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Couverture / *Cover* :
General view of the situation of El Esquilleu Cave in La Hermida Canyon. Photo: Javier Baena.

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KEY WORDS
Middle Paleolithic,
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sequence,
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ABSTRACT
El Esquilleu cave has one of the most complete Middle Paleolithic stratigraphies of northern Iberia with a complete chronological framework almost continuous from the beginning of MIS3. The complete analysis of the materials including the last section of the sequence corresponding to the last chronological interval of the occupation in the region shows clear evolutionary tendencies by important changes in the composition of the lithic assemblage. Its study confirms a continuous occupation without any gaps during the Mousterian until recent dates but without any Upper Paleolithic presence. This sequence, referenced to the Mousterian settlement of the Picos de Europa mountains, testifies to the existence of a Mousterian presence in northern Iberia with no clear relation to other Cantabrian areas. Consequently, its occupation without a break until the crucial phase of the end of the Middle Paleolithic suggests a non-transitional process in the history of local Neanderthal groups.

MOTS CLÉS
Paléolithique moyen,
cantabrie,
néandertaliens,
séquence,
transition,
moustérien.

RÉSUMÉ
Une route vers nulle part ? La séquence non transitionnelle à El Esquilleu (Cantabrie, Espagne).
La grotte El Esquilleu présente l'une des stratigraphies plus complètes du Paléolithique moyen de la péninsule Ibérique septentrionale, avec un cadre chronologique complet presque continu depuis le début de MIS3. L'analyse complète des matériaux, y compris la dernière partie de la séquence correspondant au dernier intervalle chronologique de l'occupation dans la région, fait apparaître de nettes tendances évolutives, du fait de l'existence de modifications importantes dans la composition de l'assemblage lithique. Son étude confirme l'existence d'une occupation continue, sans interruption pendant le moustérien jusqu'à des dates récentes, mais sans aucune présence du Paléolithique supérieur. Cette séquence, la référence à la colonie moustérienne des monts Picos de Europa, témoigne de l'existence d'une occupation écotonique résiduelle dans le nord de la péninsule Ibérique, sans relation claire avec les autres régions de la Cantabrie. Son occupation sans interruption jusqu'à la phase cruciale de la fin du Paléolithique moyen suggère l'existence d'un processus non transitoire dans l'histoire des groupes de néandertaliens locaux.

INTRODUCTION

The Esquilleu Cave was discovered in the 1980s thanks to the intense prospecting of regional groups (Muñoz 1988; Muñoz *et al.* 1985; Baena *et al.* 2011), which during the 80s and 90s contributed substantially to the discovery of a large number of Mousterian deposits in the Cantabrian area of northern Spain. In the Cantabrian region of Liébana (Spain), the Fuentepara Cave and the Arteu Shelter were also discovered, the first with very little anthropic evidence; the second with a scant stratigraphy practically lost (Carrión 2002) as well as the open-air site of El Habario (Carrión & Baena 2005). Some nearby Mousterian attestations were also known at Beges (Manzano Espinosa *et al.* 2006) and the Rodriguero shelter (Carrión Santafé 2002).

At the end of the 90s, the knowledge of the Cantabrian Mousterian was limited to classic sequences such as Castillo (Cabrera *et al.* 2001, 2005), Cueva del Pendo, and Cueva Morín, as well as some other mixed and/or decontextualized levels in the Cueva de la Mora, Cueva de la Flecha, Las Monedas, Cudón, Hornos de la Peña, and El Mirón, this last one re-excavated since 1996 (Straus & González Morales 2003). Along with this, some references to open-air Mousterian sites were also known and sites such as Panes II were published (Montes & Muñoz 1992)

Rebuilding a complete sequence for the regional mousterian

The cave of El Esquilleu is located at the Unit of Picos de Europa (Central Zone, Cantabrian Range) and is developed in the Barcaliente Formation (Upper Carboniferous) composed of micritic and micro-sparitic limestones, black and fetid. The cavity opens in very strong relief, at the height of 280 m above sea level and 68 m above the Deva River, on the western margin of La Hermida Gorge (Fig. 1). It has the morphology of a large rock shelter (Fig. 2) and is partially filled by archaeological sediments.

Excavations in Esquilleu began in 1997 in search of Mousterian occupations on this atypical "mountain" location, which until then seemed reserved for the Upper Paleolithic (UP) hunters (Butzer 1986). The intervention was planned as a survey with two perpendicular trenches (14 m^2) and culminated in 2006 with the establishment of a complete stratigraphic and geoarchaeological sequence with 41 archaeological levels, 36 of them with mousterian lithic industry, almost without interruption (Baena & Carrión 2013).

The site has been studied by means of two orthogonal tests, one longitudinal and the other transversal, the last perpendicular to the cave wall in an area "where the presence of what serves as a sink was detected for about 10 m. The conserved and known thickness of the deposit reaches 4.2 m. In addition,

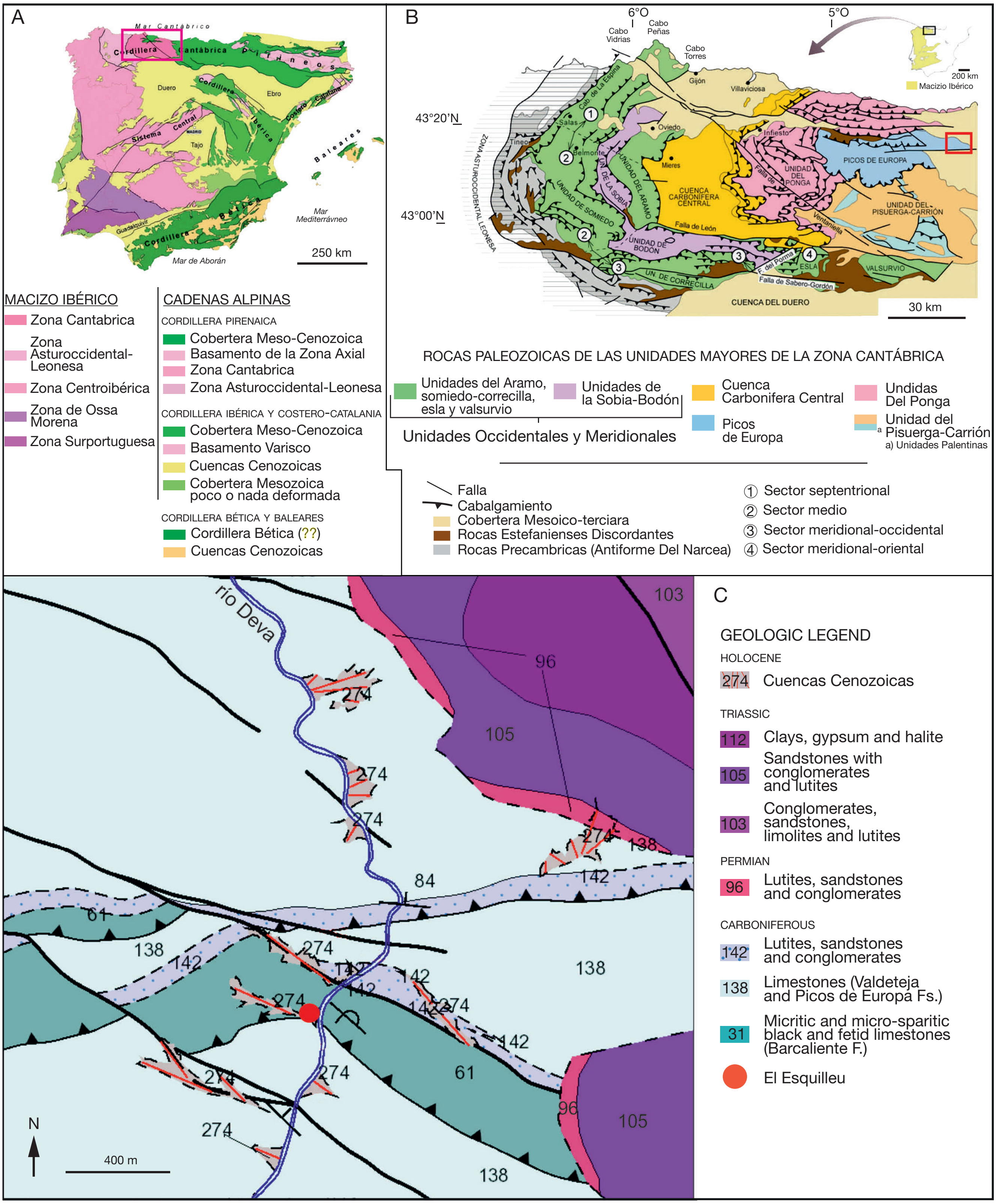

Fig. 1. — Geological location of El Esquilleu Cave (Cillórigo de Liébana, Cantabria).

manual drilling has been carried out at the bottom of the transverse test by means of a sample drill, which indicates the existence of more than 1 m of deposits below the bottom of the test, without having reached the rocky base where the sequence rests. These deposits were sealed by a speleothem of which only remains by the northeastern wall can be found, inwards behind the transverse test, where detritic deposits are conserved below the speleothem, reaching a thickness of 90 cm from the top of the crust to the current ground level. These deposits are absent in the rest of the cavity so that the surface that currently constitutes the ground is the result of erosion and partial anthropic emptying of its fill.

The first works technically defined the main sections (discoid, Levallois, Quina) with special attention to level 3 (from here on, we'll use the arabic quotation for old levels III, IV, V, VI, VII, VIII, IX, X, and XI) in the upper section of the sequence (Baena *et al.* 2019). Alongside Esquilleu, other nearby sites (El Habario, El Arteu) seemed to connect lithologically and fit into a model – if theoretical – of the end of the cycle, with brief and mobile occupations (Carrión Santafé 2002). In parallel, news was published on other levels (level 11f, with a very classic Levallois practically unknown in the western Cantabrian) as well as a very orthodox Quina presence devoted to the production of massive supports (Carrión & Baena 2003). These traits, very characteristic of the trans-Pyrenées Quina, would also be recognized later at other Cantabrian sites such as Axlor, Arrillor, and Covalejos (Sanguino & Montes 2005; Ríos-Garaizar 2012). Likewise, a preliminary study of level 17's industry was presented a few years later (Cuartero *et al.* 2007).

The atypical dates of level 3 (12,050 ± 130 BP, AA 29664; AMS bone) were published with caution, given the stratigraphic complexity of the package (Jordá Pardo *et al.* 2008). Other contextual data such as pollen, the magnetic susceptibility curve of sediments, and anthracological or faunal data seemed to indicate a recognizable inflection between 38 and 35 ka BP, coinciding with the tempering of the cold prior to H3.

Step by step, the Cantabrian region became a key area in the debate of the Middle to Upper Paleolithic transition based on the first general models (Zilhão & d'Errico 2000; Straus 2005). Some classic sites such as Morín (Maíllo 2007) were reviewed, improving the chronological framework between its Mousterian level 11 and the Chatelperronian and Aurignacian levels. Some sequences were excavated or restudied in Cantabria such as those at Covalejos (Sanguino & Montes 2005), El Mirón (Straus & González 2003), the Asturian Cueva del Conde (Arbizu *et al.* 2005), Sopeña Shelter (Pinto-Llona *et al.* 2012), El Sidrón (Fortea *et al.* 2006), and La Güelga (Menéndez *et al.* 2005). Antoliñako and Labeko Koba (Arrizabalaga Valbuena 2002; Arrizabalaga *et al.* 2003), Axlor (Ríos Garaizar *et al.* 2003), along with others such as Gatzarria, Lezetxiki, Amalda, Zerratu, and Aitzbitarte III (Rios-Garaizar 2017) became in this period references for the Basque Mousterian.

In this context, the El Esquilleu sequence emerged as one of the most complete, with chronologies beyond the cold event in H4 and even beyond the H3 around 30 ka BP (OIS 3c, OIS 3b, extending into the first half of OIS 3a). Initially, the sequence dating presented an important coherence, except for the results of levels 6 and 19.

In addition, other "transitional" lithic expressions around 40 ka BP at El Castillo (Cabrera *et al.* 2001; Wood *et al.* 2018) and at La Viña VIIIinf (Fortea 1998; Wood *et al.* 2014) were documented and subsequently revised. Dates are around 38 ka BP and at Labeko Koba IXinf and Ekain IXbase (both with later Chatelperronian), in comparison with the Esquilleu dates, contributed in those years to drawing a complex chronocultural model for Cantabria (Andrés Herrero 2009).

The optimistic phase

In fact, since the 90s, anomalous dating results have been obtained in different areas of the Iberian Peninsula (Vega 1993; Raposo & Cardoso 1998). However, the north of the peninsula, and in particular the eastern Cantabrian, has continued to provide conventional dates at sites such as Arrillor or Labeko Koba. Although much of the Cantabrian continued to offer relatively conventional dates in the 40-30 ka BP range, examples such as El Conde, La Güelga, and La Flecha criticized the "Ebro border" model (Mellars & Gravina 2008).

In this context, the dates of Esquilleu have arrived simultaneously with numerous examples of recent dates for the last Mousterian such as Gorham's Cave, Vanguard Cave, and Bajondillo in the south; Jarama VI in the center; Cova Gran, Santa Lynia, and the Cave of Els Ermitons in the northeast; Fuentes de San Cristóbal, Abauntz & Toros de Cantavieja in the east; and Sima de las Palomas in the southeast (Jordá-Pardo 2001; Cortés-Sánchez & Simón-Vallejo 2001; Utrilla & Montes 2004; Finlayson *et al.* 2006; Vaquero *et al.* 2006; Walker *et al.* 2008; Maroto *et al.* 2012).

The endurance of some Neanderthal groups would have led to irreversible isolation, unfeasible from the reproductive point of view (Garriga *et al.* 2012), defining the transition as a mosaic of adaptations (Straus 2005). In this context, fragmented biotopes (basically mountainous: Fuentes de San Cristóbal, Esquilleu, and Carigüela, for example), could have favored the diversity of adaptations. On the contrary, the first Aurignacians (e.g. Cueva del Castillo, La Arbreda, or Cova Foradada) would have generally occupied open landscapes and natural corridors in coastal strips (Carbonell *et al.* 2000). The Cantabrian seemed to have two reference sites (Castillo and Esquilleu) that fitted perfectly into this model. When the sequences such as those at Axlor (Rios-Garaizar 2017) and Abric Romaní (Vaquero *et al.* 2012) were studied technologically and diachronically, part of the final Mousterian seemed to show increasingly brief and mobile territorial schemes.

The technical and technological approach allows for the detection of a Late Middle Paleolithic in Cantabria that, with exceptions such as the Cueva de la Güelga (Menéndez *et al.* 2014) or Cova Eirós (Rodriguez-Alvarez *et al.* 2011), never seemed to continue in the sequences by the Upper Paleolithic. In this context, El Esquilleu's sequence seems to be chronologically anomalous, particularly after level 6. In this section, raw material acquisition shows lithic varieties with percentages similar to the secondary river deposits, together with a non-specialized technical production. A similar approach was taken at the Basque Axlor site (Ríos Garaizar *et al.* 2003; Rios Garaizaer 2008), although in this case with more "classic" dates (BeD; 42 ka BP).

FIG. 2. — General view of the situation of El Esquilleu Cave in La Hermida Canyon and aspect of the interior of the rock shelter during the excavation.

An occupational change was now made in reference to the fragmentation of the operational chains and the role of the site in terms of behavior patterns and mobility (Baena & Carrión 2013). The functional and residential role of the cave changes from level 6 toward an increasingly smaller and ramified discoid production. This circumstance probably responds to mobile groups who left fewer archaeological traces on the site. From the residential character of the lower layers (exotic raw materials and process fragmentation), a more ephemeral and less connected occupation was progressed to over time. This points to small, mobile groups that make for difficult archaeological reading. From the bioclimatic point of view, from level 6 of Esquilleu (*c.* 35 ka BP) the sedimentation rate increases, up to 300 mm per millennium (Zilhão 2006), with an evident deterioration of the climate, observable from the curves of magnetic sensitivity recording performed in Esquilleu (Ellwood *et al.* 2001). This change would be identified with a span around level 5 (*c.* 30.2 ka BP), very poorly represented archaeologically.

Moving beyond the traditional explicative models, the transition seems to respond as a mosaic of adaptations of populations subject to severe environmental stress. In the north of the Iberian Peninsula, the Upper Paleolithic did not appear in a generalized manner until 36.5 ka BP (carbon-14), and in the south, the Middle Paleolithic extended until *c.* 32-30 ka BP or even later. The existence in the northeast of Iberian Peninsula of two deposits with chronological circumstances similar to the Cantabrian El Castillo and El Esquilleu (Ermitons and L'Arbreda), together with more conventional dating in deposits such as L'Arbreda, Reclau Viver, and Abric Romaní (Maroto *et al.* 2012) pointed to the possibility of considering both areas as an example of related dynamics: late Neanderthal occupation in fragmented biotopes together with a very early presence of Aurignacian on the coastal plains.

Chronological deception

But the generalization of new treatments with a better removal of contaminants from the samples and a more critical position on bone dating (Jöris *et al.* 2003; Weninger & Joris 2004; Bird *et al.* 2009; Wood *et al.* 2013; Higham *et al.* 2014), as well as the generalized delay of the dates subject to calibration (about five millennia earlier on average between 32 and 40 ka BP (Hublin *et al.* 2012) suggested a lack of chronological resolution needed to create transition models at a regional level. The period around 40 ka BP seems now to be particularly sensitive, given the risk of contamination creating "(...) *the illusion of a multi-thousand-year-old muscular coexistence*" (Santamaría & De la Rasilla 2013: 245).

The peninsular dating project for the systematic drafting of the Middle to Upper Paleolithic transition reviewed a large portion of the recent dates of the northern peninsular sites, changing the chronological picture of most of the classical sequences. The resulting dates were pushed back in most of the sequences to recover classical positions in the context of 40 ka BP. Sites such as La Viña, El Sidrón, and La Güelga (which were dated to approximately 32 ka BP, according to Menéndez *et al.* 2005), present in their final levels dates of around 45-50 ka BP (Santamaría & De la Rasilla 2013; Wood *et al.* 2013, 2014; Menéndez *et al.* 2014). For El Sidrón, a range close to 48 ka BP is accepted (De la Rasilla 2014). Cueva Morín remained in its chronology for the final Mousterian at 41.8 ka BP, (Maíllo-Fernandez *et al.* 2014). But in the case of Esquilleu, both dates on non-ABOx-SC charcoal pretreatment (Wood *et al.* 2013; Higham *et al.* 2014) and dates made on bone (in this case, ultrafiltration [UF]), present results similar to those previously published. In fact, its upper levels 3 and 4 displayed coherently from a chronological point of view:

Level 3	19.300 ± 100 and 19.310 ± 80 BP;
Level 3B	20.810 ± 110 BP;
Level 4	22.840 ± 280/250 BP.

Only a few discrepancies were detected in level 6 (located between 44.1 and 30.1 ka BP) and at level 19 (30 ka BP) with respect to what was previously obtained. Nevertheless, the re-dating showed a lack of contamination and acceptable values of 13C (Maroto *et al.* 2018) for the samples.

El Esquilleu at the center of discussion

Even excluding level 3 from the debate, the extraordinary dating of levels 6 and 4 led to the dissection of these levels (to analyze whether the carbon and bone samples offered a sufficient stratigraphic guarantee) and to the review of the archaeological assemblages.

Some general syntheses (Zilhão 2006) had already signaled the increase in the sedimentation rate between levels 11f and 6, pointing to collapse between levels 6 and 3 as the origin of a thick package without positional coherence. Although no significant disruptions were observed in these final events (Jordá Pardo *et al.* 2008), some taphonomic arguments suggested the intervention of carnivores in the formation of the deposit (Yravedra & Castanedo 2014), which introduced uncertainty. From this basis, it was proposed that the sample dated at level 3 (Santamaría & De la Rasilla 2013) could not keep stratigraphic correspondence with the archaeological level, given that the very nature of the matrix (clasts with little matrix; Jordá Pardo *et al.* 2008) would favor vertical displacements (257). For these authors, the only level reliably dated in the final Esquilleu sequence would be level 6, since level 4 samples would not present satisfactory conditions for the complete ABA treatment.

On the other hand, the crisis of the model also led to a review of the assemblage of the final levels, which presents no clear typology and a very expeditious and opportunistic character, features that are already present in the lower levels from at least level 6. It was also relevant to focus on the technical description of the last part of the sequence that seems to respond to ephemeral occupations, such as the shelter of Teixoneres (Barcelona) and other assemblages of diverse chronologies, in which the features seemed common with Esquilleu: abundant pseudo-Levallois points and cores in amorphous and ultra-exhausted abandonment morphologies (Domènech Faus 2000; García Catalán 2007; Pereira *et al.* 2012). This "random facies," without precise cultural ascription (Martínez Moreno *et al.* 2006), is generally recognized as the response to mobile strategies (Casanova i Martí 2011; Turq *et al.* 2013). Typologically, it tends to be associated with denticulated retouching as regards technicality (Baena *et al.* 2019), and the concepts of recycling and ramification (Amick 2014). This strategy of nonresidential events recorded at the end of the Esquilleu sequence could be common to the Cantabrian final Middle Paleolithic (Ríos-Garaizar & Bilbao Malavé 2018) but we still leave the open door for latter technocomplex (Baena *et al.* 2019). Therefore, attention has been focused on the survival of the "flake" in the transitional technocomplex (Vaquero 2013), linked to the possibility that these last sets had been produced inside some special strategy of UP groups. We know that the Cantabrian Chatelperronian demostrates a fundamental intention of producing flakes (Pelegrin 1955), but its presence is limited (Andrés Herrero 2009): La Güelga with dates pushed back to 37.4-40.3 ka BP (Menéndez *et al.* 2014) (with some uncertainty about its attribution); Labeko Koba (LK IXinf), where its presence has also been pushed back by between four and six millennia, approximating the general chronological framework for the European Chatelperronian (Arrizabalaga & Iriarte 2014); and Ekain (Altuna & Mariezkurrena 2014), as well as Morín 10, which is maintained to carry dates of between 27.8 and 29.3 ka BP (Maíllo-Fernandez *et al.* 2014) .

Even in the Cantabrian transitional expressions, discoid cores of raw materials of low quality (often ofites and sandstones) and abundant flaking methods appear. How these productions can be connected with other sets destined for blade products could be a key aspect of their meaning (Martínez-Moreno *et al.* 2010; Picin *et al.* 2011; Mora *et al.* 2016).

During the last decade, several taphonomic analyses have contributed to a new reading of the classic sequences of Cantabria. Hornos de la Peña Cave, where only a few Mousterian attestations were known, has recently provided some hopeful signs (Ríos-Garaizar *et al.* 2018). Equally, in other historical sequences, such as that of Morín, a transitional horizon has been defined that perhaps would contribute to explaining the complex authorship of the Cantabrian transition (MaÍllo-Fernandez 2017). The Sopeña shelter (Pinto-Llona *et al.* 2012) offers an interesting sequence, with "classic" dates (37-35 ka BP) for its Late Mousterian level 12. And western Cantabria offers a sequence in Cova Eirós (Lombera-Hermida *et al.* 2014; Rey-Rodríguez *et al.* 2016) with very recent Middle Paleolithic dates (around 35 ka BP).

The XVII UISPP Congress held in Burgos in 2014 *(*A21d session*)* was a synthesis of more than two decades of research in this region (Maroto *et al.* 2018). There were re-readings from the Abrigo del Cuco (Gutiérrez *et al.* 2017); the "Chatelperronian" of the Cueva de la Güelga was confirmed (Menéndez *et al.* 2014); and some new dates for the bone industry of El Castillo Cave were presented (Wood *et al.* 2018). The Asturian Cueva del Cierro (Jordá Pardo *et al.* 2018), has offered a sequence with probable Final Paleolithic.

In general from the H4, the Levallois had been defined in the northeast Iberian Peninsula (Maroto *et al.* 2005), the south (Cortés *et al.* 2005), and the Atlantic region (Cardoso 2006). The Cantabrian could present a Levallois-Quina succession during the climate deterioration environment of the H5 (Wolf *et al.* 2018), as seems to occur at Axlor, Arrillor, Lezetxiki, and Gatzarria. Perhaps its presence in the eastern Cantabrian at Esquilleu 14-11 and Covalejos (Sanguino & Montes 2005) occurs at similar times, although the contrast of this relationship with bioclimatic factors requires a much more precise chronological framework.

When the dating corpus treated by UF reached around one hundred sites (Marín-Arroyo *et al.* 2018), the recent Bayesian models that incorporate calibrated dates set the end of the

Mousterian around 44 ka BP (in the range of 47.9-45.1 ka cal BP) for Cantabria and an early start around 40 ka BP for the Aurignacian (43.3-40.5 ka cal BP) in the northern peninsula. The role of the Chatelperronian (according to this, without strict chronological continuity with the Mousterian) is more complex. The pushing back of the dates for the replacement in the Cantabrian deposits and the persistence of the late dates in southern Mousterian deposits would somehow reinforce the two-speed transition model (Zilhão 2006).

In this chronological uncertainty, probably due to the excessive weight given to numerical chronology when systematizing and sequencing the artefacts generated by human behavior, works at Esquilleu have been directed to determining the coherence of the sequence, the integration of all available data, the reconfirmation of dating and the stratigraphic consistency, and technological review of the lithic assemblages in its higher levels.

At the moment, Fourier transform infrared spectroscopy analysis and micromorphology (Mallol *et al.* 2010) have confirmed the absence of important diagenetic transformations, except for mechanical disturbances (cryoturbation) from level 6. Recent dates for levels 3 and 3B (19.300 ± 100, 19.310 ± 80, and 20.810 ± 110 BP) and a confirmation of the Mousterian character of its assemblages still maintain uncertainties in the last phase of the occupation. Although it is possible that at levels 3 and 4 (Alcaraz-Castaño *et al.* 2013) the dated samples did not correspond to an occupational event, the overall stratigraphic integrity is also eloquent, and above all, the internal coherence of the industry with respect to the lower levels presents no doubt: a "selective" vertical shift of the dated samples seems unlikely.

So, if there is no "Neanderthal resistance," there are two explanations: the dates of the final levels of Esquilleu are invalid or the final levels of Esquilleu would have already been produced in a context of modern humans who, by adaptive convergence, would have manufactured this type of ultra-expeditious production (Vaquero & Romagnoli 2017). In the current development of research, we still lack a better methodological and descriptive convergence among groups researching the Cantabrian (Arrizabalaga *et al.* 2014) and we are witnessing a moment of caution about the models based on numerical dating. New sequences and archaeological discoveries would help our comprehension of this complex historical process.

TOWARD A COMPLETE SYNTHESIS OF THE OCCUPATION OF EL ESQUILLEU: OUTLINING THE WHOLE SEQUENCE

The dissection of all the variables that contribute to sequence interpretation (lithic procurement and production, taphonomy, sedimentology, pollen, carbon and faunal data, etc.) will contribute to drawing an equally complete picture of the sequence, including the lower levels, awaiting progress in chronological resolution to let us improve our understanding of the end of the sequence with reference to the regional framework.

Integrated geological framework

In this domain of research, the last few years have been focused on critically reviewing the sequence from a geological point of view. Geoarchaeological research at El Esquilleu included initial fieldwork during which the geological context of the site was investigated, along with sampling of the deposits and a study of the lithostratigraphy of the archaeological site. This was followed by laboratory analysis. Study of the lithostratigraphic sequence and sampling of the profiles was carried out during three field seasons (2004, 2005, and 2006). (Granulometric, mineralogical (DRX), and chemical (XRF and ESEM) analyses were carried out at the Laboratory of Geology of the Museo Nacional de Ciencias Naturales of Madrid. Edaphological analyses (color, pH, total carbonates [$CaCO_3$], organic matter [OM], and organic carbon [OC]) were made at the Laboratory of Edaphology of the Department of Geology and Geochemistry of the Universidad Autónoma de Madrid. Granulometric characteristics were evaluated using the GRADISTAT 6.0 spreadsheet (Blott & Pye 2001). The control and treatment of x-ray diffractograms were accomplished using the XPowder 2004.04 software for qualitative and quantitative analysis of samples (Martín-Ramos 2004). Some samples of sediments and bones were analyzed by x-ray fluorescence spectrometry (XRF) and environmental scanning electron microscopy (ESEM) with an energy-dispersive x-ray probe (EDX) to measure the chemical composition corresponding to each of the phases. These samples were also subjected to thermoluminescence analysis in the Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas of Madrid with a Risø TL (model TL DA-12) thermoluminescence and OSL reader.)

As we said before, we have been able to differentiate 41 levels in the sedimentary sequence of the El Esquilleu Cave. The results of all these analyses were disclosed some years ago in a specific publication on the site's geoarchaeology (Jordá Pardo *et al.* 2008). In addition, the sequence of El Esquilleu was analyzed by micromorphology, whose results have been published (Mallol *et al.* 2010).

The lower sedimentary sequence of Esquilleu (ESQ-D or the lower unit – of which 150 cm is visible) occurs from the known base of the sequence, ESQ-41, to ESQ-31 and is articulated in two subunits: ESQ-41 to ESQ-35, predominantly lutitic (Figs 3; 4), of light (10YR8/6) and mottled (5YR5/6; 7.5YR5/4) colors, with a detritic level of small-sized rolled clasts (ESQ-38) and a low presence of CaCO3, organic matter (OM), and organic carbon (OC), sometimes negligible; and upper ESQ-D (ESQ-34 to ESQ-31) formed by lumpy crusts of gray, light, and motley colors, with a weak presence of OM (maximum 2.41%) and OC (maximum 1.39%), sometimes negligible. Toward its middle part, the levels of this unit are deformed by the pressure exerted by large limestone blocks collapsed on them. Mineralogically (Fig. 3), this subunit is characterized by the strong presence of quartz and the phosphate hydroxylapatite; calcite, absent in the levels rich in quartz and hydroxylapatite, is at its maximum in ESQ-33 with little presence of the phosphate; dolomite is present in ESQ-33 and ESQ-38bis; illite is well represented; and plagioclase, K-feldspars, and clinochlore appear in minimal proportions, being absent at various levels. The pH is markedly moderate (between 8.31 and 9.11).

The middle unit, ESQ-C (70-90 cm), between ESQ-30 and ESQ-12, is formed by a succession of thin levels of dark colors (10YR2/2, 7.5YR2/0), rich in OM (maximum 8.18%) and OC (maximum 4.74%), consisting of sands with different proportions of silts and clays (Fig. 3). The strong presence of quartz contrasts with the low representation of hydroxylapatite and calcite; plagioclase, illite, and clinochlore are minimally represented (Fig. 3). The pH ranges are between 8.03 and 8.71.

The upper unit, ESQ-B (180 cm), between ESQ-11 and ESQ-1, is characterized by levels rich in autochthonous clasts with a scarce matrix of muddy sands (Fig. 3), low OM (maximum 6.16%) and OC (maximum 3.57%) and a yellowish-grayish color (10YR5/4). From ESQ-11, quartz undergoes a sharp decrease (with a rebound in the top) against the increase in calcite and the appearance of dolomite; the rest of the minerals are plagioclase, K-feldspars, illite, and clinochlore, with a greater presence of illite at the base and toward the top, coinciding with a surge in quartz; hydroxylapatite is present in low proportion (Fig. 3). The pH ranges are between 7.6 and 8.94.

Finally, ESQ-A or the culminating unit (20 cm), level ESQ-0, is a lumpy white calcareous breccia, which contains fragments of autochthonous limestone and ends up in a thin speleothem.

In relation to the diagenetic processes (Wood & Johnson 1978), the high proportion of hydroxylapatite in the upper levels of ESQ-D and its minimal presence in ESQ-C and ESQ-B allows us to affirm that it is a mineral of neoformation. Hydroxylapatite is a neoformation mineral present in caves, although infrequently (Hill & Forti 1997). However, the diagenetic process described here has been cited in sediments of other cavities with prehistoric sites such as Theopetra (Greece), Kebara (Israel), Grotte XVI (France) (Goldberg & Nathan 1975; Karkanas *et al.* 1999, 2000, 2002), Antoliñako Koba (Vizcaya) (Yusta *et al.* 2005), La Güelga (Jordá Pardo *et al.* 2013), El Buxu (Jordá Pardo 2016; Jordá Pardo *et al.* n.d.), among other caves. The presence of phosphorus and phosphates in archaeological sites is a common occurrence, on which there is abundant literature, constituting the presence of this element and its compounds as a good indicator of anthropic activity in a given area (Sánchez & Cañabate 1998). In order to verify the diagenetic nature of the hydroxylapatite present in the levels of the El Esquilleu cave, we analyzed the thermoluminiscence (TL)of bone samples of the ESQ-B and ESQ-C units and of the ESQ-D crusts. The TL spectra reveal perfectly that the most modern (neoformed) apatite levels of El Esquilleu are stratigraphically located below those with the oldest apatite (bone) (Fig. 4).

So, the sedimentary sequence of the archaeological site of El Esquilleu consists of four lithostratigraphic units clearly differentiated by various geological criteria, units that respond to the development of very different sedimentary processes. Thus, the levels of the lower unit (ESQ-D) were formed in a low-energy hypogeous medium mainly by vertical accretion processes with moments of energy recovery; the levels of the middle unit (ESQ-C) had their origin in a hypogeo-open environment formed by sheetflood processes of low energy with predominantly siliceous material contributions; and the levels of the upper unit (ESQ-B) were generated in an open rock shelter with clear influence of the outside environment by cryoclastic processes. Finally, the culminating unit (ESQ-A) was formed in a rocky shelter environment by chemical precipitation processes.

Anthropic processes are clearly present in the middle and upper units (ESQ-C and ESQ-B), with hearth development and abundant and very fragmented bone remains used as fuel (Yravedra 2005), while in the ESQ-B unit, bone fragmentation is less. The lower unit (ESQ-D) presents traits of anthropic activity that decrease towards the bottom with a rebound at a detrital level of the base, while in the upper unit (ESQ-A), no evidence of anthropic activity has been detected. In addition, features that allow identification of the accumulative activity of carnivores and scavengers are observed in the ESQ-B unit.

We have identified important features of diagenetic activity in the El Esquilleu cave sequence, such as the formation of hydroxylapatite crusts at the lower unit levels (ESQ-D). The formation of these levels of secondary hydroxylapatite is related to the dissolution of the bones present in the ESQ-C and ESQ-B units and their deep leaching until reaching the basal muddy levels, where they react with the carbonates present, giving rise to neoformation phosphates, producing a substitution of calcite, both in fine sediments and in limestone blocks and pebbles, by hydroxylapatite, generating in the first case tabular crusts and in the second case phosphate envelopes and patches. The thermoluminescence analyses carried out verify this diagenetic activity.

Faunal record and taphonomy: What about the lower sequence?

The other point for knowing Esquilleu's taphonomy, faunistic remains, is of particular importance in assessing the stratigraphic quality of the sequence. The Esquilleu is one of the few Mousterian deposits of the Iberian Peninsula in which there is an anthropic hunting pattern specializing in the exploitation of goats and animals from rocky environments (Yravedra & Cobo-Sánchez 2015). All levels are characterized by the predominance of goat, followed by chamois and deer remains (Table 1).

The taphonomic stories of Esquilleu are diverse. The last part of the sequence, upper unit ESQ-B corresponding to levels 3-5, presents a complex situation in which human activity upon the faunal remains was scarce and carnivores had a more leading role (Yravedra 2006, 2007; Yravedra & Castanedo 2014). The following levels, 6-14, show significant bone accumulations (levels 11 and 13) in which human action is very important. The bone remains have high frequencies of bones with cut marks and percussion marks with processes associated with skinning, evisceration, disarticulation, and defleshing (Yravedra & Castanedo 2014; Yravedra & Cobo-Sánchez 2015).

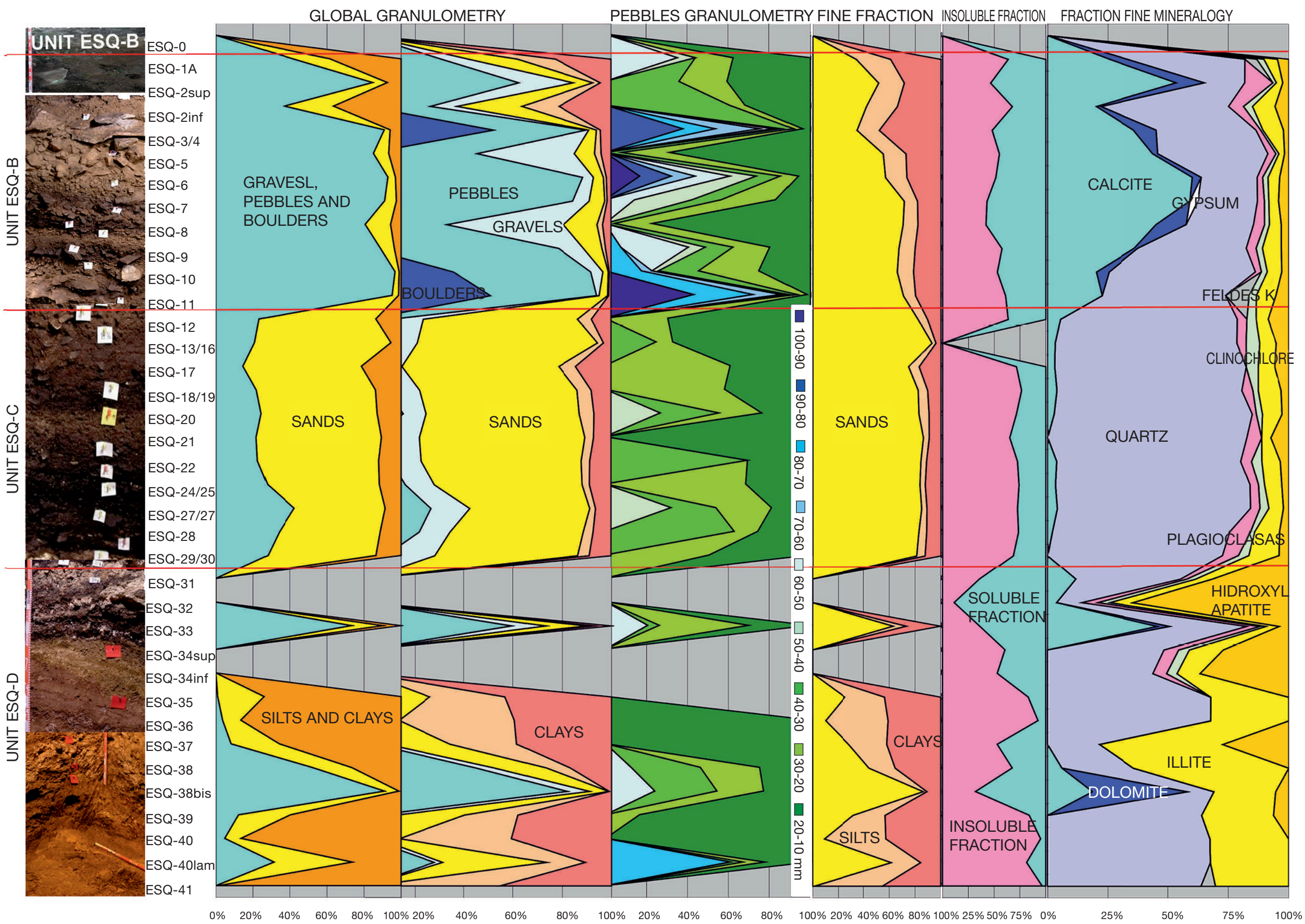

FIG. 3. — Summary of the lithostratigraphic sequence of the El Esquilleu cave showing the field, textural, and mineralogical characteristics as well as the differentiated lithostratigraphic units.

To some degree, research is focused now on the following strata, between levels 15 and 30. In the lower unit ESQ-D (levels 31-35), the same pattern is observed as in the rest of the sequence (Table 1). The goat is the most important animal, followed by the chamois and the deer. Together the remains of goat and chamois account for more than 90% of the determinable remains (Tables 1; 2), and in the overall set of the sample, it is the remains of small animals such as goat and chamois that predominate throughout the entire sequence.

From a taphonomic perspective, the lower levels of the sequence have a greater degree of water alteration in comparison with levels 3-30 (Yravedra & Castanedo 2014). Most of the bones present water alterations in the form of rounding at very high frequencies, as well as other alterations of water origin such as abrasion or polishing (Tables 1; 2). Along with these types, high frequencies of bones with manganese pigmentation are observed, as well as bones with calcareous concretions that suggest that the remains were exposed to low-energy streams and waterlogging, which also allowed for the dissolution of manganese on the bone, contributing to its pigmentation in more than 50% of cases (Table 2).

One of the consequences of the alterations is that they have affected the state of conservation of bone surfaces, causing between 26% and 50% of the remains at levels 31-35 to display poor preservation of the bone surface. However, these circumstances have not prevented us from documenting other taphonomic processes. Regarding the action of carnivores, some tooth marks have been observed at levels 32, 33, and 34 but their incidence is very low and they are mainly due to tooth marks produced by small carnivores, given the dimensions of the documented pits being less than 1.2 mm in all cases.

Regarding anthropic activity, percussion on bones at levels 32-25, as well as cut marks, episodes of defleshing and disarticulation at levels 33 and 34, and of defleshing only at levels 32 and 35 (Table 3) will let us discern the use pattern of the landscape. Finally, the presence of an *Ursus spelaeus* (unpublished information) ulna at level 33 showing disarticulation marks is noteworthy, significant because it is one of the few bear remains that have been documented in the sequence. For the moment, the analysis of these lower levels is on course.

THE FIRST OCCUPATION OF ESQUILLEU CAVE: LITHIC PRODUCTION

Although the final part of the sequence figured in the central discussion of the transition chronology, as shown above, the Esquilleu sequence still maintains its exceptionality, particularly

TABLE 1. — Taxonomic representation of El Esquilleu in NISP (Number of Identified Specimens) and MNI (Minimum Number of Individuals).

	Capra		Rupicapra		Capra or Rupicapra indet	Cervus		Bos/Bison		Carniv.	Others	Small size	Interme diate size	indet.	Total
Level	NISP	MNI A/I	NISP	MNI A/I	NISP	NISP	MNI A/I	NISP	MNI A/I	NISP	NISP	NISP	NISP	NISP	NISP
3	118	3/2	28	2/2	80	5	1/1	0	0	4	8	2	108	45	390
4	35	2/0	14	2/0	24	6	1/1	0	0	0	2	0	43	25	149
5	66	1/1	27	3/1	42	11	1/1	0	0	1	3	0	157	247	554
6	139	5/4	13	3/1	158	34	1/1	0	0	1	0	5	556	1088	1994
6F	106	4/2	7	1/0	72	27	1/0	–	–	3	0	5	275	733	1228
7	46	3/1	19	100/0	65	34	2/0	0	0	6	0	6	255	1038	1469
8	32	2/0	3	3/0	148	23	1/1	2	1/0	0	2	2	143	854	1210
9	9	2/0	12	1/0	40	14	1/0	0	0	1	0	7	129	998	1210
10	5	1/0	–	0	4	0	0	0	0	0	0	0	57	1	67
11	35	4/1	9	1/1	159	15	100	1	1/0	0	0	26	939	687	1871
11F	888	12/4	127	7/2	1414	407	8/1	15	1/0	11	3	115	6870	13601	23450
12	35	2/0	1	1/0	29	14	1/0	–	–	0	0	4	481	216	779
13	197	3/2	34	2/1	804	103	2/0	27	1/0	2	0	18	2644	3601	7430
14	38	1/0	–	0	592	11	1/0	0	0	0	0	0	379	603	1623
15	30	1/0	2	1/0	417	0	0	0	0	0	0	1	655	652	1758
16	38	1/0	–	0	135	0	0	0	0	0	0	0	83	145	401
17	10	1/0	–	0	69	1	1/0	0	0	0	0	0	111	196	387
18	3	–	–	0	68	0	0	0	0	0	0	0	169	129	369
19	11	1/0	–	0	57	0	0	0	0	0	0	0	47	523	638
20	76	2/0	4	1/0	361	9	1/0	0	0	0	0	0	739	2627	3702
21	450	12/0	0	0	272	2	1/0	0	0	1	0	0	546	15743	17018
22	42	1/0	–	0	266	3	1/0	0	0	0	0	0	225	1468	2004
23	81	1/0	–	0	24	4	1/0	0	0	0	0	0	200	2096	2405
24	–	–	–	0	31	0	0	0	0	0	0	0	20	75	126
25	–	–	–	0	13	0	0	0	0	0	0	0	9	20	42
26	15	1/0	–	0	46	0	0	0	0	0	0	0	66	153	280
27	20	1/0	–	0	46	0	0	0	0	0	0	0	151	99	316
28	1	1/0	–	0	5	0	0	0	0	0	0	0	59	7	72
29	1	1/0	–	0	8	0	0	0	0	0	0	0	23	47	79
30	12	1/0	3	1/0	120	1	0	0	0	0	0	0	247	200	582
31	12	1/0	1	1/0	90	1	1/0	–	–	–	–	–	50	39	193
32	19	1/0	1	1/0	56	1	1/0	–	–	–	–	5	82	47	211
33	98	3/1	7	1/0	22	5	1/0	–	–	1	–	9	366	84	592
34	173	8/0	20	1/1	133	9	1/0	–	–	–	–	9	869	353	1566
35	17	1/0	0	0	7	0	0	–	–	–	–	1	98	28	151

as regards its lower levels. Those, briefly presented here, can be analyzed in relation to the many other well-contextualized levels of the Cantabrian environment, with which they share chronology.

To that end, for the first time, we present the complete list of lithic categories at Esquilleu as well as the presence of the basic lithic raw materials and the quartzite quality based on the dimension of the grain (the use of this macroscopic observation of quartzites has provided us with an excellent first look at the differences in the raw material selection in one of the most representative and abundant raw materials at the site).

The cave presents an interesting sequence in the lower levels that define, at present, the origin of human occupation on a regional scale. Moreover, this is especially relevant because of the scarcity of data about the first phase of the Cantabrian Mousterian. On a regional scale, besides the lower part of El Esquilleu, the initial phases of the Middle Paleolithic in northern Iberia have also been recently recorded at Arlanpe, a site that has been re-excavated. Beyond the basal levels of Esquilleu, the Lezetxiki sequence (Arrizabalaga 2014) and deposits such as Ventalaperra were also recently restudied (Rios-Garaizar 2016) to provide information essential to building up the cultural sequence of the initial phases of the Mousterian; though initial levels of the EMP show an absence of handaxes, later phases yield evidence of bifacial shaping (Gutiérrez *et al.* 2017) in a context of a possible coexistence of EMP with Acheulian expressions (Álvarez-Alonso 2014).

As we have pointed out before, the lower geological levels (unit ESQ-D) are related to sedimentation generated by decantation processes in a low-energy hypogeum environment, with gravitational autochthonous clastic contributions, development of mudflows, and an isolated alluvial episode in its basal level (ESQ-38) (Jordá Pardo *et al.* 2008); the processes derived from the anthropic activity are moderately represented by the presence of faunal remains and little evidence of lithic industries, which is almost null at the lower levels and clearly more significant below ESQ-38.

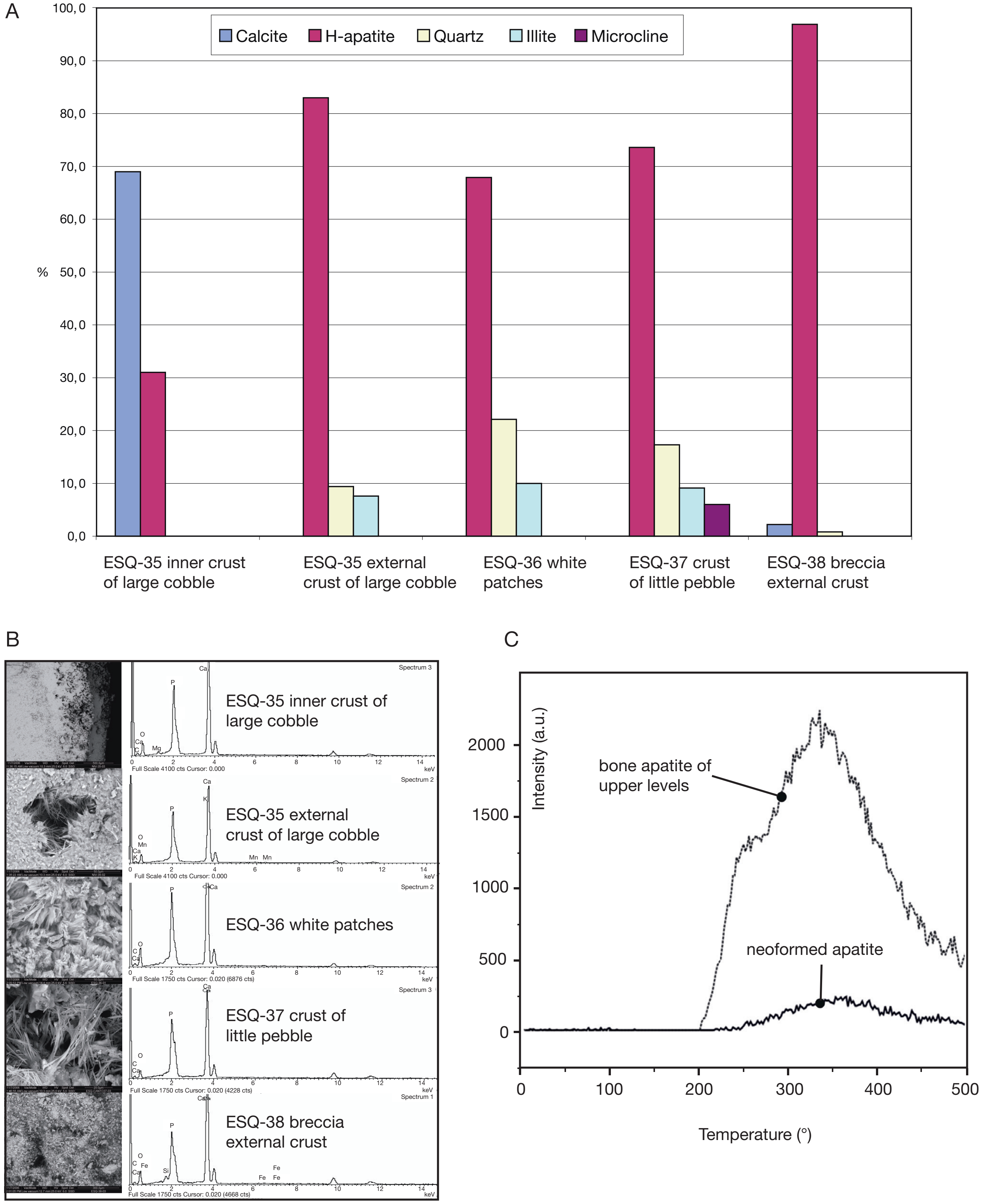

FIG. 4. — Esquilleu apatite crusts: **A**, Mineralogy (XRD) of the crusts of low levels of ESQ-D unit of the El Esquilleu cave sequence; **B**, ESEM photomicrographies under secondary electrons of different aggregates of fibrous hydroxyapatite and chemical analyses by dispersive energies of hydroxyapatites with changeable accessory quantities of silica, iron, magnesium and manganese; **C**, Thermoluminescence (TL) curves of primary apatite of a bone of upper units with TL's big signal due to its long geological history receiving environmental irradiations, in comparison with masses of recent neoformed apatite and with many minor doses of natural irradiations (TL's minor sign).

TABLE 2. — Patterns of taphonomic alteration in the lower levels of El Esquilleu.

	31	32	33	34	35			31	32	33	34	35
NISP	193	211	592	1566	151	–	NISP	193	211	592	1566	151
Weathering 1-2	1	6	46	46	–	–	% Weathering 1-2	0.5	2.8	7.8	2.9	0
Trampling	1	3	48	22	–	–	% Trampling	0.5	1.4	8.1	1.4	0
Rounding 1	167	151	377	1078	120	–	% Rounding 1	86.5	71.6	63.7	68.8	79.5
Rounding 2	12	29	151	345	27	–	% Rounding 2	6.2	13.7	25.5	22	17.9
Rounding 3	14	31	64	143	4	–	% Rounding 3	7.3	14.7	10.8	9.1	2.6
Poloshing	19	47	244	488	35	–	% Polishing	9.8	22.3	41.2	31.2	23.2
Abrasion	8	43	27	87	16	–	% Abrasion	4.1	20.4	4.6	5.6	10.6
Drip	5	19	11	12	–	–	% Drip	2.6	9	1.9	0.8	0
Concrection	72	191	97	787	38	–	Concrection	37.3	90.5	16.4	50.3	25.2
Bad preservation surface	40	78	131	787	85	–	% Bad preservation surface	20.7	37	22.1	50.3	56.3
Manganese	106	133	472	1181	64	–	% Manganese	54.9	63	79.7	75.4	42.4
Percussion Marks	–	4	11	7	1	–	% Percussion Marks	0	5.8	2.6	1.1	1.7
Tooth Marks	–	2	6	3	0	–	% Tooth Marks	0	2.9	1.4	0.5	0
Cut Marks	–	7	38	24	6	–	% Cut Marks	0	10.1	8.9	3.6	10
Thermic alteration	93	99	284	730	75	–	% Thermic alteration	48.2	46.9	48	46.6	49.7
Burned	58	70	230	423	47	–	% Burned	62.4	70.7	81	57.9	62.7
Charred	16	23	54	224	27	–	% Charred	17.2	23.2	19	30.7	36
Calcined	19	6	–	83	1	–	% Calcined	20.4	6.1	0	11.4	1.3
Fragment <3cm	192	195	536	1237	134	192	% Fragment <3cm	99.5	92.4	90.5	79.0	88.7

TABLE 3. — Bones with cut marks and frequencies of cut marks on small animals.

Bones with Cut Mark	goat	chamois	undet. remains	
Layer	32	33	34	35
Rib	0	3	2	–
Vertebrae	0	1	1	0
Escapule	–	1	–	–
Humerus	0	5	0	1
Indet Upper Limb	0	1	0	0
Femur	1	1	1	–
Radio	–	0	1	0
Tibiae	–	2	1	0
Metapodial	–	0	1	–
Carpal	–	1	0	0
Indet	4	16	12	4

At Esquilleu, so far, this lower unit is characterized by a more monotonous presence of discoid and Levallois alternating in a context with an absence of dominance of clear technological concepts (Baena Preysler & Carrión Santafé 2014). Initial dating indicates that among the complete sequence, level 19 is strikingly discordant, offering a date greater than 54 ka BP and three readings around 39.5 ka BP (obtained from the same sample but from three different pretreatments: ABA, and ABOx-SC (Santamaría & De la Rasilla 2013; Baena *et al.* 2019). However, since 2016, optically stimulated luminescence (OSL) dating on new samples has been performed with the collaboration of Dr Guillaume Guerin and Dr Christelle Lahaye. Results will probably change our chronological framework, as pointed to by the preliminary dates obtained for level 11 (Guerin *et al.* 2018) at the beginning of MIS 4. However, this dating result will completely change in the coming years our chronological scope of the units Upper ESQ-D (levels ESQ-34 to ESQ-31) and ESQ-C (levels ESQ-30 to ESQ-12).

With the exception of the lower and upper levels, the central part of the sequence points to a great sedimentary stability: herbaceous phytoliths, abundant in unit C (between 60 000 and 37 000 years, coinciding broadly with OIS 4-3; Jordá Pardo *et al.* 2008), are preserved in a compacted sebifacial-quence of fireplaces bearing plenty of coals, bones, ashes, and lithic industry (Mallol *et al.* 2010). The analyses indicate that the grass containing layers, not burned, could be part of a space-conscious management and conditioning of the home environment (Cabanes *et al.* 2010), and space sanitation strategies have also been proposed (Yravedra & Uzquiano 2013).

The complete sequence of the lithic and faunal remains has a strong correlation with geological events, as shown by the ephemeral human presence documented in the final part of the sequence and particularly the initial moments of levels 36-34. The lower ESQ-D (levels 41 to 35) is characterized by the presence of very few lithic remains, along with a local raw materials procurement in a secondary sedimentary context with the existence of intervals of water sheets and possible brief occupations. Those circumstances are similar to other Early Middle Paleolithic sites (Rios-Garaizar & Moreno 2015; Rios-Garaizar 2017; Eixea 2018). It is also quite interesting to find a visual correlation between the quality of the quartzite (expressed in the grain size of quartzite that is the main raw material in each assemblage) and the technological dominance of concepts (Fig. 5A). The existence of discoid technologies is correlated with the predominance of coarse and medium quartzite grains that is thought to be in highest proportions in the secondary deposits of the Deva River (Fig. 5B). In the case of Levallois technologies, that could be explained due to the high requirement of this technological concept, but it is not so clear in the Quina intervals except for functional reasons (Zupancich *et al.* 2016).

In addition, another important aspect documented in the sequence is the presence of particular technological ruptures. So far at Esquilleu, we had always described the existence of discrete events along the sequence, with the dominance of particular technological concepts (Moncel *et al.* 2010). This is indeed the case for many strata: levels 5-3 = discoid, levels 7-6 = discoid/discoid hierarchized, levels 9-8 = Levallois,

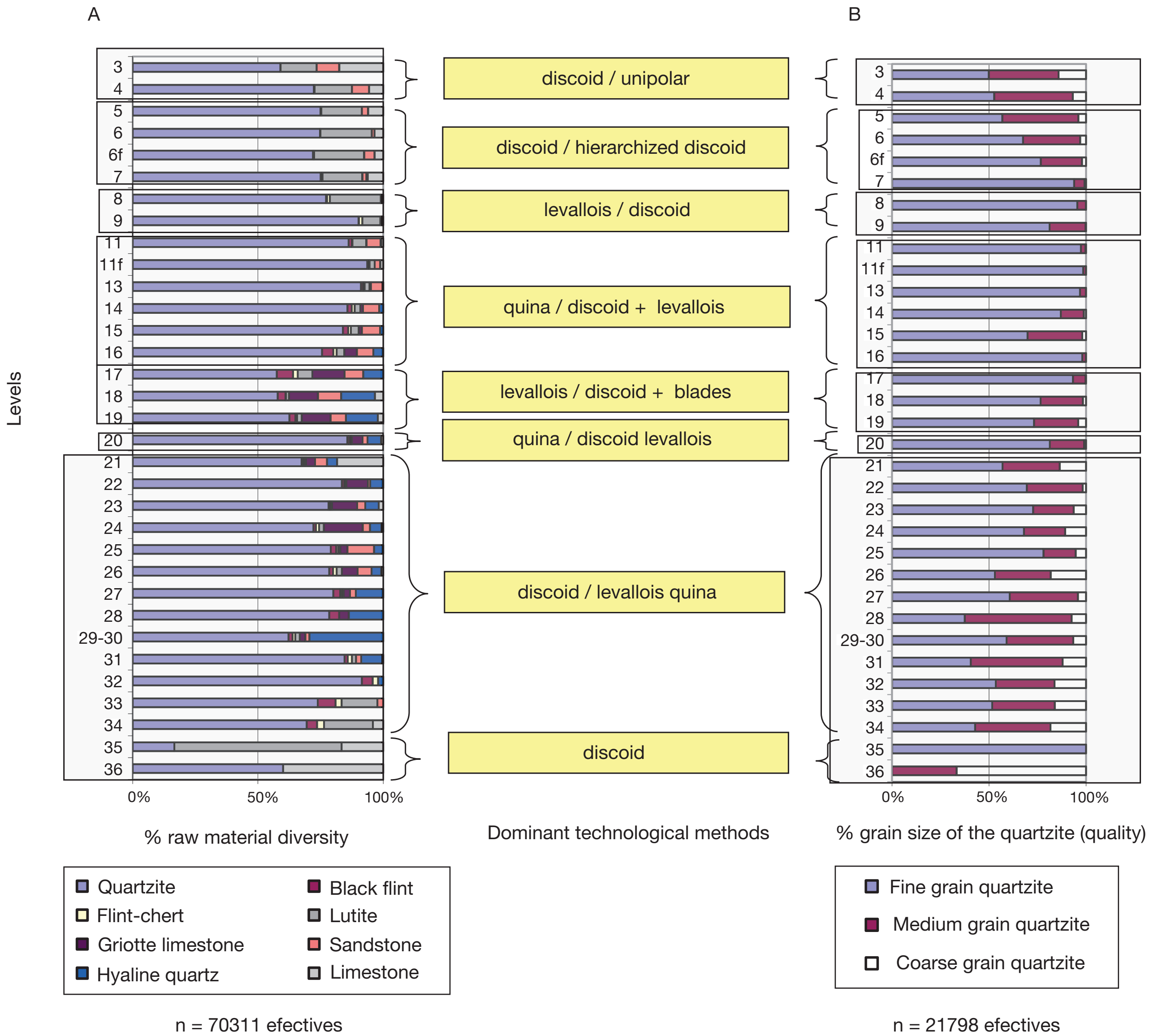

FIG. 5. — Raw material diversity, dominant technological methods and quartzite grain size (quality) along the El Esquilleu sequence.

levels 16-11 = Quina, levels 19-17 = Levallois/blades, level 20 = Quina, and levels 30-21 = discoid; those intervals confirm the existence of long periods in which the presence of particular traditions persist (Fig. 5).

But (and this is a very relevant point) between those intervals *ruptures occur*; the one produced by levels 19-17 is particularly notorious. It is represented by a clear blade tendency (Cuartero *et al.* 2007) and higher mobility in raw material catchment in the middle of a period of Quina dominance. Explanations can be based on changes in the functional role of the site, or changes in the seasonal activity pattern of the Neanderthal groups (Delagnes & Rendu 2011; Niven *et al.* 2012; Turq *et al.* 2013), or the alternation between expedient and formal productions (Vaquero & Romagnoli 2017) due to contextual constraints or also possibly caused by the existene of diverse natures in the human (and, by extension, Neanderthal) groups (Gelfand *et al.* 2011).

Those explanations do not prevent us from thinking along the lines of the irruption of new human groups in the territories traditionally occupied by specific groups. In such cases, the occupational equilibrium is broken by sudden irruptions and space competition or caused by the depopulation of those regions. In either case, the last part of the sequence does not present any feature normally associated with transitional complex, and even if we are probably dealing with recent dates, the industries match with the classic Mousterian assemblages.

CONCLUSIONS

The sedimentary sequence of El Esquilleu consists of four lithostratigraphic units differentiated by geological criteria, units that respond to the development of very different sedimentary processes. The levels of the lower unit (ESQ-D) were formed in a low energy hypogeous environment, mainly by vertical accretion processes with moments of energy rebound; the levels of the lower intermediate unit (ESQ-C) originated in a hypogeo-open environment due to diffuse stream processes with contributions of predominantly siliceous materials; the levels of the upper intermediate unit (ESQ-B) were generated in an open rock shelter environment with a clear influence of the external palaeoclimatology by cryoclasticism processes; finally, the upper unit (ESQ-1) was formed in a rockshelter environment by chemical precipitation processes.

Anthropic processes are present in the two intermediate units (ESQ-C and ESQ-B), with the development of hearths, abundant highly fragmented bone remains that were used as fuel, while in the ESQ-B unit, bone fragmentation decreases. The lower unit (ESQ-D) shows anthropic activity traits that decrease towards the base with an upturn in a detrital level of the base, while in the upper unit (ESQ-A) no evidence of anthropic activity has been detected to date. Also, the ESQ-B unit shows traits that allow the identification of accumulative activity of carnivores and scavengers.

Furthermore, we have identified diagenetic processes, such as the formation of hydroxylapatite crusts at the levels of the lower unit (ESQ-D). The formation of secondary hydroxylapatite is related to the dissolution of the bones present in the ESQ-C and ESQ-B units and their leachate in-depth, until reaching basal muddy levels, where phosphorus reacts with the carbonates present giving rise to neoformation phosphates, producing a substitution of calcite, both in fine sediments and in limestone blocks and pebbles, by hydroxylapatite, generating tabular crusts in the first case and phosphate envelopes and patches in the second. The thermoluminescence analyzes carried out verify this diagenetic activity.

In the faunal record of El Esquilleu fauna, iberian ibex is the predominant animal at all levels, with the occasional presence of other taxa such as the chamois and the deer. The taphonomic evidence shows that at almost all levels iberian ibex, chamois, and deer were contributed by humans, the frequencies and skeletal distribution of the cut marks suggest different activities related to skinning, evisceration, disarticulation, and emaciation. Taxon mortality patterns are primarily represented by adults at all levels. Everything indicates that the inhabitants of the Esquilleu were specialized in catching adult iberian ibex.

The complete sequence demonstrates the dominance of discrete technological units that survive during wide temporal episodes and clearly change after this dominance. The alternation between discoid and Quina concepts seem to be reproduced with frequency. No transitional evidence were documented, and even if this is not a novel circumstance in a regional context, contrast with the large occupation produced during millennia. However, there are also some singular events, as the one represented by levels 17 and 18, characterized by an extraordinary diversity in the raw material nature, as well as the existence of a major presence of blades and points. The explanation of such episodes is still under study.

Recently, pollen and anthracological data have been improved (Uzquiano *et al.* 2012), which report a sustained use of pine as fuel between levels 30 to 15 (> 53 and > 39 ka BP) and a other fuel sources thereafter. The relationship with the territory will also precisely analyze the evolution of the site over time and particularly the changes in the late final Mousterian as at Axlor (Ríos-Garaizar 2012) and Amalda (Rios Garaizar 2010) concerning the possibilities of use of each territory (Rios-Garaizar & Moreno 2015). Equally, isotope and DNA analyses will also open up possibilities in this regard (Jones *et al.* 2018).

The extensive excavation of El Esquilleu is still in reserve. The location of refits in some well-preserved levels (level 11 or level 9 among others) will allow us in the future to analyze intrasite and spatial data, so eloquent in other similar sequences (Romagnoli & Vaquero-Rodríguez 2016) and to set them in relation to the operational chains detected in other satellite deposits of the surrounding territory (El Habario, El Arteu). And while we await a complete chronological and geoarchaeological redefinition of the end of the Cantabrian Mousterian, the lower and middle levels of El Esquilleu represent an interesting avenue of research for working on the first Neanderthal settlement in the Cantabrian region, in a framework dominated, in general, by very recent Mousterian layers.

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