

Post-pleistocene faunas from the archeological site of El Miron cave (Ramales de la Victoria, Cantabria, Spain): a preliminary summary

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El Mirón Cave (LGS & MGM)

El Mirón is a large, west-facing cave at an altitude of c. 250 m above sea level in the face of a cirque-like cliff that dominates the deep Ruesga Valley of the upper Asón River, on the edge of the Cantabrian Cordillera in easternmost Cantabria (Fig. 1). Located only 20 km as the crow flies from the Holocene shore of the Cantabrian Sea at the mouth of the Asón, El Mirón is nevertheless surrounded by mountain peaks at around or above 1000 m and strategically dominates the tributary gorges of the Calera and Gándara above their confluence with the Asón at the town of Ramales. Access to the high Castilian meseta of Burgos is readily available via the 920 m Los Tornos pass, c. 11 km south of the site. Western Vizcaya is most easily reached via the valley of another Asón tributary, the Carranza, 3 km downstream of Ramales.

The cave, formed in hard Lower Cretaceous limestone, is one of many karstic cavities in this tri-provincial area of long and/or deep caves. It was scientifically discovered by H. Alcalde del Río and L. Sierra in 1903, at the same time that these two early prehistorians also discovered the adjacent cave art sites of Covalanas and La Haza. Never subjected to systematic archeological investigation despite the presence of abundant artifactual and faunal materials scattered on the surface of its impressive (30 m-deep x 8-20 m-wide x 13 m-high) vestibule, El Mirón was used for human occupation and/or livestock stabling until recently, and pitting had affected some areas of the cave, as was evident to LGS during his first visit to the site in 1973. Given the large size, favorable location and clear evidence of archeological content, LGS and MGM began test excavations in 1996, quickly demonstrating the existence of intact cultural deposits both near the front and at the rear of the sunlit vestibule and in the dark inner cave. Full-scale excavation campaigns –each two months long– followed suit in 1997-2002, with financial support from the Fundación M. Botín, the U.S. National Science Foundation, the Gobiernos de España and Cantabria, the National Geographic Society, the L.S.B. Leakey Foundation and the University of New Mexico and material support from the Town of Ramales and the Universidad de Cantabria.

The cave so far has revealed a sequence of often very rich cultural layers from top to bottom pertaining to the Bronze Age, Chalcolithic, Neolithic, Mesolithic, Azilian, Magdalenian, Solutrean, early Upper Paleolithic and Middle Paleolithic. This sequence is dated by 51 radiocarbon dates (both conventional and AMS –all run by Geochron Laboratories of Cambridge, Massachusetts, in collaboration with Lawrence Livermore Laboratories of Berkeley, California, for accelerator mass

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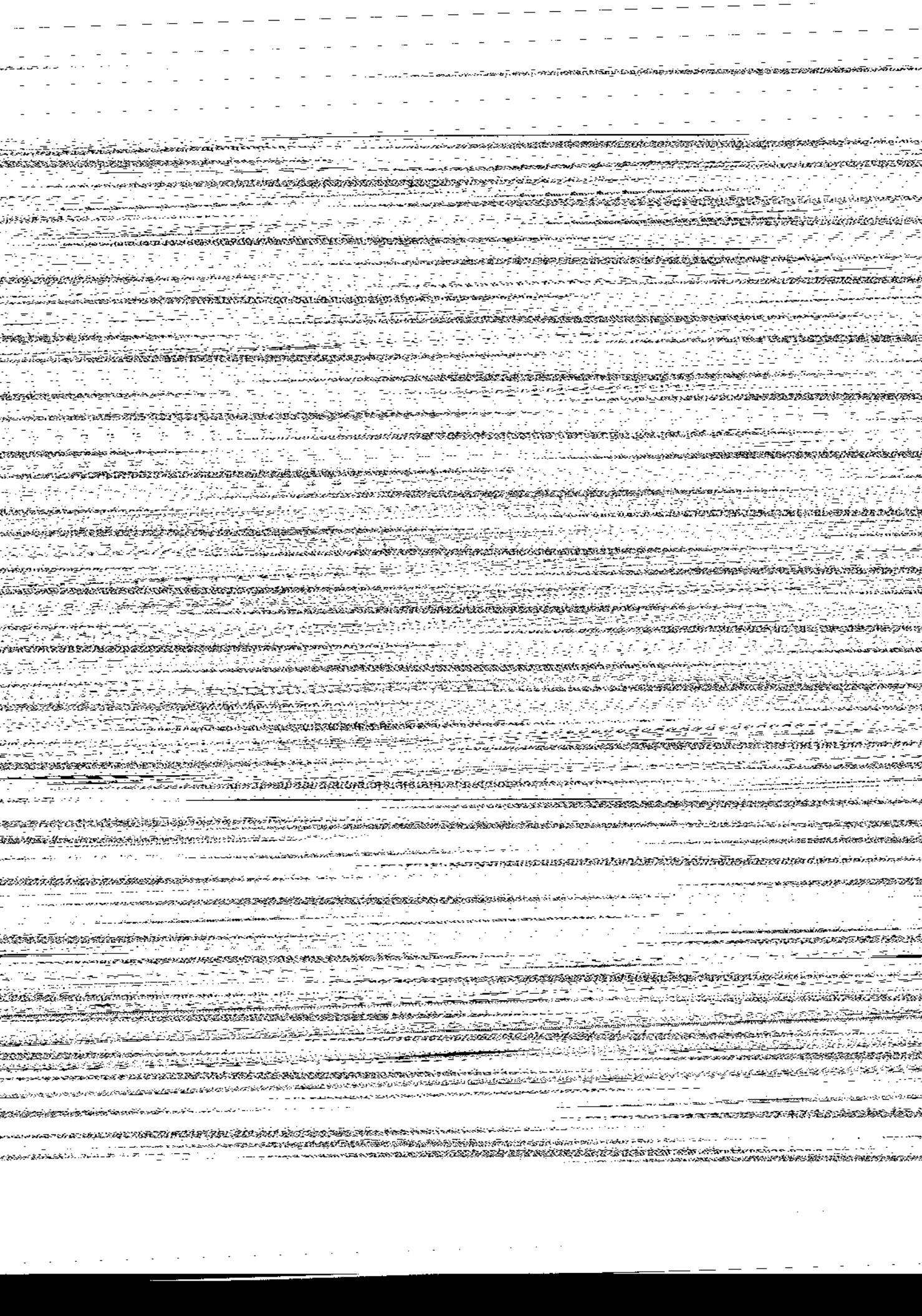
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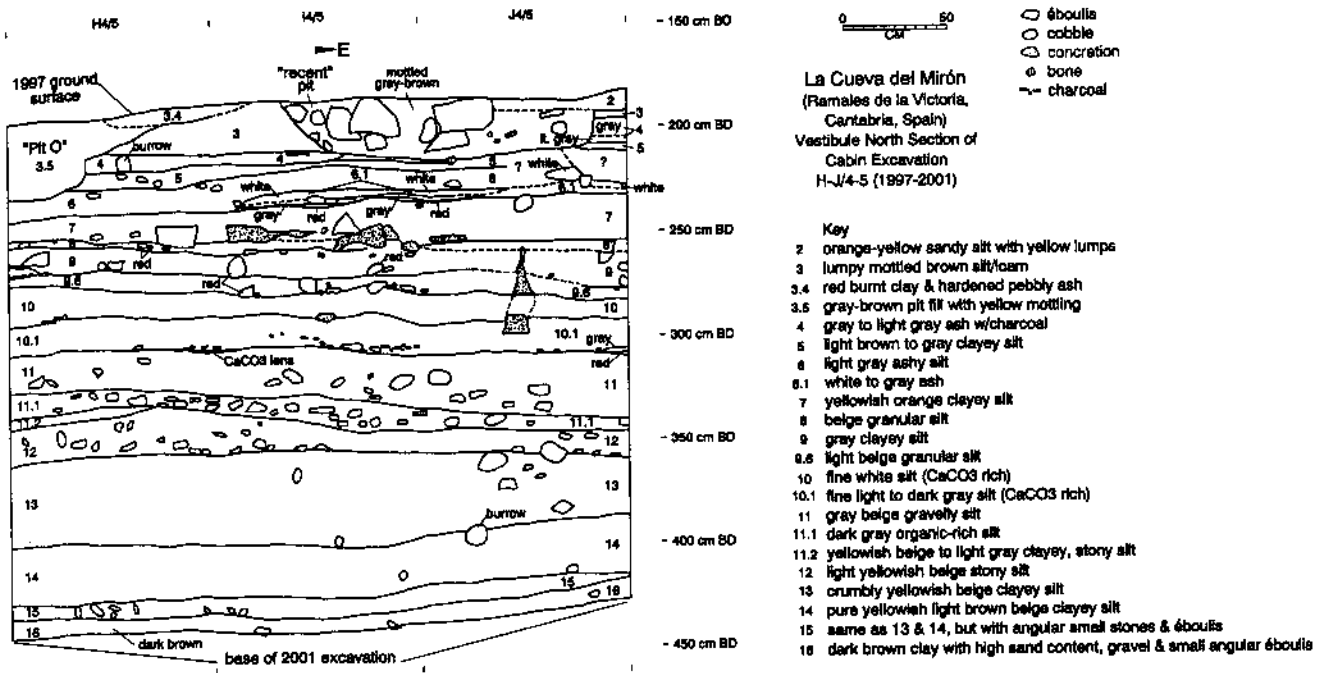


Fig. 3. North stratigraphic section of the Cabin excavation area between the 4 & 5 rows (L. Straus & R. Stauber).

of typical Chalcolithic arrowheads; associated with three radiocarbon dates ranging between 3740-4120 BP.

Levels 8-9 (and various lenses): faunally and artifactually rich layers (including a few geometric microliths and ceramics), with numerous pits and fire features; associated with three coherent radiocarbon dates ranging between 4680-5250 BP: late Neolithic.

Level 10: thick layer of light grey, clayey silt with good-quality, undecorated ceramics, some -largely banal- lithics, and significant amounts of both domesticated and wild animal remains; associated with two radiocarbon dates: 5570±50 and 5690±50 BP.

Level 10.1: Darker grey, clayey silt, not recognized as separate from 10 in the initial 3m² of 1996; contains very scarce lithic artifacts and faunal remains, but no ceramics; three coherent radiocarbon dates of 8380±175, 8700±40 and 9550±50 BP: Mesolithic age. These dates, plus the ones from Level 10 and a date of 11,720±140 BP from underlying Azilian Level 11.1, indicate the existence of depositional hiatus before, during and after the period of the Mesolithic, which is culturally attested at El Mirón by only meagre evidence of ephemeral human visits to this cave in the montane interior of Cantabria, probably from the area of many early Holocene shell midden sites around the Asón estuary. Level 10.1 attests to very humid conditions in Preboreal times.

The post-Paleolithic sequence at the western end of the mid-vestibule connecting trench is shorter, but complicated by

massive (sub-) recent disturbance (represented by a number of pit fills and mixed layers, including Levels 300, 301 and possibly part of 302) (Fig. 4). A large prehistoric pit quartered by an excavation grid square (pit 98-a, square O6) seems to show at least two episodes of infilling: an upper one with apparent slag (hence possibly Bronze Age) and a basal one packed with ash and charcoal, that yielded a radiocarbon date of 4910±80 BP: late Neolithic. The latter episode *might* be stratigraphically related to the lower part of Level 302 (?). The underlying levels are clearly intact, but are cut into by some pits. These levels, from top to bottom, are:

Levels 303, 303.1, 303.2, 303.3: Alternating darker and lighter, ashy, clayey silt layers with good-quality undecorated ceramics, scanty lithics including some geometric microliths and relatively abundant faunal remains; associated with three coherent radiocarbon dates ranging between 5500-5790. This horizon is clearly equivalent to Level 10 in the "Cabin" area.

Level 304: Pasty, whitish grey mondmilch-like, calcium-carbonate-rich silt, probably attesting to ponding in the area toward the center-front of the vestibule; clearly equivalent to Level 10.1; contains virtually no artifacts or macrofaunal remains. It is underlain by culturally richer Level 305 with a radiocarbon date of 10,270±50 BP (Azilian). The mid-vestibule macro-mammalian remains are considered here together with those from the "Cabin" area. All the faunal assemblages are discussed in stratigraphic order, beginning in each faunal category (micromammals, birds, amphibians, reptiles and macromammals) with the Mesolithic.

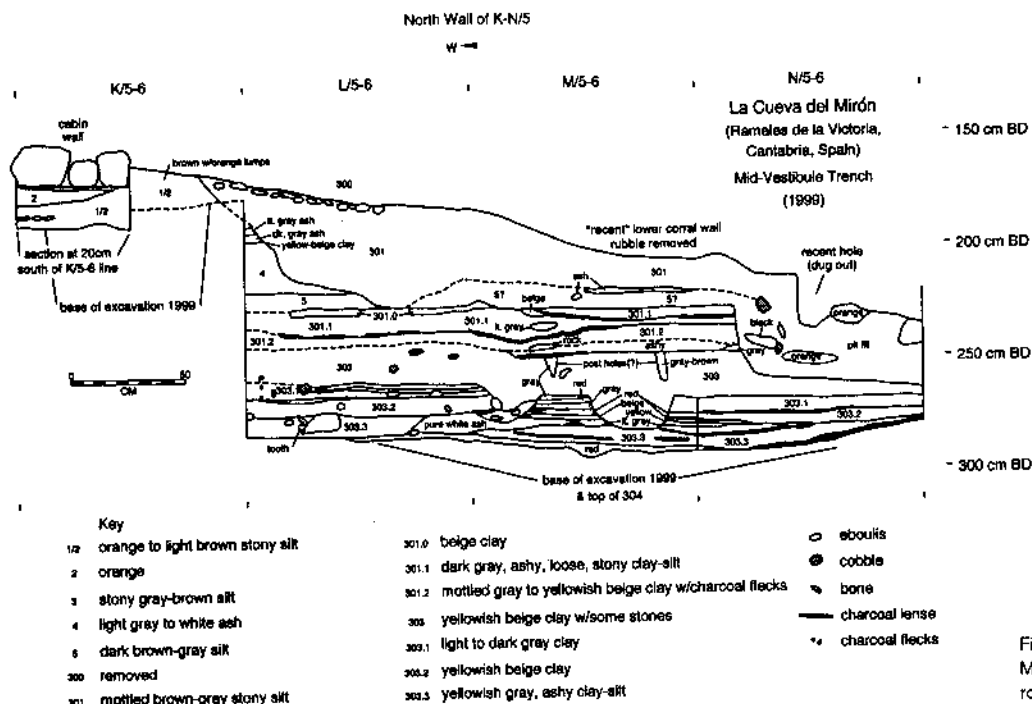


Fig. 4. North stratigraphic section of the Mid-Vestibule Trench between the 5 & 6 rows (L. Straus & R. Stauber).

Micromammals (GCB & JCGP)

With the exception of the mustelids and bats (which probably lived in the cave), roosting raptorial birds (probably owls) must have been the main agents of accumulation for the micromammals in the El Mirón cave vestibule, although some of the rodents (especially *Arvicola*) may have died in their burrows.

Level 10.1 yielded remains of *Arvicola terrestris* (mole rat), *A. sapidus* (water vole), *Microtus agrestis* (short-tailed vole), *Chionomys (Microtus) nivalis* (snow vole), *Clethrionomys glareolus* (bank vole), *Terricola (Pitymys) lusitanicus* (Portuguese pine vole), *Apodemus sylvaticus-flavicollis* (wood mouse or yellow-necked field mouse), *Glis glis* (grey dormouse), *Eliomys quercinus* (garden dormouse), *Talpa sp.* (mole), *Sorex coronatus-araneus* (common shrew) and *Mustela sp.* (small mustelid—probably weasel). The environmental conditions under which this fauna existed (albeit with depositional hiati and thus significant temporal gaps within the Preboreal and early Boreal periods) included temperate, humid climate and wooded vegetation with some open rocky slopes.

Level 10 produced teeth and bones of *Arvicola terrestris*, *Microtus agrestis*, *M. arvalis* (common vole), *Chionomys nivalis*, *Clethrionomys glareolus*, *Terricola lusitanicus*, *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Eliomys quercinus*, *Talpa sp.*, *Sorex coronatus-araneus*, a robust species of *Sorex*, *Mustela sp.* and the Chiroptera *Myotis* and *Miniopterus* (both cave bats). Environmental conditions were still basically the same in this early Neolithic level as in the underlying Mesolithic,

with no clear evidence of significant deforestation, at least not from the micromammals.

Level 9 (+associated lenses) produced exactly all the same taxa, *except* *Mustela sp.* and the Chiroptera. Levels 8+8.1 also have the same taxa, but with the loss of *Eliomys* and the addition of *Sorex minutus* (pygmy shrew), *Neomys sp.* (probably a water shrew) and some Chiroptera. There are hints of the beginnings of deforestation in the late Neolithic.

Level 7 (+associated lenses and pit fills) has a somewhat less rich micromammalian fauna: *Microtus agrestis*, *Chionomys nivalis*, *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Eliomys quercinus*, *Talpa sp.*, *Sorex coronatus-araneus* and *Crocicidura russula* (white-tailed shrew). Deforestation continued, with the presence of wet meadows in the environs of the cave.

Level 6 yielded *Arvicola terrestris*, *Microtus agrestis*, *Chionomys nivalis*, *Clethrionomys glareolus*, *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Eliomys quercinus*, *Talpa sp.*, *Sorex coronatus-araneus* and *Neomys sp.*

Level 5 (+ associated lenses), rich in micromammalian remains and taxa, yielded *Arvicola terrestris*, *Microtus agrestis*, *M. oeconomus* (nordic vole), *Chionomys nivalis*, *Clethrionomys glareolus*, *Terricola lusitanicus*, *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Talpa sp.*, *Sorex coronatus-araneus* and *Mustela sp.* The presence of *M.oeconomus* is a novelty, as this is today a species typical of the tundra and northern taiga biomes of the Holarctic, although it can be found in northwestern Europe as far south as Holland. It prefers cool or cold, wet habitats, such as bogs, marshes, wet

meadows and grasslands, tundra, but also cold wooded steppe. Nonetheless its surprisingly recent (i.e., post-glacial) presence in the Chalcolithic (and Bronze Age) of El Mirón is not completely unique, having been identified in Roman-age levels in Amalda Cave in Guipúzcoa (Pemán 1990). The indices for deforestation in late Chalcolithic times are fairly clear.

There are fewer micromammalian remains and lessened taxonomic diversity in Level 4, notable for its intense bonfires and perhaps more intensive human occupation. The finds include *Arvicola terrestris*, *Microtus arvalis*, *Clethrionomys glareolus*, *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Talpa sp.*, *Sorex coronatus-araneus* and *Mustela sp.*

The early Bronze Age Level 3 (+ associated lenses) contains *Arvicola terrestris*, *Microtus agrestis*, *M. arvalis*, *M. oeconomus*, *Chionomys nivalis*, *Clethrionomys glareolus*, *Terricola lusitanicus*, *Pliomys lenki* (an extinct arvicolid), *Apodemus sylvaticus-flavicollis*, *Glis glis*, *Talpa sp.* and *Mustela sp.* The Level 3.5 feature has the same micromammals plus *Sorex coronatus-araneus*, *S. minutus*, *Neomys sp.*, *Crocidura russula* and *Myotis*. Woodlands decreased markedly and were replaced by fields on the valley floors and lower slopes and bare rocky areas on upper slopes. Climate was cooler and humid. *Pliomys lenki* until now had been thought to have gone extinct in Late Glacial times and it had been interpreted as a cold steppe rodent. These finds in the mid-Holocene in El Mirón Cave suggest that it might have been a subterranean species, whose presence was controlled not so much by climate as by substrate - and that it might not even be extinct, perhaps surviving (albeit unobserved) in karstic refugium areas such as Cantabria to this day (or at least until the Bronze Age). If *P. lenki* is indeed extinct, this could have happened as a result increasingly intensive use of its caves in the refugia of the Atlantic valleys of northern Spain by humans and their livestock. Level 3.5 could represent the so-called Iron Age Cold Phase, but the age of this feature is unknown, as it is undated either by any diagnostic artifacts or by radiocarbon. In any event, even Level 3 attests to cool conditions, which are known for the Bronze Age in many parts of Europe.

The uppermost levels (1+2) -probably partly or wholly Bronze Age- produced only *Arvicola terrestris* and *Talpa*. The landscape was now completely humanized, with significant loss of woodlands because of agriculture and pastoralism. Micromammalian species diversity declined drastically as a result.

Human occupation does not seem to have been continuous in the El Mirón vestibule during the Holocene, since, had this been the case, the commensal micromammalian species would have proliferated in all the levels -something which is not the case. In support of this observation is the high species diversity in all the levels except the topmost ones, a fact which shows that the cave was often occupied by medium-size raptorial birds (owls), which are incompatible with humans. In short, there were periods other either ephemeral or intense human occupation throughout the Holocene, but

these were interrupted by times of abandonment when the vestibule as used as a roosting locus for owls which sampled the micromammalian faunas of the cave surroundings.

Birds (ME)

The avian faunal assemblages are rather small (648 bones, of which only 40 could be identified to genus or species level due to heavy fragmentation). Only 30 bones are whole. None of the bones have cut marks or traces of fire. There is no evidence that any of the birds had been butchered or processed by humans. Several of the taxa may have simply died in the cave, whose walls they could have used as roosting or nesting places. Among the indeterminable material, which is mainly composed of non-corvid passeriforms, there are 4 bones of medium-size galliforms (from Mesolithic, Neolithic and Bronze Age levels) and an anatine (from the Neolithic). The identified remains are summarized by major cultural phases, since individual levels have few (and sometimes no) bird bones.

The Mesolithic levels (10.1, 304) yielded 5 identifiable remains: one each of *Tetrao tetrix* (black grouse), *Columba livia/oenas* (rock or stock dove), *C. palumbus* (common wood pigeon), *Strix aluco* (tawny owl) and *Corvus corax* (common raven). The presence of *T. tetrix*, *C. palumbus* and *S. aluco* indicate the existence of both localized woods and clearings. There are 63 unidentified remains.

The early Neolithic strata with bird bones (Levels 10-9, 303.3-303) are by far the richest, attesting perhaps to only intermittent human use of the cave. There are 380 unidentifiable bird bones and 29 identifiable ones: one or two each of *Falco peregrinus* (peregrine falcon), *Scolopax rusticola* (Eurasian woodcock), *Columba livia/oenas*, *C. palumbus*, *Otus scops* (Eurasian Scops owl), *Asio sp.* (an owl), *Delichon urbica* (northern house martin), *Parus major* (great tit), and *Pyrrhocorax graculus* (yellow-billed chough). In addition there are 17 remains of *Turdus sp.* (thrushes). These species suggest the existence of alpine or montane meadows and humid woodlands with clearings.

Late Neolithic Level 8 yielded only 2 identified bird bones: one possibly of *Porzana porzana* (spotted crane) and a thrush. There are also 86 unidentified remains.

The Chalcolithic levels only yielded 3 identified bird bones: *Accipiter gentilis* (northern goshawk), *Columba livia/oenas* and *Coccothraustes coccothraustes* (hawfinch). The first and third species suggest the continued presence of some areas of dense, mature, deciduous woodland in the region. In addition, these levels have 44 unidentified bird bones. There is only one identified bird bone from the Bronze Age: *Columba livia/oenas*. There are only 34 unidentified bones. These Chalcolithic and Bronze Age levels are very poor in any bird remains, possibly as a consequence of much more intensive and continuous occupation of the cave vestibule by humans and their livestock than in the Mesolithic or, especially, Neolithic.

Herpetofaunas (BS y JL)

A total of 356 remains of reptiles and especially amphibians was culled from the micro-mammalian sample. Of those, 331 were identifiable to the species or genus level. Most taxa are represented by only 1-4 remains (MNI:1-3). These include *Salamandra salamandra*, *Alytes obstetricans*, *Natrix natrix*, *N. sp.*, *Coronella sp.*, *Elaphe sp.* and *Vipera sp.*, all of which are found in only one or two levels. The most common taxon is *Rana temporaria* (grass frog) (NISP: 250; MNI: 49), found in 17 of the post-Mesolithic levels/lenses, although absent from Mesolithic Level 10.1. *Anguis fragilis* (glass snake) is the distant second-best represented species (NISP: 39; MNI: 11), found in 11 levels (again not including Mesolithic Level 10.1). It is closely followed by *Bufo bufo* (common toad) (NISP: 27; MNI: 11; 9 levels—not including Level 10.1). In addition, there are 25 remains of indeterminate Anurans from 9 levels (this time including Level 10.1, which also has *Natrix* and *Coronella*). By far the levels richest in herpetological remains are mid-late Neolithic levels 9.6, 9 and especially 8, the latter with 7 taxa (plus *Anura* indet.) and an NISP total of 97.

The herpetological remains in the cave are probably mainly the consequence of animal predation—in the case of grass frog, probably by various nocturnal birds (notably owls), but also perhaps mammals. The amphibians and reptiles in the El Mirón Holocene levels are active and thus available as prey mainly during the period between March and October. Biogeographical and habitat suitability analyses of the present distributions of *Anguis fragilis*, *Bufo bufo* and *Rana temporaria* allow for range inferences on some environmental variables and provide preliminary information indicating that Holocene climatic fluctuations in the upper Asón area as represented by the El Mirón deposits did not exceed the current boundary between the Atlantic and Mediterranean climatic zones on the Iberian Peninsula. All the species found in these deposits are known to live in the Vasco-Cantabrian region at the present time. The region obviously has been part of the Eurosiberian biozone during the entire Holocene period. The absence of *Discoglossus galganoi* (a species which is commonly found in Cantabria today and is predated upon by *Tyto alba* at frequencies similar to *Rana temporaria*) suggests that it has expanded eastward into this region subsequent to the Bronze Age. This confirms observations made earlier at the Cave of La Paloma in central Asturias, where *Discoglossus* is now actively being predated by barn owls, but is absent from the Magdalenian and Azilian deposits, which are the most recent ones in the cave.

Macromammals (JA & KM)

The grand total of identifiable macromammalian remains from the Holocene levels is 6008. But they are highly fragmented: the total represents only 30.5 kg, for an average bone weight of about 5 gm. There are large quantities of unidentifiable remains—notably long bone shaft splinters.

The only Mesolithic assemblage is from Level 10.1. It has no remains of domesticated species—not even dog. There are 3 remains of *Sus scrofa* (boar), 28 of *Cervus elaphus* (red deer) and 11 of *Capreolus capreolus* (roe deer). The scarcity of macromammalian remains from this level corroborates the paucity of artifacts in pointing to only brief, ephemeral human visits to the site during the Preboreal/early Boreal.

The early Neolithic faunas are summarized in Table 1. In terms of minimum numbers of individuals, Level 10 has 2 cattle, 8 sheep/goats, 2 pigs, 3 red deer, 1 roe deer and 1 marten. The latter could have died naturally in the site. Levels 303, 303.1, 303.2 and 303.3 have the following MNIs: cattle: 4,3,1,1; sheep/goats: 13,9,11,4; pigs: 3,2,3,0; red deer: 1,0,1,1; ibex: 1,0,0,0; fox: 0,0,1,0. It is clear that hunting continued to be an important (albeit secondary) subsistence activity despite the arrival of Near Eastern domesticates, notably ovicaprines (mainly, but not exclusively sheep). Notable is the absence of dog in these 5800-5500 radiocarbon-year-old levels.

The later Neolithic faunas are summarized in Table 2. MNIs for combined Levels 9.8+9.7 +9.6, Level 9 and Level 8 are as follow: cattle: 6,4,4; sheep/goats: 27,12,13; pigs: 5,8,2; dog: 1,0, 1; boar: 0, 1,1; red deer: 4,3,2; chamois: 0,0,1; marten: 0,0,1; wildcat: 0,0,1; hedgehog: 0,1,0. Hunting still continued, but apparently at a reduced rate. Boar decreased and roe deer and ibex (the latter a very major game species in Upper Paleolithic times at El Mirón) disappeared. Deforestation probably began to become a significant phenomenon. Sheep continued to far outnumber goats, and cattle and pigs seem to have increased. Animals (especially ovicaprines) of all ages—but especially juveniles—are represented in the Neolithic assemblages. All months of at least the first year of life are represented among the teeth, indicating year-round human occupation of the cave—at least episodically. The fact that among both the ovicaprine and bovine teeth there are some molars that are very heavily worn, suggests that some animals were kept alive for their milk, i.e., evidence of the use of so-called “secondary (i.e., non-meat) products”. Among the major domesticates (sheep/goat and cattle) the skeletons are fairly completely and evenly represented; the animals were probably killed and butchered in the cave. The hunted red deer, in contrast, have a completely different skeletal distribution: large numbers of appendicular bones, but very few cranial remains. The domesticated pigs have a skeletal distribution opposite to that of red deer: many head parts, but relatively few appendicular or trunk bones.

The Chalcolithic faunas are summarized in Table 3. MNIs for levels 7, 6, 5 and 4 are as follow: cattle: 4,5,7,6; sheep/goats: 20,6,9,8; pigs: 3,5,6,2; dog: 1,0,0,0; boar: 6,0,0,0; horse: 0,0,1,0; red deer: 1,0,2,1; chamois: 0,0,2,0; ibex: 0,0,1,0; fox: 1,0,0,0; brown bear: 0,0,0,1. The continued presence of aurochs in Chalcolithic times (based on biometric data) confirms other late finds from northern Spain and raises the

TABLE 1: early neolithic macromammalian faunas (levels 10, 303- 303.3).

Domesticated Species (NISP)	Levels:	10	303	303.1	303.2	303.3
<i>Bos taurus</i>		12	62	11	1	5
<i>Capra/Ovis</i>		63	340	228	170	66
<i>Ovis aries</i>		7	13	8	1	
<i>Capra hircus</i>		1	1	1		
<i>Sus domesticus</i>		7	15	12	6	
Wild Species (NISP)						
<i>Sus scrofa</i>			2			
<i>Cervus elaphus</i>		86	2		11	2
<i>Capreolus capreolus</i>		8				
<i>Capra pyrenaica</i>		3	6			
<i>Martes sp.</i>		2				

TABLE 3: chalcolithic macromammalian faunas (levels 7-4).

Domesticated Species (NISP)	Levels:	7	6	5	4	302
<i>Bos taurus</i>		76	124	138	208	7
<i>Capra/Ovis</i>		441	91	123	125	18
<i>Ovis aries</i>		33		2	4	
<i>Capra hircus</i>					7	
<i>Sus domesticus</i>		59	51	70	24	2
<i>Canis familiaris</i>		1				
Wild Species (NISP)						
<i>Equus ferus</i>				1		
<i>Sus scrofa</i>		8				
<i>Cervus elaphus</i>		1	10	4		
<i>Bos primigenius</i>			1	1	1	
<i>Rupicapra rupicapra</i>			2			
<i>Capra pyrenaica</i>			8	6	1	
<i>Vulpes vulpes</i>		1				
<i>Ursus arctos</i>				1		

possibility of some local domestication of cattle (in addition to introduction of non-local domesticates). In addition, the presence of wild horse confirms that this animal did indeed persist in post-Neolithic times in northern Spain. However hunting seems to have become only an incidental subsistence activity at El Mirón in the Chalcolithic. Cattle clearly took ascendancy (especially when one considers their great weight), although ovicaprines (especially sheep) continued to be important, while pig also increased in significance. Dog continued to be very rare at this site. The domesticated livestock are represented by many young, but also some old animals (the latter presumably females maintained for their milk). There are animals killed in all seasons of the year. The cattle and sheep/goats are represented by all parts of the body, indicating slaughter, butchery and processing in the cave. Pigs again are better represented by head parts than by trunk elements, a fact which remains to be explained.

The Bronze Age faunas are summarized in Table 4. MNIs for Level 3 (*sensu lato*) include 4 cattle, 8 sheep/goats, 5 pigs, 1

TABLE 2: later neolithic macromammalian faunas (levels 9.8-9).

Domesticated Species (NISP)	Levels:	9.8	9.7	9.6	9	8
<i>Bos taurus</i>		14	26	109	77	89
<i>Capra/Ovis</i>		94	187	526	488	378
<i>Ovis aries</i>		2	12	46	15	21
<i>Capra hircus</i>			1	1	1	
<i>Sus domesticus</i>		10	10	59	34	36
<i>Canis familiaris</i>				1		1
Wild Species (NISP)						
<i>Sus scrofa</i>					3	4
<i>Cervus elaphus</i>		11	13	36	48	10
<i>Bos primigenius</i>				1		
<i>Rupicapra rupicapra</i>						1
<i>Martes sp.</i>						1
<i>Felis silvestris</i>						3
<i>Erinaceus europæus</i>					1	

TABLE 4: bronze age macromammalian faunas (levels 3.4-3).

Domesticated Species (NISP)	Levels:	3	3.1	3.2	3.4
<i>Bos taurus</i>		85	44	56	12
<i>Capra/Ovis</i>		63	44	62	8
<i>Ovis aries</i>			3	4	
<i>Capra hircus</i>		1	41	2	1
<i>Sus domesticus</i>		9	13	18	1
Wild Species (NISP)					
<i>Sus scrofa</i>		3			
<i>Cervus elaphus</i>			10	5	1
<i>Rupicapra rupicapra</i>			1		
<i>Capra pyrenaica</i>			17	5	1

boar, 2 red deer, 1 chamois and 3 ibex. Hunting was clearly done even in the Bronze Age, perhaps at a somewhat greater rate than in the Chalcolithic. While cattle continued to be important, there seems to have been an increase in ovicaprines, but for the first time goats became the dominant form at least among the specifically identifiable remains from one lens (3.1). Pig continues to be fairly well represented—but again especially by head parts. Cattle and sheep/goat skeletons are more evenly and fully represented by their various elements.

In sum, following the sporadic and minor human visits of Mesolithic hunters to the cave, there appeared ovicaprines (probably mostly sheep) of Near Eastern origin around 5800 radiocarbon years ago. Whether the Mediterranean ovicaprines finally spread to north Atlantic (Cantabrian) Spain from the Ebro Valley across the Cordillera or from Southwest France via the Basque Country or by sea, is as yet unknown. They were accompanied at El Mirón by small numbers of domesticated cattle and pigs whose origins are less absolutely clear, since wild forms lived and continued to be hunted in the region of the site.

(Curiously, despite a logical and very intensive specialization in ibex hunting on the steep, rocky slopes around this site in the Magdalenian, ibex are not present in the Mesolithic and very rare in the Neolithic levels.)

Pigs and cattle increased in the later Neolithic and were joined by at least one dog.

Cattle really became very important in the Chalcolithic, as pigs also increased in importance.

Cattle seem to have declined a bit in relative importance in the Bronze Age, as the livestock population of the cave evened out somewhat with an apparent (albeit momentary) increase in goats. When humans used El Mirón (apparently more episodically in the Neolithic and more continuously in the Chalcolithic and early Bronze Age), they did so year-round, judging from the ages of animal slaughter. And they were using cows and sheep/goats for more than just their meat, while continuing to at least opportunistically hunt small numbers of boar, cervids and caprines, which were butchered off-site.

Evidence of Ungulate Butchery (MPR)

A total of 48,838 ungulate bone fragments (2832 of which are taxonomically identifiable; teeth and whole bones – mostly carpals, tarsals and phalanges – not included) were examined for traces of butchery and carnivore activity. The former consist of cutmarks, breakage for disarticulation and marrow extraction, and fire, while the latter are gnawmarks, presumably by dogs. Interestingly the most abundant evidence of damage to the bones is gnawmarks, attesting to the presence of dogs which would have guarded and controlled the livestock during the post-Mesolithic occupations of the cave. This phenomenon is also typical among sites in the Mediterranean zone of Spain (e.g., Cova de les Cendres, Cova de l'Or, Jovades, Niutet).

Breakage for marrow extraction is almost only observed among bones of the largest ungulate, *Bos*; such breakage is very rare among bones of ovicaprines and pig. This suggests that marrow from mid-size ungulates had lost much of the importance that it had had in the hunting-based economies of Upper Paleolithic times, probably because now agriculture was providing significant sources of energy and carbohydrates. In both the Cantabrian and Mediterranean zones of Spain, Upper Paleolithic faunas are characterized by high levels of systematic marrow bone breakage.

Two classes of cutmarks were observed: ones made by stone tools in Levels 10-6 and others made by metal ones in Levels 5-3. Most of the marks (and all those made by metal tools) seem to have been related to carcass dismemberment and are situated in articular zones. Marks related to the removal of meat are rare. Meat removal or "de-boning" does not seem to have been done frequently here. Carcasses were simply dismembered and cooked with the bone on; once the meat was consumed, the bones were tossed to the dogs. This is very different from what goes on in hunting societies, where the

meat is generally removed from the bones to be cooked and eaten, while the bones are then often broken for their marrow and grease. Thus cutmarks are much more frequent than in agriculturally-based systems. We did note the presence of some red deer and ibex bones with lithic toolmarks, from the Mesolithic horizon (Level 10.1). These marks include longitudinal scraping and long parallel cuts that would have been caused in the process of meat-removal. In the Mesolithic, first and second phalanges and a roe deer mandible were broken for the extraction of marrow, all things which clearly were not done in the succeeding Neolithic levels. Limited numbers of red deer and ibex bones from Neolithic (10,9), Chalcolithic (5) and Bronze Age (3) levels have lithic scrape-marks and evidence of marrow cracking.

Four of the relatively few bones from the Mesolithic show burning evidence, but otherwise, in the later levels, traces of fire on the bones are not numerous. In terms of cutmarks and other traces of butchery, the results of the study of taxonomically unidentified bone fragments are similar to those of the identified specimens, but naturally the former are on average smaller than the latter (generally 1-3 cm. versus 3-5 cm).

Conclusions (LGS & MGM)

Humans were not the only inhabitants of El Mirón Cave during the Holocene. Birds roosted in its great vestibule –as they do today at times. Some of those birds (probably owls) scoured the landscape around the cave for micromammalian meals. Some micromammals (such as the voles) and slightly larger burrowers (weasels) may have contributed to the disturbing of the sedimentary layers. All these animals were most abundant when humans chose not to use the cave for themselves or their livestock. Commensal rodents and birds are not prominent. A few human hunting parties visited the cave on several short occasions during the Mesolithic ("one-night-stands"?). But then things changed significantly (but not completely, as people continued to hunt) in the Neolithic, although occupation of the cave was still far from permanent or continuous, as the densities of cultural and macrofaunal materials continued to be relatively modest. Heavily dependent on sheep, these people also kept some goats, pigs and cows, and continued to hunt. Butchery involved disarticulation with stone tools, but some marrow bone cracking only of cattle. Deboning of mid-size domesticated ungulates was not often done; joints of meat were cooked and consumed, and then the bones were tossed to the dogs, which gnawed them extensively. However dog remains are scarce in the faunal assemblages recovered from the excavations. Finally, in the Metal Ages, the cave vestibule seems to have become a more intensive place of human residence, complete with livestock stabling, including long-lived cattle, sheep and goats. These were at least sometimes butchered with metal tools. Wild animal carcasses were treated differently.

Although the various faunas point to progressive deforestation of the area around the cave, especially beginning in the late Neolithic, woodlands persisted even in Chalcolithic times and the high relief of the Cantabrian Cordillera clearly always favored the existence of mosaic landscapes in which humans practiced a mixture of subsistence activities including both pastoralism and hunting, as well as agriculture. The relative importance of the latter from early Neolithic times on remains to be evaluated by our paleobotanical colleagues based on flotation samples from the El Mirón Cave excavations.

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