whereas level Va – with industry that might be assigned to the Archaic Aurignacian or the Old Aurignacian – already testifies to the EUP. The industries of level III extend from the Old Aurignacian to the Evolved Aurignacian.

The difficulties of classifying Châtelperronian levels and the scarce datings available preclude the establishment of a precise chronological framework for this technocomplex in the Cantabrian region. Stratigraphically, it is located beneath the Proto-Aurignacian (de Andrés-Herrero & Arrizabalaga 2014). The sample of levels attributed to the Châtelperronian is very sparse, and on occasions this cultural ascription has been made over-hastily on the basis of the mere presence of Châtelperron points, an item that on the Cantabrian coast has in fact also been found in Mousterian contexts (Maroto *et al.* 2005; de Andrés-Herrero 2009; Menéndez *et al.* 2018). With a variable degree of justification, this stage, traces from the Châtelperronian or generically transitional periods from the Middle to Upper Palaeolithic have been pointed out at sites such as El Conde, La Viña rock-shelter (Fortea-Pérez 1995, 1996), Oscura de Perán (Fernández-Rapado & MalloViesca 1965) and La Güelga, where a context designated Mousterian, with Châtelperron points, is dated to between 45.8-41.4 ky cal BP (Menéndez *et al.* 2005, 2018), effectively coinciding with the dates of the Châtelperronian in the south of France and in the Basque Country (Higham *et al.* 2014). Recently, a chronological interval has been proposed for the Châtelperronian in the Cantabrian región, extending from 42.8-41.4 ky cal BP, associated with the early disappearance of the Mousterian. This would imply an interval of 2.7-5.8 ky (95.4% probability), with a median of 4.4 ky, between the end of the Mousterian and the beginnings of the Châtelperronian. According to this proposal, in other words, the Châtelperronian would have begun several millennia after the disappearance of the Mousterian in the region (Marín-Arroyo *et al.* 2018a).

At Labeko Koba, the levels assigned to this period are those between level IX and IV. Level IX has been attributed to the Châtelperronian fundamentally on account of the weight given to three Châtelperron points and the blade production among the scarce lithic industry. Initially, it yielded a very recent ^{14}C date of 34.215 ± 1.265 uncal BP (UA-3324) (38.465 ± 1.494 ky cal BP) for this period, but subsequently it has been dated to between 37.4 and 38.1 ky uncal BP (Wood *et al.* 2014) (41.8-42.3 ky cal BP). The Proto-Aurignacian level VIII has an abundance of semi-abruptly retouched Dufour-type bladelets and evidence of symbolic expression. Level VII, likewise assignable to the most primitive Aurignacian, has been dated to as early as 41.96-40.7 ky cal BP (Wood *et al.* 2014). Levels VI, V and IV have been assigned to the Old Aurignacian. Levels VI and V have yielded a number of split-base lance points (Arrizabalaga 2000a, b).

Level 16 of El Castillo, which was dated to 34.300 ± 1.000 uncal BP (GifA-95539) several years ago (CabreraValdés *et al.*1996) (38.578 ± 1.242 ky cal BP) and assigned to the Archaic Aurignacian or Proto-Aurignacian, has Dufour bladelets as its most numerous and characteristic typological element. The production of bladelets is thought to have been based on unipolar prismatic cores and scrapers (Bernaldo de Quirós *et al.* 2008). A recent dating of this level yielded a date of 38.600 ± 1000 uncal BP (Wood *et al.* 2018) (42.677 ± 730 ky cal BP), placing it among the earliest evidence of the Upper Palaeolithic of Cantabria.

At Morín, levels 9 and 8, assigned to the Archaic Aurignacian, have highly developed operative schemes for bladelet production based on unipolar prismatic cores and, to a lesser extent, carinated scraper-type cores, with a continuum between the production of blades and bladelets. The production of flakes was based on discoidal-type operative schemes. Typologically, they are defined by a high percentage of Dufour bladelets (17.9% in level 8). Particularly notable are pieces with lateral retouch and from a common base, with scrapers more abundant than burins. Level 8 has been dated to 36.590 ± 770 uncal BP (GifA-96263) (41.018 ± 702 ky cal BP). Levels 7 and 6 are assigned to the Old Aurignacian, with a clear dissociation between the production of blades and bladelets. The former are produced using unipolar prismatic cores. The latter are manufactured by means of carinated scraper-type operative schemes. Flake production is more limited. Typologically, scrapers predominate over burins, especially thick ones, and the bone industry is scarce and fragmentary (Bernaldo de Quirós *et al.* 2008).

Level 3 (former level C) of Covalejos has been classified as Archaic Aurignacian (Proto-Aurignacian). A first dating gave 32.840 + 280 / -250 uncal BP (GrA-24220) (Rasines del Río 2005; Sanguino-González & Montez-Barquín 2008) (36.970 ± 474 ky cal BP), although the oldest date for this cultural horizon has a value of 37.940 + 400 / -350 uncal BP (GrA-33877) (42.800-42.136 cal BP) (Maroto *et al.* 2012). Statistical analysis of the available information suggests that the first evidence of the EUP is found at roughly 37.0 ky uncal BP (Maroto *et al.* 2021) (41.5 ky cal BP).

In Asturias, La Viña rock-shelter (Manzaneda, Oviedo) is the site that has provided the sequence of greatest interest for the study of the Aurignacian. The Proto-Aurignacian has been identified in the lower level XIII, which has been dated to 36.500 ± 750 uncal BP (Ly-6390) (40.950 ± 694 ky cal BP), suggesting that the era began around 42 ky cal BP (Zilhão 2006; de Andrés-Herrero & Arrizabalaga 2014; Wood *et al.* 2014). The Old Aurignacian has been recorded in level XIII, which has been dated to 31.860 ± 680 uncal BP (GifA-95463) (35.856 ± 739 ky cal BP). Subsequently, however, the lower XIII has been assigned to the Mousterian, with a chronology of >59 ky uncal, and level XIII to the Old Aurignacian, with an age of 30-31 ky uncal (34-35 ky cal BP). The Evolved Aurignacian is recorded in levels XII and XI, with a battery of datings falling within the interval from 31.600 ± 400 uncal BP (OxA-21678) to 27.900 ± 280 uncal BP (OxA-X-2290-19) (de Andrés-Herrero & Arrizabalaga 2014; Wood *et al.* 2014) (35.500 ± 418 – 31.814 ± 376 ky cal BP). At La Güelga, the Aurignacian falls between 40.7 ky – 36.6 ky cal BP (Menéndez *et al.* 2018) (44.2-41.1 ky cal BP). At Sopeña, the datings of level XI, which is Aurignacian, show controversial variations, yielding results of 40.2, 38.4, 34.4 and 32.8 ky uncal BP (Pinto-Llona & Grandal-d'Anglade 2019) (43.8, 42.5, 39, 37 ky cal BP).

Accordingly, the origins of the Aurignacian in the North of the Iberian Peninsula might go back to *circa* 43-42 ky cal BP (Maroto *et al.* 2012; Wood *et al.* 2014; Marín-Arroyo *et al.* 2018a), even though most researchers suggest that its appearance in western Europe took place around 42-41 ky cal BP (Szmidt *et al.* 2010; Douka *et al.* 2012; Higham *et al.* 2012; Jacobs *et al.* 2015).

A chrono-cultural scheme that is sufficiently precise, solid and generally accepted has yet to be established for the LMP-EUP transition period. The latest Mousterian and early stages of the Upper Palaeolithic have proved to be a complex field of study that we are still far from understanding adequately. There are a variety of factors that have made the task more difficult. Its chronology is susceptible to wide-ranging revision, largely due to new pre-treatments such as ultrafiltration now used in radiocarbon dating. At present, the availability of reliable dates is certainly limited. The preservation of samples and the limitations of radiocarbon technology when dealing with such old time periods present further handicaps (Wood *et al.* 2014). We are thus faced on the one hand with difficulties deriving from the method of dating itself and on the other hand with problems engendered by the circumstances and the "quality" of the archaeological record and of the samples that are to be dated.

Although ^{14}C dating is the most efficient method known for such time intervals, we are at the limit of its applicability, and correlating it with other dating procedures remains problematic for the present. New developments and improvements in the method in recent years (AMS, UF, etc.) have called into question the use of older dates achieved in earlier years with conventional procedures that on occasion yield conflicting results. Although UF has been shown to yield older dates, this is not always the case, as has come to light in level III of El Cuco and in levels XI and XII of Sopeña (Pinto-Llona & Grandal-d'Anglade 2019).

The quality of the sample and of the archaeological record on which datings have been made is not uniform in all the sites. In general, there are not enough high-quality dates available for each of the time periods. In some cases, the samples are from old excavations; in others, the stratigraphy may have been affected by post-depositional processes and may throw up problems associated with alterations or contamination.

Moreover, there is a shortage of complete archaeological sequences, given that the presence of sedimentary hiatuses is the norm.

As a result, the chronological scheme for the period in question comprises a succession of the different stages but with overlapping dates for which there are various explanations. Such intersections may be understood not to be real, but rather as testifying to the superposition of the margins of error inherent in the dating method and certain inaccuracies caused by problems of sampling. If this is the case, we have an approximate chronological scheme of the succession and substitution of one technocomplex by another, whether by a process of replacement (Mousterian to Aurignacian) or of evolution (Archaic Aurignacian to Old Aurignacian to Evolved Aurignacian). If, by contrast, the overlaps are interpreted as reflecting the coincidence in space and time of diverse technocomplexes, distinct activity facies or different traditions, one might be led to posit divergent models of cultural and/or biological coexistence. The paucity of the human fossil record does not help resolve this question.

In this chrono-cultural context, El Cuco rock-shelter proves to be a site of great interest for studying the final Neanderthal occupations and the first occupations of AMH in the Cantabrian region. Its characteristics as a rock-shelter confer an additional value upon it since, as we have seen, on the Cantabrian coast these periods are more commonly known from cave sites that may display a different functionality and of course distinct taphonomic conditions.

CONCLUSIONS

The extraordinary wealth of lithic industry at the El Cuco rock-shelter makes this site particularly well-suited for studying the late Mousterian and Aurignacian technocomplexes of the northern Iberian Peninsula.

In spite of the difficulties in obtaining numerical datings, the levels of the rock-shelter have been placed, reasonably precisely, within their chrono-cultural context, a context that developed in a landscape of open vegetation, with a cold and rather dry climate that fluctuated over time.

Hunting activity at the site revolved around four taxa that were among the most frequent at this time in the Cantabrian region: *Cervus elaphus*, Bovini, *Capra pyrenaica* and *Equus ferus*. The species most frequently hunted down was *Cervus elaphus* although if the calculation is by bone weight, the proportions of large bovids and deer change. This comes to light with particular clarity in level Vc.

Level Vc is located just prior to 43.5 ky uncal BP and exhibits a late Mousterian industry whose most diagnostic technology is Levallois, with a range of tools where denticulates, notches and racloirs are predominant.

Level Vb was formed between a time just before 43.5 ky uncal BP and roughly 42.7-40.5 ky uncal BP (46-44 ky cal BP). However, the industry studied shows two technological traditions: the first is late Mousterian, in synchrony with the dates in question, whereas the second is attributable to the Aurignacian. The origin of this apparent diachrony may reside either in phenomena of bioturbation or diagenesis or in some error committed in the course of the excavation.

Level Va has just a single dating of 36.1 ky uncal BP (41.4-40.1 ky cal BP). The technical diagnostic systems are blade and microblade. Both “large” and “small” Dufour bladelets are recorded among other elements, comprising an industry that is not numerous or significant enough to be able to establish whether it should be placed in the Archaic or the Old Aurignacian. The production of flakes may also indicate the presence of Mousterian elements. The discovery in this level of a set of beads made from marine shells, manufactured, concentrated together and coloured by scattered ochre, suggests the possibility of symbolic behaviour.

The thin level IV is lacking in concrete dates, but its stratigraphic position in relation to the underlying and overlying levels that are dated situate it between 36 and 34 ky uncal BP (41-39 ky cal BP), which might be assigned to the Old Aurignacian or – less probably – to the Archaic Aurignacian.

Level III was formed between around 34.5-30 ky uncal BP (39.3-34.2 ky cal BP). This is the only level in which the representation of marine malacology attains a certain significance. The characteristic technical systems are microblade, blade and flake production. Numerous fragments of Dufour bladelets are identified. Despite the reservations resulting from the small size of the sample, this industry can be ascribed to the Evolved Aurignacian.

Consequently, the stratigraphy can be said to contain a continuous succession of levels, all of them archaeologically fertile. The chronology (>43.5-40.5 ky uncal BP) of the Mousterian levels (Vb-Vc) represents one of the final phases of this period in the Cantabrian region, whereas the dates (*c.* 36.5-30 ky uncal BP) of the Aurignacian levels (III-Va) are compatible with a continuous occupation from the Old Aurignacian (or from the Archaic Aurignacian) to the Evolved Aurignacian. In spite of the stratigraphic continuity between LMP and EUP, however, a chronological gap of at least 4 kyr (*c.* 40.5-36.5 ky uncal BP) can be observed.

Accordingly, the upper levels of El Cuco (III-V) range from roughly >43.5-30 ky uncal BP (>47-34 ky cal BP) between LMP and EUP, spanning the misnamed “transition” that incorporates the change in population resulting from the disappearance of the final Neanderthals and the arrival of the first anatomically modern humans.

All this is indicative of the remarkable archaeological interest of this site, the dimensions and potential of which we are now just beginning to glimpse.

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