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A preliminary description of Solutrean occupations in El Mirón cave (Ramales de la Victoria, Cantabria)

Una descripción preliminar de ocupaciones Solutrenses en la cueva del Mirón (Ramales de la Victoria, Cantabria)

KEY WORDS: Solutrean, Last Glacial Maximum, Cantabrian Cordillera, El Mirón Cave.
PALABRAS CLAVES: Solutrense, Ultimo Máximo Glacial, Cordillera Cantábrica, Cueva del Mirón.
GAKO-HITZAK: Solutrealdia, Azken Izotz Aro Handia, Kantabriar mendikatea, El Mirón kobazuloa

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ABSTRACT

A 2m² *sondage* excavated by us opportunistically from the base of a treasure-hunters' crater at the rear of the vestibule in El Mirón Cave, has revealed a sequence of Solutrean (as well as Early Upper Paleolithic and late Middle Paleolithic) levels that underlie the long, complete sequence of Magdalenian and Azilian layers in this major site, located in the upper Asón valley of the Cantabrian Cordillera. Far poorer in artifacts and fauna, and lacking obvious features, in stark contrast to the dark brown, culturally and organically rich Initial, Lower and Middle Magdalenian levels, the eight thin, relatively poor, and lighter-sediment Solutrean-age levels or lenses are suggestive of very different kinds and intensities of human uses of this large, strategic and versatile cave during Last Glacial Maximum times than those of the Late Glacial. Dated by ^{14}C to between 18 and 19 (and by extrapolation downward, possibly, 20) kya, these levels were formed quickly, banked up as they are against an ancient, steep, erosional, colluvial-alluvial slope. They seem to attest to short, repeated, specialized human visits to the cave at a time of severe environmental conditions–especially in this upland interior setting. These visits may have been made by small, specialized human groups (e.g., hunting parties) exploiting specific resources (e.g., ibex, red deer, salmon and other fish), perhaps seasonally (summer?), from residential base camps along the Cantabrian coast. This is suggested by the fact that the relatively small lithic artifact assemblages contain disproportionately large numbers of Solutrean points. Almost all of these (and the few antler points) are broken (indicating that they had been used violently) and the points as a group include a wide variety of forms and flint types (and colors), suggesting that the people who were using El Mirón came from and/or traded with a number of different parts of the Vasco-Cantabrian region. Curiously, for a putative hunting/fishing camp, the Solutrean levels also yielded surprisingly large numbers of artificially or naturally perforated shells and bored red deer canines, suggestive of personal ornamentation and possibly caching or even human burial at the site. Larger exposures of the Solutrean occupation surfaces are needed to test these ideas.

RESUMEN

Un *sondeo* de 2m² excavado por nosotros aprovechando la base de un pozo hecho hace tiempo por buscadores de tesoros, al fondo del vestíbulo de la Cueva del Mirón, ha revelado una secuencia de niveles solutrenses (y del Paleolítico superior inicial y Musteriense final) que yacen por debajo de una larga y completa secuencia de estratos magdalenienses y azilienses en este yacimiento mayor, ubicado en el valle alto del Asón de la Cordillera Cantábrica. Mucho más pobres en artefactos y fauna y sin estructuras humanas obvias, en marcado contraste con los niveles de color pardo oscuro y culturalmente y orgánicamente ricos del Magdaleniense Inicial, Inferior y Medio, los ocho niveles o lentejones delgados y relativamente pobres y de colores más claros de la época solutrense sugieren unos tipos e intensidades de empleo humano de esta cueva tan estratégica y versátil muy diferentes durante el Ultimo Máximo Glacial respecto al Tardiglacial. Datados por fechas de ^{14}C entre unos 18 y 19 (o 20) miles de años BP, estos niveles se formaron rápidamente, puesto que están amontonados sobre la rama erosionada de un depósito coluvial-aluvial muy antiguo. Parecen atestiguar la existencia de unas visitas humanas especializadas a la cueva durante un periodo de condiciones ambientales rigorosas–especialmente en esta zona montañosa del interior cantábrico. Estas visitas podrían haber sido de pequeños grupos humanos (p.ej., expediciones de caza) que explotaban recursos específicos (p.ej., cabra montés, ciervo, salmones, otras peces), tal vez de manera estacional (probablemente veraniega), y con sus bases en yacimientos residenciales a lo largo de la costa cantábrica. Esta hipótesis está sugerida por el hecho de que los relativamente pequeños conjuntos líticos contienen unas cantidades desproporcionadamente grandes de puntas solutrenses. Casi todas estas (y las pocas azagayas de asta) están rotas (evidencia de unos empleos violentos) y las puntas en conjunto incluyen una gran variedad de formas y de tipos (y colores) de sílex, lo cual sugiere que las gentes que emplearon El Mirón venían de o intercambiaban con diversas áreas de la región vasco-cantábrica. Curiosamente para un campamento de caza y de pesca, los niveles solutrenses también nos entregaron unas cantidades sorprendentemente grandes de conchas perforadas (artificial- o naturalmente) y de caninos de ciervo perforados, lo cual sugiere el adorno personal o incluso el enterramiento humano (hipotético) en el yacimiento. Haría falta excavar unas áreas más amplias de las superficies de ocupación humana para poder probar estas ideas.

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LABURPENA

Garai bateko altxor-bilatzaileek El Mirón kobazuloko atariaren barrenean egindako putzu bat baliatuz, 2 metro koadroko zundaketa bat egin dugu. Bertan, solutrialdiko (eta hasierako Goi Paleolitoko eta Musteriar aroaren amaierako) mailen sekuentzia bat aurkitu dugu. Kantabriar mendikateko Asón ibaiaren goi-haranean dagoen aztarnategi horretan, Madeleinealdiko eta Azilialdiko geruzek osatutako sekuentzia luze eta oso bat ere aurkitu dugu Solutrealdiko geruzen gainean. Solutrealdiko geruza horiek ez dira Hasierako Madeleinealdikoak, eta Erdi eta Behe Madeleinealdikoak bezain aberatsak, tresnei eta faunari dagokienez, eta ez dute giza egitura argien aztarnarik eskaintzen. Madeleinealdiko zortzi maila edo lentejoi arre ilunak kulturalki eta organikoki aberatsak dira; aldiz, Solutrealdiko geruza argiagoei erreparatuz gero, esan dezakegu, Azken Izotz Aro Handian eta Aro Tardiglaziarrean gizakiek ez zutela erabilera anitzeko kobazulo estrategiko hura gauza berak egiteko eta maiztasun berarekin erabili. Karbono-14aren frogak 18 eta 19 (edo 20) mila urte (BP) inguruan datatu ditu geruza horiek. Horrez gain, geruzak oso antzinakoa den biltegi kolubial-alubial baten adar higatuaren gainean pilatuta daudela kontuan izanez gero, oso azkar osatu zirela esan dezakegu. Geruza horiek adierazten dute ingurumen-baldintzak txarrak zirenean –batez ere kantauriar eskualdearen barnealdean– gizaki-talde batzuk kobazuloan babesten zirela. Talde horiek talde txikiak izango ziren ziurrenik (esate baterako, ehiza-espedizioak); agian, zenbait urtarotan (ziur asko, udan) baliabide zehatzak ustiatzen zituzten (esate baterako, basahuntz piriniarra, oreinak, izokinak eta bestelako arrainak) eta ohiko bizitokiak kantauriar kostaldean zituzten. Urri samarrak diren talde litikoetan Solutrealdiko punta asko aurkitu dira eta horrek eman digu hipotesi hori egiteko bidea. Punta horietako gehienak (eta adarrez egindako azagaia urriak) hautsita daude (bortizki erabili izanaren ondorioz), eta itxura, mota (eta kolore) askotako silexa erabili zuten horiek egiteko. Hori dela eta, pentsa dezakegu El Mirón kobazuloan bizi izan ziren gizakiak euskal edo kantauriar eskualdekoak zirela edo haiekin trukean aritzen zirela. Ehizarako edo arrantzarako erabilitako kanpamentuetan ohikoa izan ez arren, Solutrealdiko geruzetan naturalki edo artifizialki zulatutako oskolak eta oreinen letaginak aurkitu dira; asko, gainera. Horrek apaingarriak erabiltzen zituztela edo aztarnategian gizakiak lurperatzen zituztela pentsatzera garamatza. Hala ere, hipotesi horiek frogatu ahal izateko, gizakiek bizitoki modura erabili zuten guneko esparru handiagoa induskatu beharko litzateke.

1.- INTRODUCTION

Studies of the Solutrean of North Atlantic Spain have revealed apparent gaps in the distribution of sites pertaining to the human occupation of Vasco-Cantabria during the Last Glacial Maximum (=LGM: 20.5-17 ^{14}C kya) (Straus 1975, 1983, 2000; Straus *et al*. 2000; Rasilla & Straus 2007). There are "empty"(or "near-empty") areas along the East-West-oriented coastal zone, notably between the basins of the Holocene Ría de Gernika and the Bahía de Santander, between the valleys of the Río Nansa and the Río Bedón, and between the valleys of the Río Sella and the Río Nalón. Furthermore, the known Solutrean settlement pattern is heavily dominated by sites located along that narrow coastal strip, with few genuinely montane sites. Most (70%) sites are at ≤200 m above present sea level (≤ ca. 320 m above LGM sea level) and 40% are at ≤100 m above present sea level (≤ ca. 220 m above LGM sea level). Both these lacunae in the Solutrean site distribution could be partially due to biases in archeological research, notably the relative distances to the places of residence of active prehistorians (e.g., major cities or the palace of the Conde de la Vega del Sella in Nueva, Asturias) or to stations along the old narrow-gauge railroad line that was a major means of transportation in the high, rugged relief of Vasco-Cantabrian Spain until the recent construction of divided highways and modern roads. The situation is slowly changing to some extent with the discovery of new Solutrean sites (e.g., Arlanpe in central Vizcaya on the northern edge of the Cordillera [Ríos *et al*. 2007]). However, other recent discoveries (e.g., Antoliñako, El Ruso, La Lluera) have tended to reinforce the extant pattern, which consists of clear clusters of major sites and satellite loci usually near the lower courses of rivers in the coastal zone and often geographically linked via those valleys to one or more montane sites. Major examples include the sites of the Ría de Gernika (Santimamiñe, Antoliñako, Atxeta + Bolinkoba, Atxuri), the sites of the Pas/Saja/Bahía de Santander/Miera area (Altamira, Caranceja, Hornos de la Peña, Castillo, Pasiega, Pendo, Ruso, Camargo, Cobalejos, Morín, Fuente del Frances, Garma, Bona, Salitre), the sites of the Ríos Bedón and Cares in eastern Asturias (Cueto de la Mina, Riera, Balmori, Coberizas, Tres Calabres+Buxu, Guëlga, Canes, Llonín) and the sites of the Río Nalón valley in central Asturias (Candamo, Lluera, Caldas, Viña).

This article is a brief, interim report on the Solutrean levels excavated to date in the montane site of El Mirón Cave, located in the upper sector of one of the principal valleys in the heretofore Solutrean-poor area of eastern Cantabria-western Vizcaya (Encartaciones), namely the Río Asón Basin (Figure 1). El Mirón, scientifically discovered at the same time as the adjacent cave art sites of Covalanas and La Haza, in September 1903, by Hermilio Alcalde del Río and Lorenzo Sierra, is part of a greater cluster of unfortunately little-known and/or poorly preserved Upper Paleolithic sites in the area of Ramales de la Victoria. In the cliffs of Monte Pando dominating the confluence of the Ríos Calera and Gándara with the Asón, are also located the caves of Cullalvera (Upper Magdalenian), La Luz (Solutrean), El Horno (Upper Magdalenian and Azilian). Only 3-4 km to

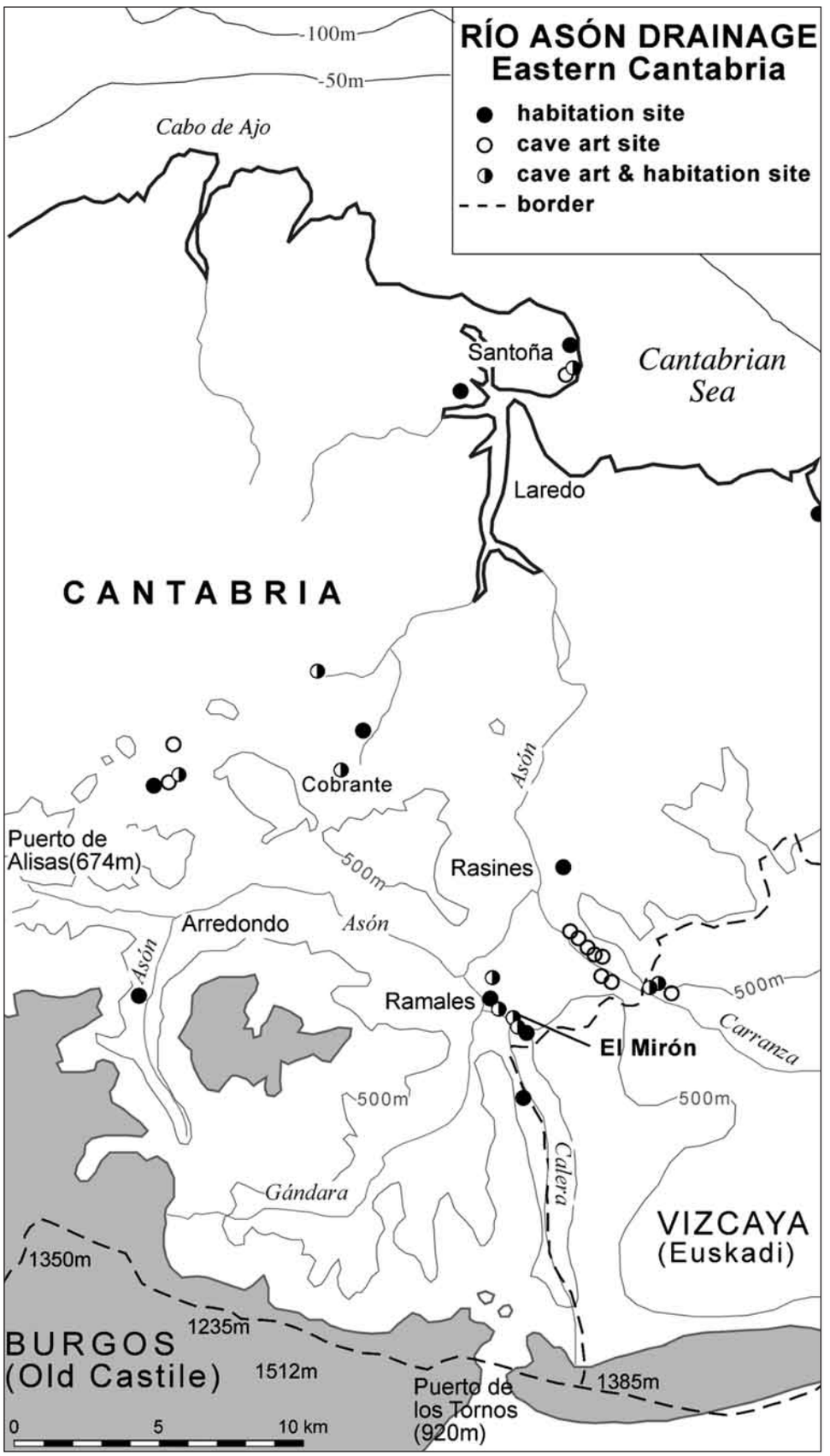

Fig. 1. Map of the Rio Ason drainage basin. La Haza and the Ramales open-air site are immediately NW of El Miron and La Luz is SE of it.

the NE along the gorge of the Río Carranza (the main eastern tributary of the Asón) is a string of art and residential sites (Venta de la Perra, Polvorín, Arco A-B-C, Pondra, Sotarriza, Covanegra, Morro del Oridillo), none of which has (yet) yielded Solutrean artifactual evidence, although there are red dot outline painting in the Arco caves, Pondra and Morro, which are often attributed to the Gravettian or Solutrean periods (González Sainz & San Miguel 2000). Likewise, the many known sites of the middle and lower Asón (El Valle, El Otero, La Chora, La Fragua, El Perro) all (so far) lack Solutrean materials, although, with a date of 18,540 BP, artifact-poor Level 3 of Cobrante might be Solutrean (Rasines 2008:61). The early reports on El Mirón (Alcalde del Río 1906:46; Sierra 1908: 110; Alcalde del Río *et al*. 1911:11; Cabré 1915:47) mention a variety of Paleolithic periods, although it was never made clear whether the discoverers or other early prehistorians (e.g., Juan Cabré) had excavated at all in the cave or if the materials summarily described were scattered on the surface as the result of previous digging by treasure-hunters or peasants exploiting organic-rich cave earth for fertilizer and/or to level the vestibule rear for livestock stabling. Only Cabré specifically mentions the presence of Solutrean artifacts (together with Magdalenian and Azilian ones). Although he turns out to have been correct, we do not know what the source of his information might have been. We did find a fragment of a concave base point (Figures 5.3 and 6.9) in mixed surface fill at the vestibule rear, so such artifacts do seem to have been brought up by non-archeological diggings in El Mirón in the past, though not from any crater we have managed to uncover.

Besides El Mirón, the information on the Solutrean occupation of the Upper Asón Valley is highly sketchy. La Haza yielded a bifacial willow leaf point with an ogival base (Corchón 1971, Plate VI), almost certainly found when the ground surface of this small art cave was lowered (as in the case of nearby Covalanas and other caves, such as those of Monte Castillo) and a gate installed to prepare it for tourist visits (J.González Echegaray, personal communication with LGS in 1973; *pace* Corchón 1971:157-8). This piece (lost at least as of 1973) had been found possibly in 1959, since, in 1973, LGS found an empty box labeled "La Haza, 1959" in the Provincial Archeological Museum in Santander, although Corchón speaks of "a test pit" dug in La Haza by the Seminario Sautuola of that museum in 1955 (see Straus 1975, 1983:78; García Diez & Eguizabal 2007:182; Moure *et al.* 1991). (The sedimentary deposits at the mouth of Covalanas Cave–also apparently not very rich archeologically–were similarly shoveled out by workmen under the general direction of Jesús Carballo [founding director of the Santander Prehistory Museum] and supervision of civil engineer, Alfredo García Lorenzo, in the period between 1950-56 [García Diez & Eguizabal 2003:31-32]. It was during this time that García Lorenzo directed construction of the road up to Covalanas [and the one leading to the Monte Castillo caves, the art in two of which he discovered and in which he also dug under Carballo's general direction] and also ordered the digging of a trench across the inner gallery of El Mirón. None of this "excavating" was published.) La Haza is some 400 m. NW and 40 m below El Mirón, near the base of El Haza Cliff (the western face of Monte Pando).

Below and a few score metres NW of La Haza were found a few artifacts of Upper Paleolithic aspect during the construction of a group of houses at the upper edge of Ramales in the early 1990s (Bohigas *et al*. n.d.: 27-39, Fig.I). Among them are a pair of backed blades, a sidescraper and splintered piece, plus a mesial fragment of a unifacial point with ribbon invasive retouch. This piece could either be a *pointe à face plane* or a large shouldered point. Whether these objects were really *in situ* or had washed down the very steep slope of the lower cliff (perhaps from one of the several other cave mouths therein) is unknown, given that they were surface finds and their context was not specified in detail. The present location of the point is unknown. Both La Haza and Covalanas mainly contain virtually identical red dot outline paintings of red deer hinds, horses, bovines, ibex and signs, generally thought to date between the late Gravettian and Solutrean (García & Eguizabal 2003, 2007; Moure *et al*. 1991; Apellániz 1982).

La Luz Cave is ca. 200 m SE of and about 60 m below El Mirón near the base of La Pared Cliff (the southern face of Monte Pando. It contains a few rupestral engravings (lines and a quadruped of possibly pre-Magdalenian style)(Montes *et al*.2003). One shouldered point fragment of Solutrean aspect was found on the surface and another in a speleologist-dug pit, along with faunal remains, other lithics and some ceramics indi-

cative of mixing (Gomez *et al*. 2006). Thus there were slight (and somewhat uncertain) hints of a cluster of minor Solutrean occupations (and probably significant Solutrean cave art) in the Ramales area, as well as perhaps at least one site in the lower Asón valley. The excavation of El Mirón would add significantly to our knowledge of human use of this hinterland area and the Asón valley in general, a major area between central Cantabria and central Vizcaya that until now has been a large gap in the Solutrean distribution.

2.- EL MIRON CAVE

2.1. The Site

El Mirón is a large cave (mouth: 16 m wide x ca.20 m high; vestibule:8-10 m wide x 12-13 m high x 30 m deep; inner cave: 6-8 m wide x 100 m deep, until it is filled to the ceiling with alluvial deposits at the back) which faces due West and dominates the Calera-Gándara-Asón at the eastern end of the Valle de Ruesga from a position ca. 100 m above the valley floor in the lower part of El Haza Cliff, ca. 260 m above present sea level. It is provides ample dry living space, excellent shelter from winds and ample solar insolation, as well as panoramic views, a strategic setting. It is located near the crossroads of key routes of interior communication West-East between central Cantabria (Bay of Santander area) and Vizcaya (via Alisas Pass–674 m--between the Miera and Asón Valleys and the Carranza Valley through Trucios and the Encartaciones) and North-South between the Cantabrian coast and the Northern Meseta of Burgos in Old Castile (via the Asón, Calera and Los Tornos Pass–920 m). El Mirón is immediately surrounded by mountain summits and ridges at or somewhat over 1000 m above present sea level, making it a montane site, despite its own relatively low elevation and the very low elevation of the valley floor below the cave. It is about 20 km from the Holocene shore at the mouth of the Asón and would have been ca. 28 km from the LGM shore.

2.2. The early Magdalenian

Our excavations since 1996 (e.g., Gonzalez Morales & Straus 2005, 2009; Straus *et al*. 2001, 2002) have revealed a nearly complete cultural sequence from a terminal Mousterian to an early Bronze Age, plus traces of Medieval use of the cave , dated by 65 radiocarbon assays ranging from 41,000 BP to AD 1400. The excavations have been conducted mainly in two completely intact areas in the outer ("Cabin") and inner ("Corral") sectors of the vestibule, each ca. 10 m^2 in size and connected by the 1 m-wide "Mid-Vestibule Trench" (Figure 2). In addition, a 1 m^2 test pit was dug down

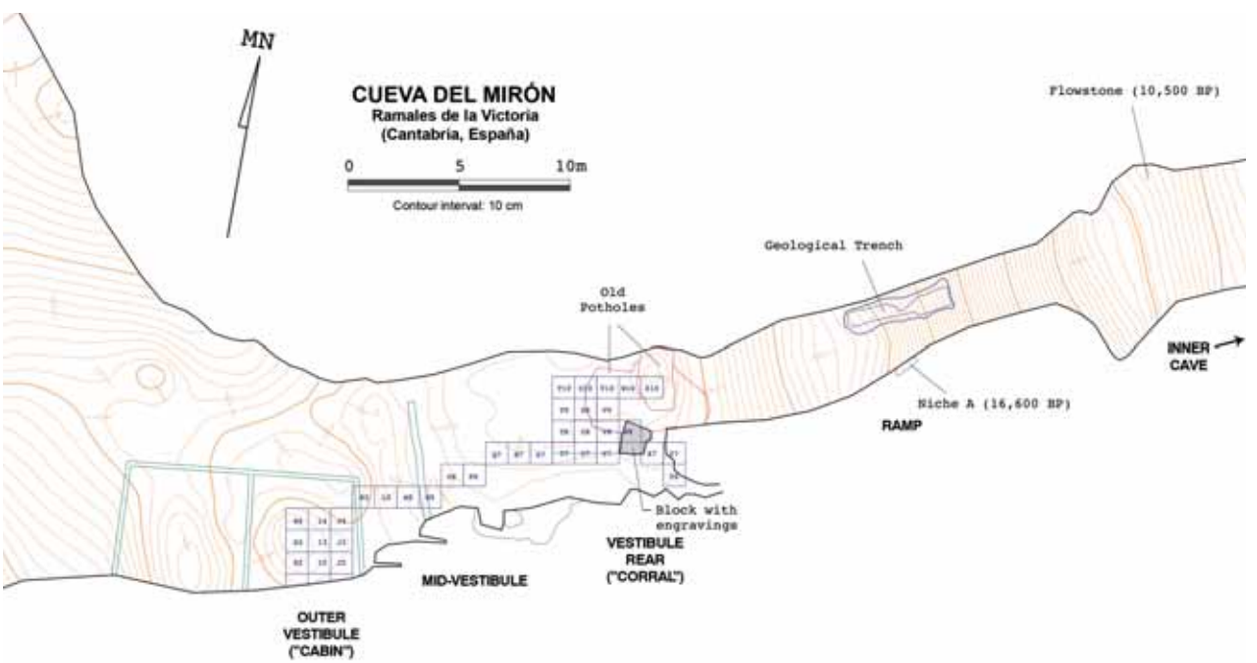

Fig. 2. Plan of the Mirón Cave vestibule showing the Corral (front), Mid-Vestibule Trench, and Corral (rear) excavation areas. *Sondage* W-X/10 is located at the base of the "old pothole" at the foot of the colluvial-alluvial slope connecting the vestibule to the inner cave. (Drawn by E.Torres.)

from the base of the inner cave trench that had been originally excavated by García Lorenzo and sedimentary in-filling of a niche in the cave wall above the colluvial-alluvial erosional slope that leads steeply up from the vestibule to the inner cave was excavated. Both of these limited tests yielded radiocarbon dates corresponding to the early Magdalenian and, as of the time of writing (July 2009), the main excavation areas (Cabin and Corral) had also reached early Magdalenian levels. Specifically, the current base of the Cabin area (Levels 19-21) dates at most to 16,600 BP (uncal.), the base of the Mid-Vestibule Trench (Level 313) to 17,400 BP, the base of the Corral (Levels 119-119.2) at most to 16,960 BP, Niche A to 16,600 BP and the inner cave test pit (Level VIII) to 14,620 BP (Straus & González Morales 2003, 2007, 2010). All these oldest-to-date strata, except the one in the inner cave test pit, could be labeled "Initial Magdalenian" and one could argue that 1 m^2 Mid-Vestibule Trench test pit P6 Level 313 could be attributed to the Solutrean, based on its stratigraphic position below classic Cantabrian Lower Magdalenian Level 312 and its ^{14}C date. However no Solutrean points have been found (yet), so caution is in order (Straus *et al*. 2008; Straus & González Morales 2008).

2.3. The W-X/10 sondage at the base of the treasure hunters' crater in the vestibule rear

In addition, a large area of obviously loose, disturbed, mixed sediments in the NE corner of the vestibule rear, was identified at the start of our work in the site. This area had been repeatedly dug in recent times, presumably by looters. This crater was located at the foot of the steep colluvial-alluvial slope and its deposits were banked up against the solid, intact boulder, cobble and yellowish-brown sandy silt of that erosional slope. Concurrently with our excavations in intact areas of the vestibule, we emptied the crater, dry-screening some 25 m^3 of sediments that contained a mix of Paleolithic and modern artifacts. The base of this crater corresponds to the top of a stratum (120=ex-400) that is radically different in color, texture and content from all the Magdalenian levels directly above it. Level 120 (on average 12 cm thick) is light yellowish-beige in color and consists of a compact clayey silt/silty clay with water-worn cobbles and small *éboulis* and only a low density of artifacts, charcoal and faunal remains. The overlying, clayey-silt levels with *éboulis* in immediately adjacent (west- and south-ward) areas of the Corral are blackish, dark grey-brown in color, with patches and lenses of red ochre, fine silts of greenish-greyish color, rich organic content (abundant charcoal, faunal remains, hearths and hearth-sweepings), and densely packed with lithic and osseous artifacts and manuports (fire-cracked rocks, anvils). In short, the contrast between the extraordinarily rich early Magdalenian levels and the underlying Level 120 is dramatic. (And the change in color and texture and the appearance of archeological sterility are what may have caused "treasure-hunters" to stop digging in at least this crater when they reached relatively hard and homogeneous Level 120.) This contrast is mirrored between Levels 313 and 314 in the Mid-Vestibule Trench and between Levels 17 and 18 in the Corral, although the exact timing and contemporaneity of this break in the different sectors of the Mirón vestibule are not yet proven. The suggestion, however, is that there was a sharp change in the nature and intensity of the human use of the cave between Level 120 times and Level 119-119.2 times and later.

To determine whether the deposits below the base of the crater (Level 120) are in fact sterile or archeologically fertile, we first excavated a 1 m^2 pit in square W10 in 1998. This immediately revealed that the pre-119 levels are indeed fertile, albeit relatively poor. Excavation was conducted, as usual, by quarter-meter subsquares and by thin spits (ca.3-10 cm), at least in the culturally rich upper levels. The spits were thicker (ca.≥10 cm) and excavation was done by small shovel and hand-pick, as well as by the normal trowel, in the culturally very poor basal levels (128-130). Removal of large limestone blocks from the latter levels was done with the aid of wedges and hand-held hammers, as well as a pneumatic hammer. The sediments were water-screened in the field laboratory, as usual, but because this was a test pit, three-dimensional piece-plotting of finds was relatively limited.

At first the deposits immediately underlying Level 120 (initially called 400 until its equivalence with 120 could be physically demonstrated) were called Levels 400.1 and 401. Later, in 2000, when the crater-base *sondage* was doubled in size with the addition of square X10, it was realized that 401 could be subdivided into three lenses. By that time, a physical connection had been made between

Level 400 and Level 120 at the base of the full intact stratigraphic sequence in square V8. Thus, Level 400 was renamed 120, 400.1 became 121, and 401, 401.1 and 401.2 became 122, 123 and 124 respectively (Figures 3 & 4). After the W-X/10 *sondage* was completed, the Corral Magdalenian sequence was excavated down to the base of Level 119.2 in nearby squares U9-10. It was again shown to lie immediately atop Level 120. Then, in 2006, we dug carefully into and through Level 120 at the western edge of the base of the crater in squares V9-10, revealing an intact and artifact-bearing Level 121, thus making a direct, physical connection between the W-X/10 *sondage* and the Corral area of U9-10. The culture-stratigraphic sequence of the W-X/10 *sondage* below Level 120 (described above) is given as follows:

Level 121 is a localized, ca. 3 cm-thick brown, stony lens with organic matter and cultural material. Level 122 is another yellowish-beige, homogeneous, compact clayey silt with *éboulis*, gravels and cobbles, and only a low density of artifacts and bones; 10-15 cm thick. Level 123 is a 3-7 cm-thick, localized, brown stony silt lens with artifacts and bones. Because of the steep slope and the lense-like extent of 123, merging as it does with 124, some artifacts initially provenienced to 123 may actually pertain to 125, which is similar in color

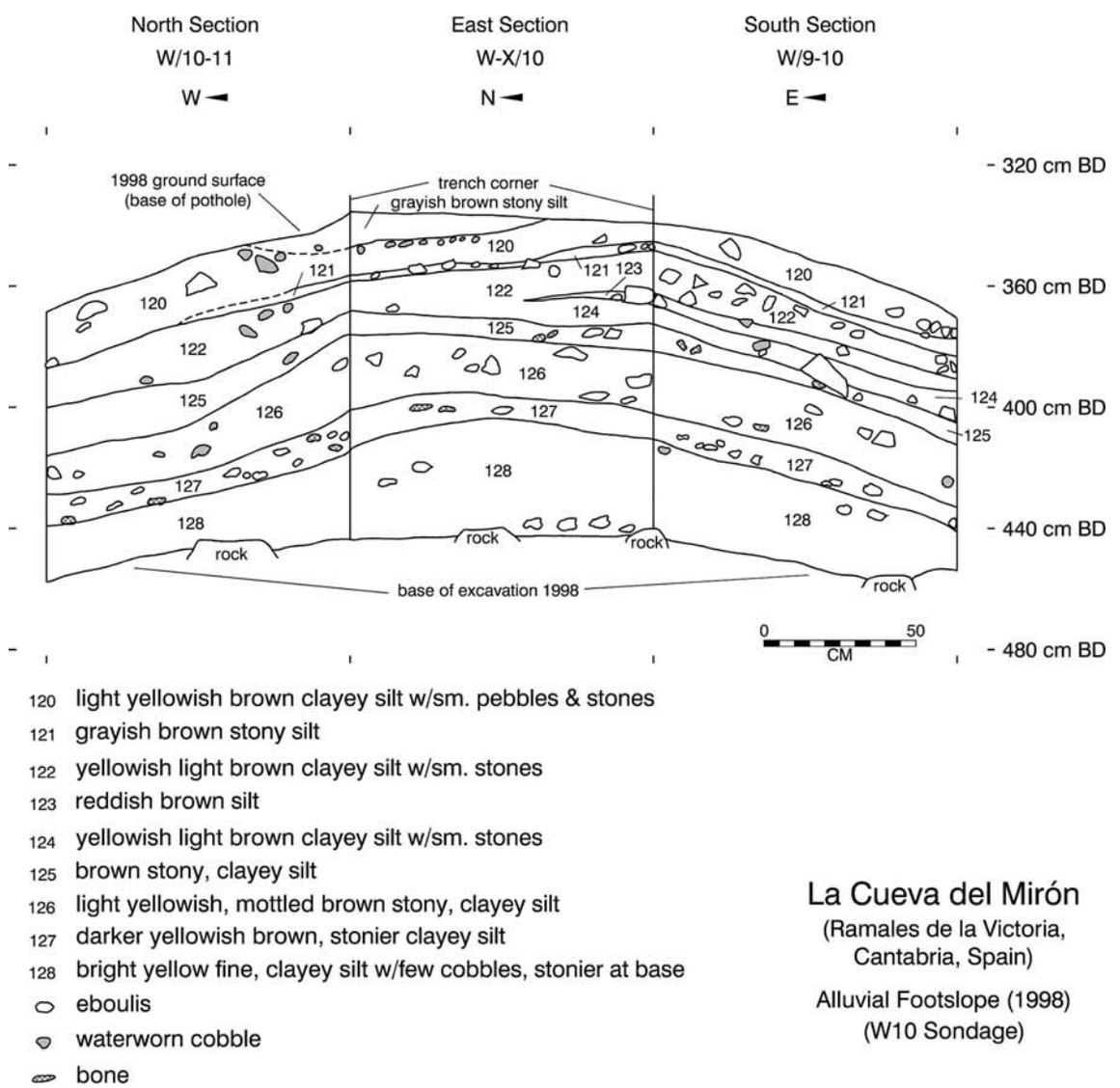

Fig. 3. Stratigraphic section (Drawn by Straus, redrafted by R.Stauber.)

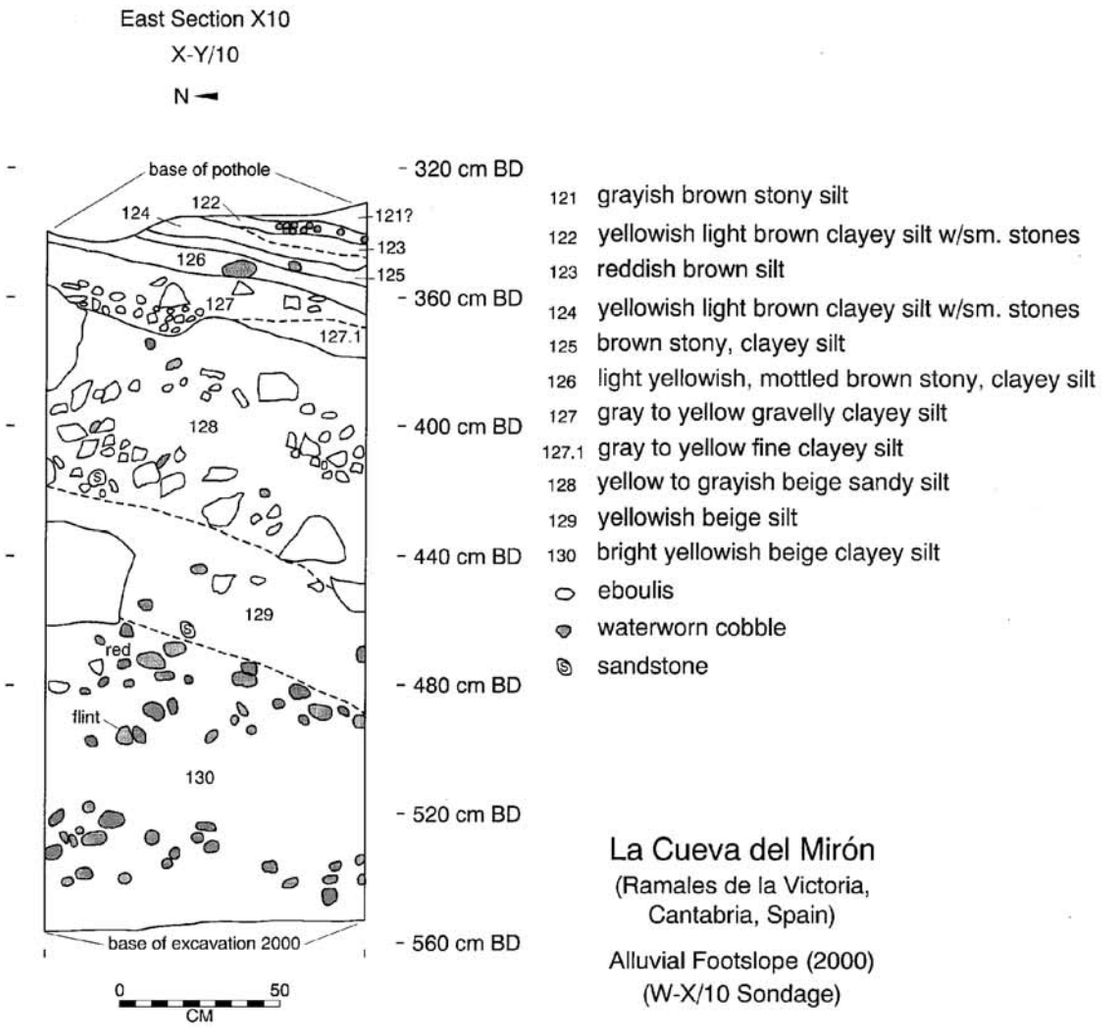

Fig. 4. Stratigraphic section (Drawn by Straus, redrafted by R.Stauber.)

and relative cultural richness. Level 124 is a yellowish-orange-beige stony silt layer about 5 cm thick, nearly sterile culturally. Level 125 (=ex-402) is a darkish brown silt layer, 10-12 cm thick, with artifacts and bones. Level 126 (=ex-403) is a more yellowish, lighter (beige) clayey, sandy silt layer with cobbles, éboulis, fairly abundant artifacts (lithic and osseous) and faunal remains, 20-25 cm. Level 127 (=ex-404) is a darker brown-gray, stony, loose layer, 10 cm-thick, with organic matter, abundant bones, teeth and artifacts. It intergrades with Level 126. Lens 127.1 seems to be channel fill within Level 127, consisting of fine, laminated silt of yellowish-grey silt, 1-10 cm thick. Level 128 (=ex-405) is a massive (25-60 cm) layer of bright yellow, smooth, clayey silt which slopes steeply down toward the cave mouth (i.e., westward). The top of this layer contrasts sharply with Level 127 and the base is marked by large limestone blocks and smaller *éboulis*. The layer is very poor in artifacts, but there are remains of both micro- and macro-mammals, as well as fish. Level 129 (=ex-406) intergrades with 128, but underlies the stony zone at the base of that layer; 35-40 cm-thick. It is an even purer, pasty, clayey, bright yellow silt set in very large limestone blocks. It is culturally almost sterile. Level 130 intergrades with 129, but is a reddish-brighter yellow, less clayey silt. It contains many water-worn cobbles and pebbles. It generally underlies large blocks and contains dispersed flakes, bones and charcoal flecks. The bottom of 130 was not reached and core-boring showed that it (or a deposit very similar to it) continues at least 1.5 m below the base of the year- 2000 excavation, by which point its exposed thickness was already ca. 1.0 m.

The levels of this lower deposit, banked up against the "poorly sorted, heterogeneous fluvial deposits" of the erosional slope, are all sedimentologically characterized by William Farrand (n.d.; Straus *et al*. 2001) as variations on the category of "sandy loam", with differing amounts of cobbles and limestone debris, as well as organic matter, artifacts and faunal remains. It seems apparent that at least for Levels 120-127, there is an alternation between culturally relatively richer and poorer levels, perhaps reflective of times of human visitation to this part of the cave versus episodes of also rapid, but totally natural deposition (namely via sheet runoff [*ruissellement*] down the steep erosional slope). The deep, long test trench he and his student William Hubbard dug into the erosional slope deposits 8-13 m above (East of) the crater test pit (W-X/10) yielded absolutely no cultural or faunal remains. These deposits undoubtedly constitute the kind of "foundation" material that had been partially eroded out of the cave vestibule by strongly running water (capable of transporting cobbles up to 0.5 m in size) and that clearly predated and underlaid the Upper (and Middle) Paleolithic levels that we have uncovered in the vestibule. In addition, as Farrand (n.d) argues, the erosional slope is a (the) principal source of mineral sediments that–together with *éboulis* (limestone ceiling and wall spall), limited aeolian silt, and often abundant anthropogenic and organic materials–formed the late Pleistocene and Holocene deposits in the vestibule.

The levels (120-130) exposed in the W-X/10 *sondage* generally display a double slope, down toward both the South and the West, probably reflecting the geometry of the underlying colluvial-alluvial erosion slope, which may take the form of a cone emanating from the mouth of the narrow, funnel-like passage leading back and up into the inner cave. The slope of all these levels westward down toward the cave mouth is around 15o. However the slope down toward the South ranges from 5 to 17º among the lower levels, while the uppermost levels (120-122) are either flat or slope slightly (ca. 8º) down toward the North. In addition to being far from flat, this area of the cave vestibule is relatively dark (sunlight reaches it in the late afternoon in summer) and very drafty since it lies in the axis of the passage leading up to the inner cave. Hence we might deduce that this was an area that was marginal for actual human occupation, compared with areas of the vestibule further toward the West and South.

3- RADIOCARBON CHRONOLOGY OF THE *SONDAGE*

Level 121 is dated by the conventional method (extended count) on bone collagen from square V9: 18,390±300 BP (GX-32655). Level 125 is dated by the conventional method on bone collagen from square W10 to 18,980±360 BP (GX-24470) and similarly Level 126 is dated to 18,950±350 BP (GX-24471). These dates in the Corral area are bracketed by dates of 16,320±160 BP for Level 119.2 (in square U9) and 16,960±80 BP for overlying Level 119 (in V8) and 27,580±210 BP for Level 128 (in square X10). The former two dates correspond to the artifact-rich Initial Magdalenian and the latter to the early Gravettian/terminal Aurignacian (although without diagnostic artifacts). The dates from levels 125 and 126 are statistically identical and suggest very rapid formation of these levels (and probably 124 and 127), which would not be surprising given the steep underlying slope.

Since Solutrean point fragments have been found in levels 120, 123, 124, 125, 126 and 127, it is clear that these deposits were laid down during the LGM between ca. 20 kya and ca. 17 kya. It should be noted, however, that several small fragments of lithic pieces with invasive retouch have been found in levels with Magdalenian-period radiocarbon dates and typically Magdalenian antler and lithic artifacts. These possible or definite point fragments include three from Level 116 (one highly doubtful)(Figure 6.1), two each from Levels 119 (Figure 6.10) and 15 (the latter pair being particularly convincing–one bifacial, the other unifacial)(Figure 6.2), one (highly problematic) from Level 115 and another (probably a unifacial shouldered point base) from Level 17. As noted above, because of its stratigraphic position and radiocarbon date of 17,400± 270 BP, Level 312 in the Mid-Vestibule Trench (P6 *sondage*) might well pertain to the Solutrean, despite the lack of characteristic points.

4- MICROFAUNAL & OTHER EVIDENCE OF SOLUTREAN ENVIRONMENTS

The rich micromammalian faunas of the Solutrean (and all the other) levels were studied by Gloria Cuenca and Juan García Pimienta (Universidad de Zaragoza) (Cuenca *et al.* 2008, 2009). Owls were the principal agents of rodent and insectivore accumulation. The Solutrean levels are

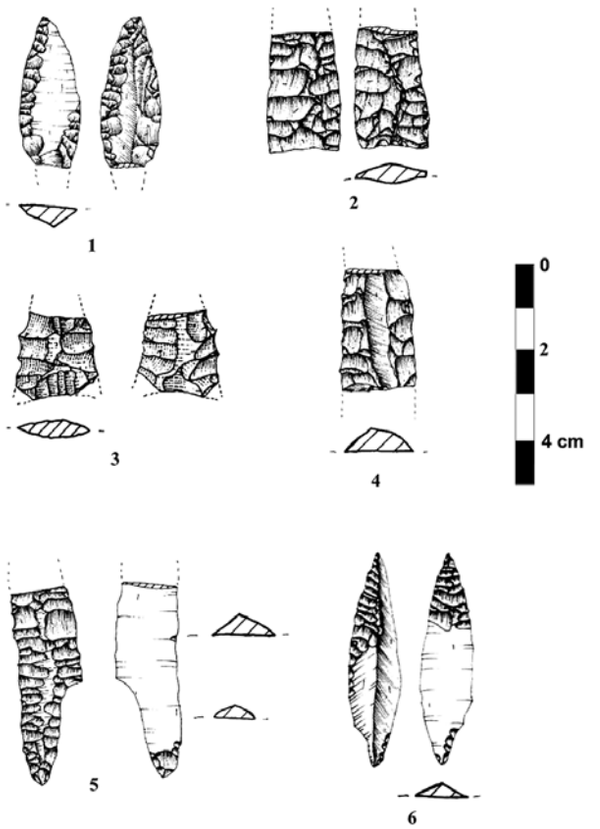

Fig. 5. Solutrean points. 1. W10d, Lev.125, spit 4, No.17; 2. W10c, Lev.126, spit 5, No.22.13; 3. W8, mixed surface fill; 4. W10a, Lev.127, spit 7, No. 29.8; 5. W10d, Lev.126, spit 5, No.23.1; 6. X10d, Lev. 123 (or 125), spit 5, No.28.6 (Drawn by S.Ruiz and N.Suarez).

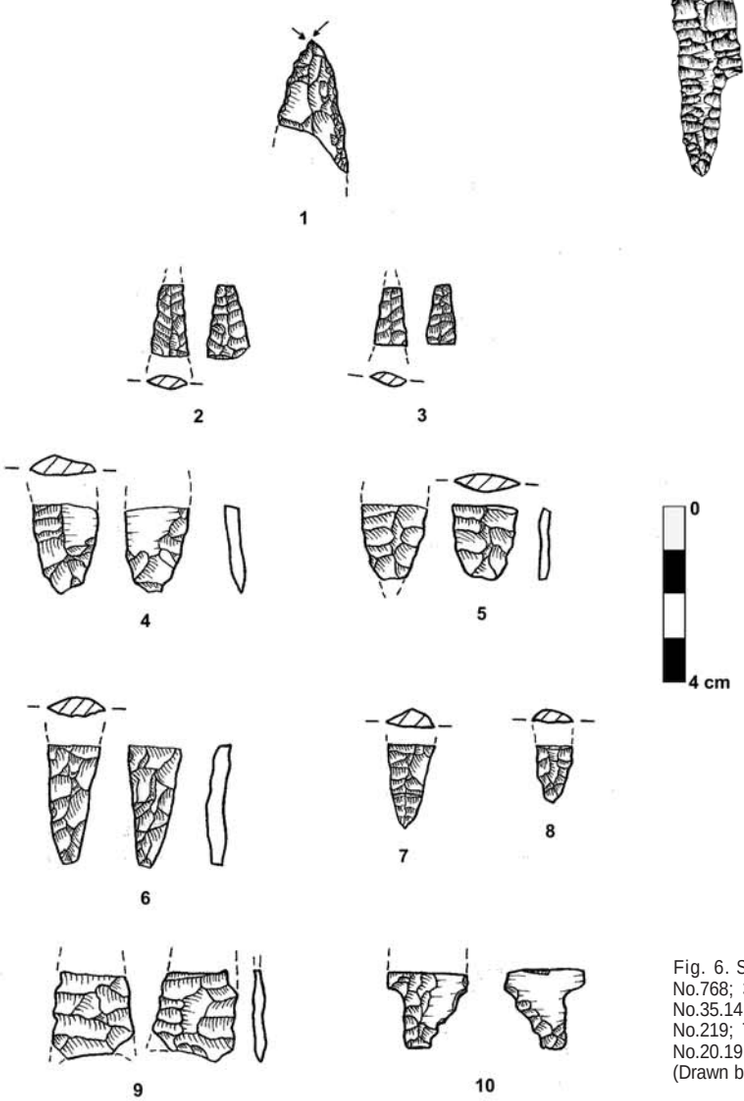

Fig. 6. Solutrean points. 1. U9c, Lev.116, spit 23; 2. H2a, Lev.15, spit 40, No.768; 3. W10d, Lev.126, spit 5, No.23.22; 4. W10c, Lev.127, spit 8, No.35.14; 5. W10b, Lev.125, spit 4, No.14.12; 6. X10c, Lev.127, spit 13, No.219; 7. W10c, Lev.125, spit 4, No.15.18; 8. W10a, Lev. 126, spit 5, No.20.19; 9. W8, mixed surface fill; 10. V8c, Lev.119, spit 28, No.4674. (Drawn by Straus, redrafted by A.Kenward.)

particularly well-endowed with the contents of their regurgitation pellets. These levels demonstrate the highest percentages of open grassland species and the lowest percentages of woodland ones in the whole Mirón sequence. Species of barren rocky slopes are also very abundant, while water-edge species are very poorly represented. There is notably a major spike in the representation of *Microtus oeconomus,* a cold-climate indicator. All of this is indicative of the rigorous conditions of the LGM. These results are being corroborated by the palynological study currently underway by Maria Jose Iriarte (Universidad del País Vasco) (personal communication), which is also showing a scarcity of trees (mainly scattered pines and some birches) in an otherwise open landscape dominated by composites, grasses and heaths during Solutrean times. This picture is consonant with results from coastal Solutrean sites such as La Riera (Straus & Clark 1986).

Although no charcoal from the Solutrean levels has been identified, several pieces from the underlying Gravettian/late Aurignacian and late Mousterian levels were determined by Lydia Zapata (Universidad del País Vasco) (personal communication). These include five fragments of *Alnus* (alder) and the knot of an indeterminate Angiosperm from Level 128 and five of indeterminate Gymnosperms that could be *Pinus* (pine) and/or *Picea* (spruce). These identifications might hint at somewhat more wooded conditions in the vicinity of the cave in pre-LGM times (ca. 27 kya) than during the Solutrean/LGM.

The Solutrean levels also contain small-moderate amounts of macro-mammalian faunal remains that are not yet studied, but that, based on field observations, are heavily dominated by ibex and red deer. The bones are highly fragmented, indicative of intensive butchering, processing and probably marrow/brain extraction. Fish vertebrae are also very abundant in some of the Solutrean levels. These include both salmon and smaller species (S.Consuegra & C.García de Leániz [Centro Ictiológico de Arredondo] personal communications).

5- SOLUTREAN ARTIFACT ASSEMBLAGES

Levels 120-128 in squares W-X/10 yielded a grand total of 3701 lithic artifacts, of which 3598 are knapping debris (débitage + cores) and 103 are retouched tools/weapons, as classifiable by the standard de Sonneville-Bordes/Perrot typology. By far the richest level is 126, with more than 37% of the debris and more than 28% of the tools. The next-richest levels are those that stratigraphically bracket 126, namely 125 and 127+128. The knapping debris are detailed in Table 1 and are summarized by major groups in Table 2. Retouched tools are listed in Table 3.

Microdébitage (trimming flakes and shatter [small angular debris without Herzian morphology]–all measuring ≤1 cm in length) makes up between 62-89% of the lithic debris in all the levels except 120 (31%). Bladelets (also ≤1 cm long) constitute between 4.5-10%, while blades range from 0 to 11%. Plain (i.e., non-cortical) flakes range from 2-17%, again with an outlier in Level 120 (26%). Similarly, cortical flakes are abundant in Level120 (10.5%), but rare in all the rest (2-5%). Cores are notably absent or very scarce among all these levels (0-1%), again with an outlier in Level 126 (3%). And finally, chunks are similarly distributed: 11% in Level 120 and 1-5% in all the rest of the levels (121-128). Despite the lack of cores, it can be said that both relatively heavy (chunks) and many very light (microdébitage and bladelets) artifacts are represented, suggesting that the assemblages were not totally winnowed by running water on the slope. With the exception of Level 120, it cannot be said that much primary reduction was conducted in this area of the vestibule rear (lack of cores, rarity of chunks [large angular debris/ exhausted cores], rarity of cortical flakes [or cortical blades, shatter, or trimming flakes for that matter], virtual absence of crested blades or platform renewal flakes). In fact, Level 120 seems anomalous in general, possibly because its contents may include materials from the base of the treasure hunters' crater, (as reflected in the field notes for these squares), despite our efforts to scrape down to what appeared to be the top of intact, undisturbed prehistoric sediments. This might help explain its high relative frequencies of larger objects and lower percentages of small ones. Note that although Level 128 is dated to terminal Aurignacian or early Gravettian time, its distribution of debris types is quite similar to that of the overlying Solutrean assemblages. This is the case despite an apparent hiatus of some 7000 radiocarbon years between 128 and Solutrean Level 127. The small (n=56) Mousterian Level 130 assemblage is almost totally dominated by microdébitage and flakes, with only 3 items that could be classified as blade (1) or bladelets (2).

Types/Levels:	120	121-4	121	122	123	124	125	126	127	128
0 Microburin								1		
1 Plain Trim. Flake	65	1	52	72	163	78	451	714	189	154
2 Cort.Trim. Flake	1		1	4	9		15	52	7	17
3 Plain Shatter	6		1	53	11	16	58	164	56	46
4 Cortical Shatter				1	1		2	23	19	5
5 Plain Flake	57	20	1	8	18	23	48	123	44	51
6 Prim.Decort.Flake	5					2	1	11	5	3
7 Second.Decort.Flk.	19		1	3	8		11	41	5	15
8 Whole/Prox.Pl.Bld.	9	4		3	2	5	7	21	2	7
9 Dist./Mes.Pl.Blade	6			9	5	2	11	26	13	10
10 Prim.Decort.Blade							1			
11 Sec.Decort.Blade	5						3	1	4	4
12 Dis./Mes.Cort.Bld.	6	1						6	1	
13 Wh./Prox.Pl.Bldlt.	4			1	5	2	11	18	2	11
14 Dis./Mes.Pl.Bldlt.	12	5	4	15	15	4	15	61	15	9
15 Wh./Prx.Cort.Bldlt	1							1		1
16 Dis./Mes.Cort.Bldlt.						2	1	2		
17 Burin Spall					1			1	5	2
18 Unidir.Crested Bld.	1									
20 Flake Core								1		3
22 Pyramid.Bld.Core	1									
23 Prismat.BladeCore	1									
25 Mixed Core	4							2		1
26 Noncortical Chunk	18	3	1		8	4	3	51	9	14
27 Cortical Chunk	8			1			2	17	5	3
28 PlatformRenew.Fl.	2						1	3		2
Totals:	229	35	61	171	245	136	643	1342	380	356

Table I. W-X/10 sondage, lithic debitage.

Debitage Groups/Levels:	120	121	122	123	124	125	126	127	128
Microdebitage	31.4	88.5	77.6	75.1	69.1	82.0	71.0	71.3	62.4
Plain & Platform Ren.Flakes	25.8	1.6	4.7	7.3	16.9	7.6	9.4	11.6	14.9
Cortical Flakes	10.5	1.6	1.8	3.3	1.5	1.9	3.9	2.6	5.1
Blades	11.4		7.0	2.9	5.1	3.4	4.0	5.3	5.9
Bladelets	7.4	6.6	9.9	8.2	4.4	4.5	6.4	5.5	5.9
Cores	2.6						0.2		1.1
Chunks	11.4	1.6	0.6	3.3	2.9	1.1	5.1	3.7	4.8

Table II. W-X/10 sondage, debitage group summary, percentages.

Tool Types/Levels	120	122	123	124	125	126	127	128
1 Simple endscraper	1					1		4
2 Atypical endscraper								1
5 Endscraper on retouched flake						2+		
14 Flat nosed endscraper								1
15 Nucleiform endscraper							1	
17 Endscraper-burin					1			
23 Perforator					1			
24 Bec							1	
25 Multiple perforator				1				
26 Microperforator								3
27 Straight dihedral burin								1
30 Angle burin on break			2			1	1	
39 Transverse burin on notch		1						
43 Nucleiform burin	1		1					
44 Flat burin			1					

Tool Types/Levels	120	122	123	124	125	126	127	128
57 Shouldered piece	1							
58 Totally backed blade						1		
60 Piece w/ straight ret. truncation								1
65 Contin.retouched.piece, 1 edge	3	1	1	1	1	8	1	3
66 Contin.retouched piece, 2 edges	1					1		
69 Unifacial point				1	2@			
70 Laurel leaf point						2		
71 Willow leaf point					1	1	2	
72 Shouldered point	1		2*	2	1	4	1	
74 Notch	1		1		1	5	2	1
75 Denticulate		1			1		1	
77 Sidescraper	1				1	1		
85 Backed bladelet		3	5		1			1
86 Truncated backed bladelet		1						
89 Notched bladelet			1					
90 Nibbled bladelet						1		
92 Other		1						1
Totals:	11	6	15	5	10	28	10	18

Table III. W-X/10 sondage, retouched tools. * May actually pertain to Level 125; + One is bifacial (an unfinished or failed laurel leaf?); @ One is partially bifacial.

The 103 Solutrean (and EUP) retouched tools/weapon tips are unevenly distributed, being "heavily" concentrated in Levels 123-128. Overall, the most "abundantly" and generally represented tool types are unilaterally retouched pieces (type 65), notches (type 74) and Solutrean shouldered points (type 72). Endscrapers, perforators and especially burins (all classic and often very common Upper Paleolithic tool types) are all surprisingly poorly represented, suggesting low amounts of specialized fabrication/maintenance activities at least in this marginal area of the cave vestibule. Backed/retouched bladelets are not abundant, but their presence might be related to hunting activities. The continuously retouched pieces plus notches, denticulates and sidescrapers might all represent generalized "expedient" tools useful for a variety of non-specialized tasks. One of the unilaterally continuously retouched pieces from Level 126 also has a notch on the opposite edge and one notched piece from the same level also has a backed edge.

The particular interest of Levels 120 (or more certainly 122) through 127 is the unusually high representation of Solutrean points (types 69-72). There are fully 20 such items (most, small fragments), representing 19.4% of the overall tool total. However the range (perhaps not very meaningful given the small size of all the tool assemblages) is from 0 to 60%, which is fully consonant with the range of Solutrean point percentages among the corresponding levels in La Riera Cave in Asturias, which was excavated with similar methods (Straus & Clark 1986). The Mirón points pertain to all four recognized major types of Solutrean points: unifacial, laurel leaf, willow leaf and shouldered. Among the laurel leaves there is one concave base piece (from Level 126–Figure 5.2), although a second (also a basal/proximal fragment; width: 20 mm; thickness: 2 mm) was found in mixed surface fill at the vestibule rear (Figures 5.3 and 6.9). Many of the pieces (distinguished by their invasive retouch, and often by their characteristic outline shape) are difficult to classify, since, for example, shouldered point stems can look like willow leaf tips if the bulb of percussion has been removed and mesial fragments of willow leaves can look like mesial fragments of large shouldered points. The diversity of shapes and sizes (though none are very large) of points is notable, as is the variety of lithic raw material types on which they are made.

The 20 points are made on some 9 different types of flint, including diverse subtypes of our flint group A. Group A represents a range of very high-quality, homogeneous, fine-grain flints (usually grey-black-blue-white, solid or banded) that are likely to come from one or more Upper Cretaceous source outcrop(s) along the present sea cliffs that, in LGM times, would have overlooked a strip of then-exposed continental shelf. Flint Group B is also represented by two points made of type 18 flint–a very fine, translucent, material. It and type 28 (also represented among the points) are chalcedony-like. A likely source location for some or all of the Types A and B flints may have been the well-

known outcrops in the cliffs at Barrika, near Bilbao in central Vizcaya, although there is also a coastal source of similarly excellent flint at Llaranza, not far from Santander in central Cantabria (Rissetto 2009). Both these potential sources are about 45-50 km from El Mirón (Barrika via the Carranza Valley and the Encartaciones area; Llaranza via the Asón Valley and the then-broader coastal plain). In addition to the variety of flints among the points found in situ in Levels 120-127, the concave base point found in mixed surface fill is made on a fine-grain grey quartzite, much like many of the concave base points of Asturias (to the West of Cantabria), a region poor in good-quality, large-nodule flint, where quartzite was the favorite material for making concave base points–more so than in flint-richer Cantabria. The Mirón Solutrean points are also striking for the diversity and sometimes striking nature of their colors, a characteristic of some Solutrean sites, as shown long ago by R. and S.de Saint-Périer (1952:16 & frontispiece) in Isturitz (French Basque province of Basse-Navarre) and more recently in Antoliñako (Vizcaya) by M. Aguirre (1998:127). The diversity of point types and especially of raw material types (all of excellent quality, not available locally) and colors suggest that the people who visited El Mirón during Solutrean times either came there from various home areas and/or traded with a number of different regional band members, both to the West and to the East of the Asón Valley.

Among the larger and hence statistically meaningful assemblages of lithic artifacts (Levels 120,122, 123, 124, 125 and especially 126), the objects that measure < 1 cm (and thus for which reliable lithic type attributions can be made) are generally overwhelmingly made on group A flints, followed by group B. However, all these assemblages are marked by the high diversity of lithic raw material types represented: from 15-30, partially dependent on assemblage size. Most types are represented only by trace quantities (i.e., 1-5 pieces), but there are a few exceptions, notably 15 items of type 82 flint (an unusual, shiny, translucent bright brown flint, with white inclusions) and 12 of type 31 mudstone in Level 126. In fact, non-flint materials (mudstone, quartzite, limestone, quartz, calcite and others) are not generally frequent in the Solutrean levels (unlike in the Initial Magdalenian ones right above Level 120), but again there is a bit of an exception again in Level 126–not so much for the quantity thereof (except the dozen type 31 mudstone items), as for the diversity of non-flints (9 types, all believed to be local in origin) that are represented. By and large, the Solutrean visitors to the cave were bringing non-local flints (mainly groups A and B) with them, probably in the forms of finished tools/weapons, blanks and some cores, the latter of which were further reduced to exhaustion (hence the abundance of “chunks”–angular debris–at the site). Most of these flints almost certainly came from coastal source outcrops, notably of Upper Cretaceous age. The distribution of lithic raw materials in the Level 128 assemblage is basically similar to that of the larger Solutrean assemblages (i.e., dominance of group A flints followed by group B, and then trace quantities of many other types, including a few local mudstones, quartzites, limestone and, exceptionally here, 17 pieces of apparently flaked quartz crystal). This suggests lithic procurement patterns in the late Aurignacian/early Gravettian visit(s) to the cave that were very similar to the Solutrean ones. In contrast, the (admittedly very small) Mousterian assemblage(n=62) from Level 130 has no group A or B flints (and indeed almost no flints at all!), but rather is composed of a great variety of non-flints(mudstones, limestones, quartzite, sandstone and especially calcite). This might suggest a radically different kind of site use and territorial mobility in final Middle Paleolithic times than in the early and middle Upper Paleolithic, as well as in all but the Initial Magdalenian occupations of El Mirón. But these suggestions are made only very cautiously, given the small size and marginal location of the W-X/10 sondage.

The fact that almost all the Solutrean points are fragmentary (one laurel leaf from Level 126 was actually also classified as a burin on a break–probably an accident caused by use-impact) suggests that they were broken in hunting. The basal fragments may have been brought back to the cave in their hafts, and the distal (tip) and mesial fragments embedded in meat.

The Solutrean points (Figures 5 & 6) can be described as follows (measurements are length [given in ( ) if fragmentary] x width x thickness.):

Level 120

X10-6.17: Shouldered point; Proximal; Unifacial; Raw material A; (10)x11x3 mm.

Level 123

X10-28.6: Shouldered point; Whole; Partly bifacial; Raw material 16; 14x12x2 mm.

Maximum width and length of stem: 5x6 mm (Figure 5.6).

X10-28.26: Shouldered point (?); Distal;Partly bifacial; Raw material 8; (33)x9x3 mm.

Level 124

X10-56.20: Unifacial point; Mesial; Raw material 17; (9)x13x3 mm.

X10-56.5: Shouldered point; Mesial; Bifacial; Raw material 00; (8)x5x2 mm.

X10-56.1: Shouldered point; Proximal (?); Slightly bifacial; Raw material A; (13)x7x3 mm.

Level 125

W10-14.12: Willow leaf; Proximal; Bifacial; Raw material 2; (16)x14x3 mm.

W10-15.18: Shouldered point; Proximal (?); Unifacial; Raw material 1; (18)x9x3 mm (Figure 6.7).

W10-17: Unifacial point; Whole; Raw material 2; 34x14x5 mm. (Figure 5.1).

W10-15.14: "Unifacial" point; Mesial; Partly bifacial; Raw material 28; (25)x16x6 mm.

Level 126

W10-23.22: Willow leaf (?); Mesial; Bifacial; Raw material 18; (13)x7x2 mm (Figure 6.7).

W10-20.19: Shouldered point; Proximal (?); Unifacial; Raw material 18; (12)x7x3 mm (Figure 6.8)

W10-23.1: Shouldered point; Proximal; Unifacial; Raw material 8; (44)x15x5 mm. Maximum width and length of stem: 10x23 mm (Figure 5.5).

W10-22.13: Laurel leaf (concave base); Proximal; Bifacial; Raw material 3; (27)x17x5 mm. Width and depth of basal concavity: 15x2 mm (Figure 5.2).

W10-21.20: Laurel leaf ("burinated"); F; Raw material 18; (15)x17x4 mm.

X10-195.12: Willow leaf; Mesial; Partly bifacial; Raw material A; (30)x29x4 mm.

(X10-162.11: Unfinished bifacial laurel leaf classified as endscraper on retouched flake; Whole; Raw material A; 35x27x10 mm.)

Level 127

W10-33.10: Willow leaf; Mesial; Partly bifacial; Raw material 23; (43)x15x6 mm.

W10-29.8: Unifacial point (or willow leaf); Mesial; Raw material 7; (27)x17x6 mm (Figure 5.4).

W10-35.14: Willow leaf; Proximal; Partly bifacial; Raw material 2; (19)x15x5 mm.

X10-219: Shouldered point; Proximal; Bifacial; Raw material A; (27)x12x5 mm (Figure 6.6).

The concave base point from Level 126 plus the one from disturbed surface sediments are among the very few examples of this type that are found scattered throughout the Spanish and French Basque Country and Pyrenees, well to the East of the center of concentration of this distinctive type in Central Cantabria and Central-Eastern Asturias (Straus 1977; Rasilla & Santamaria 2006). The two whole or nearly whole shouldered points are of radically different forms and sizes, again suggestive of different "home areas" for the people who visited El Mirón, in these cases during the formation of Levels 123 and 126. Unfortunately most of the other points are too small and fragmentary to provide much information, other than the fact that most were probably broken as a result of violent impact. Backed bladelets, sometimes common especially in late Solutrean assemblages (e.g., La Riera [Straus & Clark 1986]), are very rare here, despite the use of fine-mesh water-screening. There are only 10 among all the Solutrean levels in W-X/10, plus a couple of other retouched bladelets that conceivably could also have served as weapon elements.

It is telling that, although these Solutrean (and pre-Solutrean) deposits all contain unmodified cobbles, pebbles and stone slabs (no doubt originating, at least in part, via erosion and gravity from the alluvial fill of the inner cave), no fire-cracked rocks were found. No clear hearths (or other anthropic features) were uncovered, although localized Level 121 might represent an area where there had been fire and indeed isolated charcoal flecks were scattered throughout many of the levels. No investment seems to have been made (at least in this part of the cave) in infrastructure, unlike what went on in immediately adjacent areas of the vestibule rear (as well as nearer to the cave mouth).

6- MARINE MOLLUSCS AND PERFORATED TEETH

Despite the small area excavated (2 m^2), the Solutrean levels yielded a remarkable number of artificially perforated objects (shells and red deer canines) and very small, unmodified, but tube-like *Antalis* (formerly *Dentalium*) shells that could also have been strung as beads. The shells were identified by Igor Gutierrez Zugasti (Instituto

Internacional de Investigaciones Prehistóricas, Universidad de Cantabria).

Level 123 produced a single *Antalis*: Level 124 a perforated canine; Level 125 a perforated *Littorina obtusata* and 3 *Antalis*; Level 126 a doubly perforated *Trivia* sp., 4 perforated *Littorina obtusata*, 13 *Antalis*, 1 *Turritella* sp. with a "worm" hole, 2 perforated canines and 1 perforated stone; Level 127 a perforated *L.obtusata* and 13 *Antalis*. Pre-Solutrean Level 128 yielded 1 perforated *Trivia* and 1 *Antalis*; and Level 129 (which is otherwise culturally nearly sterile) a perforated *Littorina saxatilis* shell.

The number of probable beads in Levels 126 and 127 is truly astonishing and hypothetically suggestive of some unusual occurrence(s), such as a nearby burial or a cache. The similarity of these two levels in terms of the kinds of artifacts found in both might also suggest that there had been mixing between them-- not surprising given the extremely steep slope.

7- OSSEOUS ARTIFACTS

The Solutrean levels yielded only a small number of osseous (and other non-chipped stone) artifacts, generally not more than one per level except in Level 126. They are as follow:

Level 120, Spit 1, X10c-3: Distal fragment of a quadrangular-section sagaie (antler point), oval section at tip; broken with a long scar on the dorsal surface; beginning of a cut mark on the right side; highly polished, with fine finishing striations; (52)x7x5.5 mm.

Level 120, Spit 2, X10c-6: Small, quadrangular, sandstone pebble, broken at one end; three regularly spaced, oblique, right-to-left incisions on the dorsal surface that do not appear to be natural (though this remains to be confirmed).

Level 121, Spit 3, W10d-12: Small, longitudinally split, mesial fragment of a rib with short, perpendicular incisions on the one intact edge; one flat face also has a longitudinal mark and the other face has short incised lines.

Level 122, Spit 4, X10d-12: Mesial fragment of a rib or sternum with two short, oblique cut marks or engraved lines; (25)x5.5x4.5mm.

Level 123, Spit 5, X10c-27: Possibly a very pointed, elongated bevel (proximal) fragment of a flat-section sagaie or the distal end of a flattened, triangular-section sagaie; bears multiple, oblique, left-to-right engraved striations on the flat, spatulate "bevel" surface; (41.5) x 10x5 mm (Figure 7).

Level 125, Spit 4, W10c-15: Small long bone diaphysis fragment with several short, but deep engraved or cut marks on one edge.

Level 126, X10-132: Distal fragment of a possible flattened quadrangular-section awl or fine point of antler (32.5)x5x2.5 mm.

Level 126, Spit 5 W10d-23: Distal fragment of an flattened oval-section sagaie; tip incompletely polished, but rounded and blunted by wear; double basal hinge fracture; (95.5)x10.5x6.5 mm.

Level 126, Spit 5, W10d-23a: Longitudinally broken, mesial fragment of a small rib with short, perpendicular on one face.

Level 126, Spit 6, X10 -57: Distal fragment of a needle or fine point made of antler or bone, with a short, deep, oblique incision adjacent to the basal break; (13.5)x2x2 mm.

Level 126, Spit 9, X10b-112: Small lithic flake (possibly compact sandstone) with three deep, oblique incisions on one edge, apparently not natural (but this remains to be confirmed).

Level 124-127, W10: Distal end of antler tine with possible engraved marks; (30)x15.5x12 mm.

Other bones with incisions that are more likely-- all or mostly-- butchery marks:

Level 120, Spit 1, W10c-3: Fragment of long bone diaphysis with several possibly cut marks, but also other finer, chevron lines.

Level 121, Spit 3, W10d: Fragment of long bone diaphysis with several, possible cut marks.

Level 121, Spit 3, W10d-12: Small bone fragment with numerous fine, oblique lines on the dorsal surface, probably cut marks.

Notable is the presence of at least one needle fragment at about 19 kya. Measuring 2 mm in thickness, this piece, like the very small *Antalis* (*Dentalium*) "tubes", reminds us of the likely importance of fine sewing and stringing that was already going on in the Solutrean, which is when the needle seems to have been invented or adopted in Western Europe. The variety of *sagaie* cross-sections is also noteworthy; this is a phenomenon that also characterizes the far-more-abundant assemblages of antler points from the overlying Initial, Lower and Middle Magdalenian levels in El Mirón

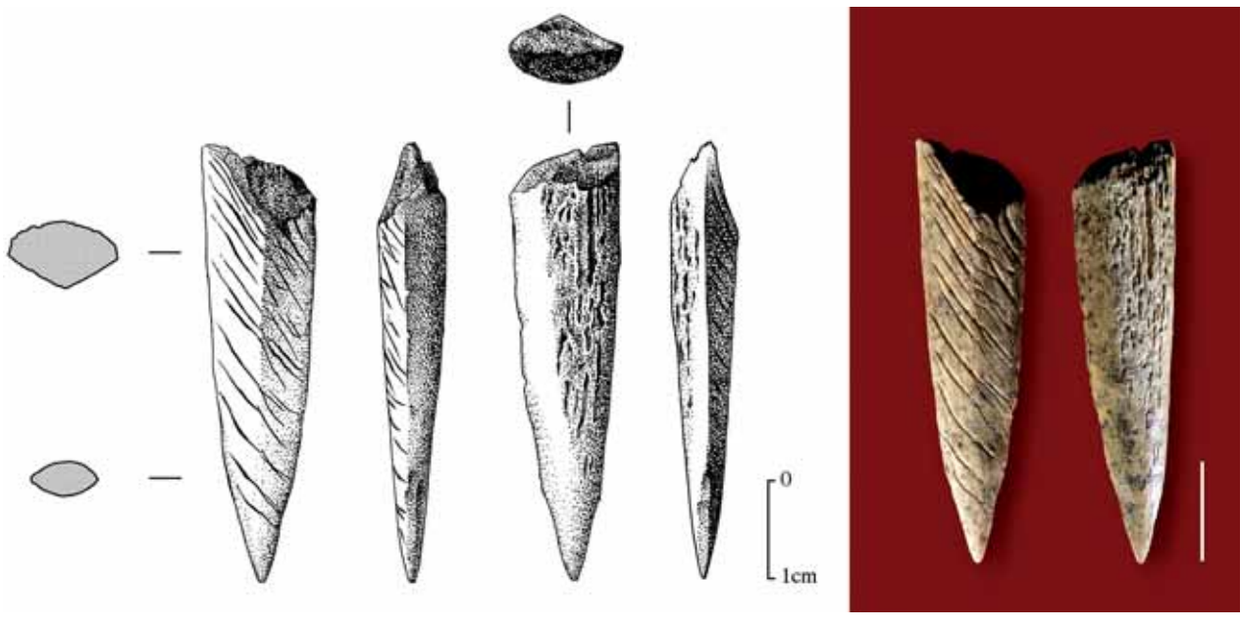

Fig. 7. Photo and drawing of striated sagaie bevel base or tip (X10, No.27) from Level 123 (Photo by M. González Morales, drawing by P. Burgeño.

(González Morales and Straus 2005). The sharp *sagaie* bevel or tip fragment with fine, oblique line decorations (X10-27) is reminiscent of a piece described by I. Barandiarán (1967: 293) from the Upper Solutrean level in Cova Rosa (Ribadesella, Asturias), thereby helping to define a particular (rare) type (4.10) and coinciding with the cultural attribution of Level 123 in El Mirón Cave.

8- DISCUSSION

Why should much attention be paid or stock given to the results from a 2m^2 *sondage* excavated in a penumbral, drafty, marginal area at the rear of the vast El Mirón Cave vestibule? Can they in any way be presumed to be representative of potential Solutrean occupation residues in the rest of the vestibule?

There is obviously no way to positively respond to these hypothetical questions, however, there are some hints that Solutrean-age uses of the cave were significantly different from those of the following early Magdalenian periods, when climatic conditions were becoming slightly less severe during Dryas I than they had been during the LGM.

First, in the 9.5 m^2 Cabin area excavation near the front of the vestibule (a much sunlit, yet well-sheltered, dry zone), the early Magdalenian sequence bottomed out atop a light, yellowish beige clayey silt layer with *éboulis* (Levels 18-21), very reminiscent of Levels 120 and below in the "crater" *sondage* W-X/10. In 2007, in a 1m^2 *sondage* in square J2, we dug some 55 cm below the massive (ca. 20-25 cm-thick), dark "chocolate" brown and extremely rich Lower Magdalenian Stratum 17, through Levels 19-20 and into similarly light-color, culturally and faunally poor Level 21. At most, these deposits date to about 16.6 kya (Straus & González Morales 2010). In addition, in 2002-2003, geomorphologist Arantxa Aranburu (Universidad de País Vasco) did a pneumatic core boring in the center of the Cabin area (square I3a). She eventually reached a depth of 3.77 m below the top of Stratum 17, that is, 3 m deeper than the J2 *sondage*. Neither the *sondage* nor the core boring (diameter, ca. 6 cm) encountered levels that are notably dark brown or dense in cultural or faunal remains below Stratum 17. (A slight exception might be somewhat darker Level 19, which yielded a pair of partially invasively retouched flakes.) Low-density finds of artifacts, ungulate bones and charcoal flecks do occur in at least the 55–70 cm below the base of Stratum 17 in the core boring (i.e., through Level 21, as confirmed in the J2 *sondage*), but below that depth, flints and macromammalian bone fragments become extremely rare, sporadic or totally absent. Below Level 21, the sediments continue to be light or darker, yellowish, sandy-clayey silt with varying amounts of small-medium *éboulis*. However, the lowest deposits reached in I3 are light yellowish beige clay and

are totally sterile, at least as sampled by the core. In short, there is no evidence of pre-16.6 kya levels in the Cabin that might represent the kind of extraordinarily dense, diverse, repetitive, trash- and feature-rich occupations that characterize the early Magdalenian throughout the cave. The Solutrean levels may have been more localized, representing shorter-term, less complex occupations, perhaps by fewer people focused on more limited activity sets (e.g., hunting, fishing).

Second, if Level 313 in the Mid-Vestibule P6 *sondage* is Solutrean (as suggested only by its stratigraphic position and one ^{14}C date of 17.4±0.3 kya), despite the lack of characteristic projectile points, the density of its materials is far less than that of overlying Lower Magdalenian Level 312. In the same 1m^2 area, the three spits of Level 313 yielded only 1128 items of knapping debris and 66 retouched lithic tools, versus 28,848 and 579 respectively for the 5 spits of Level 312, which is a massive, dark brown, highly organic cultural horizon with abundant ungulate faunal remains, charcoal and fire-cracked rocks like (and no doubt continuous with) Cabin Stratum 17. Level 313 rests atop a light greyish-brown granular silt deposit with abundant limestone gravels and small *éboulis* that appears to be very poor in artifacts, fauna or charcoal. Again, there exists evidence of a major change in the intensity and nature of human use of the cave between Levels 314-313 and Level 312. If 314 is Solutrean, which seems likely, it too suggests minor, ephemeral (and perhaps narrowly specialized) visits to the cave during the LGM, perhaps by small parties, not by larger groups such as whole families or bands. The cave apparently was a very different kind of site in Solutrean times than it was to become in the early Magdalenian. Of course it would be better to have larger exposures of Solutrean levels to test this hypothesis–and preferably in all three areas of the vestibule (Front, Mid-Vestibule and Rear). The point is that the same cave, but surrounded by a somewhat different vegetative environment, could be used for very different kinds and ranges of activities.

9- CONCLUSIONS

Despite its small size and peripheral location, the W-X/10 *sondage* at the foot of the eroded ramp-face of the ancient alluvial-colluvial deposit in the passage between the vestibule and inner cave of El Mirón, revealed the existence of repeated, but limited and ephemeral human visits during the Last Glacial Maximum, corresponding to the Solutrean cultural period. Solutrean visits to this cave in the montane interior of the Asón River Valley in eastern Cantabria seem to be confirmed by *sondages* in the front and middle sectors of the vestibule, although less clearly. The artifact assemblages from W-X/10 suggest that the site was used for hunting (and fishing) expeditions, especially because of the relative abundance and (morphological and raw material) diversity of (mostly fragmented) Solutrean points. However, these ibex- and red deer-hunters, who may have come to El Mirón for very focused subsistence activities (indeed there are very few other retouched tools besides stone points, and the latter are accompanied by also broken antler *sagaies*), did leave behind numerous perforated shells and teeth (cached or perhaps buried with a hypothetical defunct comrade–as yet to be found).

In this respect, one is reminded of the cluster of nine perforated and engraved red deer canines found in Upper Magdalenian Level 2b of El Rascaño Cave, a small, specialized ibex-hunting site in the adjacent valley of the Río Miera (González Echegaray & Barandiarán 1981) or of the mass of 18 contours *découpés* of chamois heads and 1 of a bison from the Middle Magdalenian site of Labastide in the Central French Pyrenees (Simmonet 1947). From one end of the Pyreneo-Cantabrian mountain chain there were montane sites of Late Upper Paleolithic age (mostly Magdalenian), sometimes specialized in the hunting of ibex (e.g., Erralla, Bolinkoba, Rascaño, Collubil, Ermittia, Les Eglises), but in other cases combined with the hunting of reindeer or red deer (e.g., La Vache)(Straus 1987a). El Mirón is rather different from several of the limited-function montane site because of its great size, commodity and physical versatility. It was obviously capable of harboring large, multi-purpose, relatively long-term, residential occupations. And such were the occupations during the Initial, Lower and Middle Magdalenian (and, for that matter, during the Neolithic, Chalcolithic and Bronze Age). However, it was also perfectly suitable for shorter-term, more specialized, smaller-scale, more limited-function occupations. And such seems to have been what happened (repeatedly) during the Solutrean (as well as in the Upper Magdalenian and Azilian, and even more ephemerally in the Mesolithic and Middle Ages).

While El Mirón, despite its montane location, was clearly a "hub" residential site during the early Magdalenian, like the great contemporaneous sites of Altamira and El Juyo in the lowland coastal zone, it was probably more appropriate only for Solutrean logistical use under the more severe climatic conditions of the LGM. One should not forget that, although the maximum extent of glaciation had occurred somewhat earlier, the Cordilleran summits and high valleys (e.g., Castro Valnera) continued to be significantly glaciated during Solutrean times, and the deglaciation occurred in sawtooth fashion during the Tardiglacial (i.e., Magdalenian)(see González Trueba & Serrano 2008, with references). El Mirón, despite the relatively limited nature of its Solutrean occupations , seems to have been the most important locus in a small cluster of Solutrean sites above the confluence of the Ríos Calera and Gándara with the Asón at Ramales. This cluster would have had even greater significance if indeed the nearby red dot outline cave art sites of Covalanas, La Haza, Pondra and Arco were to be definitely shown to be of Solutrean age, as has been argued many times in the past (including arguments based on the--sometimes unique or at least prominent--presence of Solutrean artifacts in several of the red dot outline sites, such as La Haza, La Pasiega, Salitre, and, recently, El Pendo (Straus 1987b; but see González Sainz & San Miguel 2001). Obviously, however, what is lacking are the base camps in the coastal lowlands around the mouth of the Asón from which (hypothetically) the Solutrean hunting parties went up to El Mirón– possibly in summer. Could they be under water along the now-flooded continental shelf, or did the Solutrean hunters who used the Ramales area come there from coastal bases further afield as the Upper Cretaceous flints might suggest, despite the lack of known Solutrean residential sites near either Barrika or Llaranza? Only future investigations and discoveries may one day tell...

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