Lower IX level from Labeko Koba and X level of Ekain have been considered relevant because their archaeological attribution to the Chatelperronian. Nevertheless the association of these archaeological evidences with complex faunal assemblages, characterized by the high presence of carnivores, requires a detailed archaeozoological analysis in order to understand the real nature of human interaction in the site and thus asses the function of these occupations.

The Labeko Koba IX lower layer is an occupation of cave hyenas (Crocuta crocuta spelaea), where we can identify, through a taphonomic analysis that a part of the assemblage had anthropic origin. On the other hand, the level X of Ekain is an accumulation of remains of cave bear (Ursus spelaeus) associated with a small assemblage of lithic artifacts. The particularities of cave bear ethology during hibernation suggest that ursids were not the main accumulator of other species bones.

In this paper, we wish to contribute to a better understanding of human presence in these sites during the Chatelperronian, by comparing the results produced by the Archaeozoology and the Lithic Techno-tipology. Grace to this interdisciplinary study it has been possible to identify, in both levels, the role played by carnivores and humans in faunal remain accumulation and thus characterize the impact and nature of human presence in both sites.

This paper could be a contribution for understanding the coevolution of humans and carnivores in caves of the southwestern Europe during the early Upper Palaeolithic.

**Keywords:** *Ursus spelaeus, Crocuta crocuta spelaea, Chatelperronian, Labeko Koba, Ekain, Taphonomy, Lithic Techno-Tipology, Use-Wear Analysis*
Introduction

For this study, we have reviewed two archaeological layers excavated in the 1970s and 80s. These are Levels X at Ekain (EK) and Lower Level IX at Labeko Koba (LK), attributed to the Chatelperronian (Altuna & Merino, 1984; Arrizabalaga & Altuna, 2000; Rios-Garaizar, 2008). They are two of most widely accepted series of this chronology in the Iberian Peninsula, especially Labeko Koba (Arrizabalaga & Iriarte, 2006). The scarcity of artefacts in both layers suggested that they were ephemeral occupations, probably related with hunting activities (Arrizabalaga, 1995; Rios-Garaizar, 2008; Rios-Garaizar et al., 2012).

In the context of Cantabrian Spain the Chatelperronian appears to be marked by this type of brief occupation for logistic purposes, except perhaps in the case of Cueva de Morín (Maillo, 2005). This will make a clear cut with the territory management strategies recognised in the Middle Palaeolithic (Rios-Garaizar, 2009), and will appear closer to those interpreted in the Proto-Aurignacian or Ancient Aurignacian of this region (Normand et al., 2008; Rios-Garaizar, 2011; Bachellerie et al., 2011). One of the main problems to interpret these occupations is doubtlessly their association with very large faunal assemblages, with an abundance of carnivores and herbivores, which suggest a complex taphocenosis, and reflecting different uses of the caves and complex interactions between humans, herbivores and carnivores (Brugal & Jaubert, 1991; Costamagno, 1999; Villa & Soressi, 2000). Prior data indicates that in both levels, Labeko Koba IX and Ekain X, the human presence was sporadic, the caves were used alternately by carnivores and humans and both contributed towards the formation of the archaeological record (Brugal et al., 2006). In addition, the particular morphology of Labeko Koba could have acted as a natural trap and thus build up an even more complex faunal assemblage (Arrizabalaga & Altuna, 2000).

In this paper we aim to determine, through taphonomic data, the role played by humans, carnivores (hyenas and bears) and natural causes in the accumulation of the palaeontological record, and consequently offer new hints that will help in the interpretation of the small artefact assemblages and their relevance to the comprehension of settlement dynamics during Chatelperronian.

Situation, Chronology and History of Research

Labeko Koba

The site of Labeko Koba is located in the town of Arrasate, Province of Gipuzkoa, in the upper Deba Valley, situated on the mid-slope (220 m) of Monte Kurtzetxiki (774 m). Its strategic position facilitates the view of a long section of the valley. Although the cave was known long time ago, it was not until 1970 when locals found the first artefacts. New finds followed in 1973, 1978 and 1979, while the upper entrance to the cave was searched without success. During 1987 the cave entrance was exposed by the construction of a by-pass road. A complete excavation dug out, during 1987 and 1988, the entire archaeological deposit. Excavation methodology included careful stratigraphic control and water screening of all the sediments with 1 mm sieve. The archaeological deposit had an average surface area of 25 m², and was over 450 cm thick, divided into ten stratigraphic units. Units I, II, VIII and X were archaeological sterile. The other levels contained a succession of Early
Upper Paleolithic occupations including Chatelperronian (IX inf), Protoaurignacian (VII) and Ancient Aurignacian (VI-III) (Arrizabalaga et al., 2003). Level IX was divided into two sub-levels according to sedimentological and archaeological features. Upper sub-level showed almost no human activity while lower layer contained almost all the anthropic evidences. Faunal assemblage from both sub-levels, initially documented and studied by J. Altuna and K. Mariezkurrena (Altuna & Mariezkurrena, 2000), was characterized by the presence of cave hyenas (*Crocuta crocuta spelaea*, initially determined as spotted hyena- *Crocuta crocuta* - see discussion about taxonomy and genetic evidence for distinguishing both species in Rohland et al., 2005). In addition, part of the sediment from level IX was re-accumulated in a dejection cone that fills a sinkhole located in the northern part of the cave. A series of bone samples sent to the Uppsala Laboratory in 1993 dated the Lower Level IX in 34,215 ± 1265 BP (Ua.3324). This determination, at that time thought to be too recent within the regional Chatelperronian framework. A new date was obtained from a *Megaloceros giganteus* antler base from IX Sup. in 2004, 42,200 ± 2400 BP (OxA10104) (Stuart et al., 2004) suggesting that the actual chronology of Chatelperronian occupation was older than previous estimations.

**Ekain**

Ekain cave is located on the east slope of the hill of the same name (90 m.a.s.l.), in the valley of the River Urola, near the historical town of Zestoa (Gipuzkoa). Its Palaeolithic rock art was discovered in 1969 by a group of local explorers after they unblocked the cave entrance (Barandiaran &
Altuna, 1969). This discovery was followed by a systematic excavation in the entrance of the cave that took place in the course of six seasons, initially supervised by J.M. Barandiarán (1969-72) and continued by J. Altuna (1973-75) (Altuna & Merino, 1984). During the excavation a long Upper Paleolithic sequence (>4 m deep) was revealed. It was mainly formed by Magdalenian (VII-IV) and Azilian (III-II) layers. Levels IX and X were characterized by a massive presence of *Ursus spelaeus*, together with a small ensemble of lithic artefacts and other faunal remains. The base of level IX was dated by conventional radiocarbon in >30,600 BP (I-11056, Altuna & Merino, 1984) and recently, its archaeological assemblage has been interpreted as the result of few ephemeral occupations attributed to Ancient Aurignacian (Rios-Garaizar, 2011).

Level X was excavated in a surface of 9 m² and sub-divided into two sub-levels Xa and Xb according to sedimentological features. In the upper sub-level (Xa) were found, alongside faunal remains, some lithic artefacts. The lower sub-level (Xb) only had paleontological evidence.

**Materials and Method**

In this paper we will make a comparative study of the layers Labeko Koba IX and Ekain X. They are similar in many ways: chronological attribution, material record (few lithic remains and large faunal assemblages), probable taphocenosis (alternating between carnivores and human groups), and similar geographic context. Likewise both archaeological sites were

![Figure 2. Profile of Labeko Koba and the different archaeological levels. VIII level is absent because was formed by non-continuous clay deposits.](image-url)
dug out with a systematic methodology including screening with 1 mm sieves. This allows us to assess several aspects, not only regarding the human occupations but also about the relationship between them and different carnivore species (*Crocuta crocuta* *spelaea, Ursus spelaeus* and canids).

The main part of the analysis is dedicated to the archaeozoological assemblages. The taxonomical and taphonomic composition of both levels will be analyzed in order to understand their formation. Ekain and Labeko Koba faunal collections were revised in the “Depósito temporal de materials Arqueológicos y Paleontológicos de Gipuzkoa” of San Sebastian (Gipuzkoa) during 2009 and 2010. Taxonomy was established using the osteological collection of Aranzadi Science Society (Saint Sebastian, Gipuzkoa) and different anatomical comparison atlas (Barone, 1976; Pales & García, 1981; Schmid, 1972; Varela & Rodríguez, 2004).

Previous taxonomic identifications made by Altuna (Altuna & Merino, 1984) and Altuna & Mariezkurrena (2000) were contrasted and revised, and non identifiable material was analysed. Moreover, this assemblage was for first time analysed from a taphonomical point of view. The biometric measures (Driesch, 1976) were recorded with a digital caliper (*Mitutoyo CD-20CPX, 200 mm*) and used for descriptive statistics.
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developed with stone tools following already known methodologies (Ibañez & González, 1996; Burroni et al., 2002). Obtained results were used to categorize site function using the classic site types described by Binford (1978a, 1978b, 1980).

Results

Labeko Koba

The lower part of the sequence at Labeko Koba consists of two units: Cone of Dejection and Level IX, each one sub-divided into two sub-layers (Lower and Upper Cone, and Upper and Lower Level IX). The Chatelperronian occupation is in Lower Level IX which is separated from Upper Level IX by a layer of calcite (depth -360/-390 cm). Faunal assemblage from two sub-levels was stored together, some of the identifiable materials are labelled including reference to depth thus they can be assigned with one sub-level or another, but the majority of the unidentifiable bone fragments have no label at all and therefore they cannot be assigned to a concrete sub-level. This presents problems to assign recognized taphonomic features to one or another layers. In any case the original study made by Altuna and Mariezkurrena (2000) presented the identifiable remains in separate subsets. Following this separation the faunal assemblages from sub level Lower Level IX and Upper Level IX seem to correspond to very different climate conditions. Upper Level IX clearly reflects cold conditions with the presence of four significant and rare taxa in Cantabrian Spain: Rangifer tarandus, Megaloceros giganteus, Coelodonta antiquitatis and Mammutthus primigenius (García & Arsuaga, 2003). The abundance of the Coelodonta antiquitatis (distribution, media, etc) and more complex statistic procedures as Mixture analysis specifically applied to identify sexual dimorphism among cave bears (Monchot, 1999; Arceredillo et al., 2011). Taphonomical alterations were observed and photographed with a digital macroscope (Nikon SMZ 1500) and a digital photo camera (Sony α350, 75-200 mm). Different works were used to interpret taphonomical modifications (Blasco Sancho, 1992; Cáceres, 1995; Waldron, 2008), to quantify them (Klein & Cruz Uribe, 1984; Dong, 1997; Lyman, 2008) and to understand the nature and characteristics of bone accumulations (Johnson, 1982, 1985; Haynes, 1980, 1988; Olsen & Shipman, 1988; Villa & Mahieu, 1991; Alcántara García et al., 2006).

Labeko Koba level IX inf and Ekain level Xa lithic industry has been previously published in detail (Arrizabalaga, 1995, 2000; Tarriño, 2000; Rios-Garaizar, 2008; Rios-Garaizar et al., 2012). Previous lithic raw material provenance data was available for Labeko Koba (Tarriño, 2000). For Ekain assemblage we used the identification criteria described by Tarriño (2006) to precise the origin of raw material. Production strategies were analyzed from a reduction sequence (Châine opératoire) perspective following the classic work for Chatelperronian technology made by Pelegrin (1995). Structure, morphometry, technique and typology were analyzed following Laplace systematic (Laplace, 1972; Bagolini, 1968). Sonneville-Bordes-Perrot (1953) typology was only used to facilitate tool assemblage description. Extensive samples of lithic materials from both sites were submitted to a high and low power use-wear analysis (Rios-Garaizar, 2008; Rios-Garaizar et al., 2012) with the objective of characterizing post depositional alterations on stone tools and activities (distribution, media, etc) and more complex statistic procedures as Mixture analysis specifically applied to identify sexual dimorphism among cave bears (Monchot, 1999; Arceredillo et al., 2011). Taphonomical alterations were observed and photographed with a digital macroscope (Nikon SMZ 1500) and a digital photo camera (Sony α350, 75-200 mm). Different works were used to interpret taphonomical modifications (Blasco Sancho, 1992; Cáceres, 1995; Waldron, 2008), to quantify them (Klein & Cruz Uribe, 1984; Dong, 1997; Lyman, 2008) and to understand the nature and characteristics of bone accumulations (Johnson, 1982, 1985; Haynes, 1980, 1988; Olsen & Shipman, 1988; Villa & Mahieu, 1991; Alcántara García et al., 2006).

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remains (NISP 92), belonging to a minimum of seven individuals (8% of the MNE in the assemblage), indicates the frequency of this species in the surroundings of the cave.

In contrast, Lower Level IX, like the upper and lower Cone of Dejection layers, is characterised by a eurythermal fauna. *Rangifer tarandus* is present in small number (NISP 14) belonging to two individuals, while the three most abundant taxa (*Cervus elaphus*, *Equus ferus* and *Bos/Bison*, making up 93.7%) are species less clearly associated with any particular climate and capable of withstanding moderately severe conditions.

The abundance of the *Cervus elaphus* remains (65%) should be highlighted; it is the most common species with 792 remains belonging to 16 individuals. *Cervus elaphus*, *Equus ferus* and *Bos/Bison* are the most common species associated with human activity in the Middle Palaeolithic and Early Upper Palaeolithic of Northern Spain (Altuna, 1992; Castaños, 2005). In this case, the taphonomical analysis of the ungulate remains of Labeko Koba, saw a considerable number of carnivores modifications, higher than the alterations due to human activity. Over the *Cervus elaphus* remains we have identified 135 modifications caused by carnivores and only 16 anthropogenic alterations (135/16), this means that only the 11.85% of these alterations had been produced by humans. This proportion is quite similar between the *Bos/Bison* group, 12.79% (86/11) and quite lower in *Equus ferus* 5.71% (70/4).

In our opinion the formation of the archaeozoological accumulation at Labeko Koba was a progressive process. Probably, attending to the chronology, this sample was accumulated in a relatively short period of time. During the formation, attending to the taphonomic information, the carnivores were, in the lower levels of the cave (Cone of Dejections and IX level). First agents were the carnivores, human alterations are quantitatively less important. The absence of superimposed modifications over a single remain, suggests that humans too they had a primary access to the ungulates remains. Probably Labeko Koba was visited or occupied for short periods in an alternative way by carnivores and human groups during the early Upper Palaeolithic.

The morphological composition of the ungulates remains, saw the existence of a natural accumulation, probably with a higher component over the *Cervus elaphus* remains (all the skeletal elements are represented). On the other hand, *Bos/Bison* and *Equus ferus* limb bones are more usual than axial or cranial rests. These composition means that probably, these two taxa remains were, in part, carried for humans and carnivores from outside.

All this information become the interpretation of the formation of Labeko Koba as a complex process. The morphology of the cave, in the form of a funnel, with the entrance on the highest point of the hillside and an overhanging roof, creates a natural trap for the ungulates living in the area, especially in the older layers, which are at a depth of nearly five metres below the surface.

The proportion of carnivores in Lower Level IX is quite low (5%) and they are practically all remains of *Crocuta crocuta spelaea* (4.5%). Destruction caused by hyenas is seen in a large number of remains, although the degree of breakage is low (see Table 2). In addition to the presence of scores and pits, the partial destruction of the epiphysis of the larger bones has been noted. This is therefore an assemblage in which most of the bones have been fragmented very little, although many of them exhibit
Table 1. Taxonomical distribution of Labeko Koba.

<table>
<thead>
<tr>
<th>TAXON</th>
<th>D. Inf.</th>
<th>D. Sup.</th>
<th>IX Lower</th>
<th>IX Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>NISP</td>
<td>MNE NISP</td>
<td>NISP MNE</td>
<td>NISP MNE</td>
<td>NISP MNE</td>
</tr>
<tr>
<td>Cervus elaphus</td>
<td>15</td>
<td>1</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>Megaloceros giganteus</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Rangifer tarandus</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Capreolus capreolus</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Sus scrofa</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Bos/Bison</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Rupicapra pyrenaica</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Equus ferus</td>
<td>33</td>
<td>3</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Coelodonta antiquitatis</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Mammutthus primigenius</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Canis lupus</td>
<td>--</td>
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<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Vulpes vulpes</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Ursus spelaeus</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Crocuta crocuta spelaea</td>
<td>8</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Identifiable</td>
<td>63</td>
<td>7</td>
<td>56</td>
<td>7</td>
</tr>
<tr>
<td>Non Ident.</td>
<td>164</td>
<td>--</td>
<td>80</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>--</td>
<td>136</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 1. Taxonomical distribution of Labeko Koba.

signs of hyena activity, similar to those documented in the literature (Cruz-Uribe, 1991; Fosse, 1997; Stiner, 1994; Álvarez-Lao & García, 2005). If we take, for example, the group of Coelodonta antiquitatis in Upper Level IX, most of the long bones have been gnawed intensely in their epiphysis. However, due to their large size, the shafts have remained whole, except for some pits and scores, thus creating the characteristic cylinders with crenellated edges. Further evidence of the presence of hyenas in the cave is confirmed by the large number (n= 64) of coprolites recovered in this level. It should also be pointed out that infantile hyena remains are absent. The absence of juvenile hyena and the single presence of few remains of sub-adult hyena (an hemi-mandible with P₄ and M₁ teeth in the process of erupting). Ethological studies in Africa (Kruuk, 1972) with extant Crocuta crocuta, have shown that this degree of tooth eruption corresponds to an individual nine months old which would be starting to collaborate in hunting and defending the territory (Holekamp et al., 1997).

The low degree of breakage and anatomical representation of the remains, of which a significant proportion are complete, whereas others were consumed, especially of the species Cervus elaphus and Equus ferus, indicate an initial natural accumulation,
occasionally visited by hyenas and humans. The taphonomic data indicates it was a sporadic, non-systematic, consumption of the remains found in Level IX similar to that seen in caves visited sporadically by hyenas to scavenge the animal remains that had accumulated there naturally (Diedrich & Zak, 2006) and different to the pattern seen in other Upper Pleistocene hyena dens in Europe (Enloe et al., 2000), where the breakage of the bones reaches extreme layers.

All this evidence suggests that Labeko Koba was not used as a communal den. This site was sporadically visited by hyenas, probably out of the breeding season due to the absence of juvenile animals (extant Crocuta crocuta cubs, remains almost six months in the communal dens) (Pokines and Peterhans 2007). This fits better with extant striped hyena (Hyaena hyaena) behaviour, which uses several dens and cavities in a territory throughout the year (Kempe et al., 2006), than with the behaviour observed in actual African spotted hyena (Crocuta crocuta) clans, where are found a communal den and a variable quantity of natal dens (Boydston et al., 2006; Höner et al., 2005).

From the taphonomic point of view, human presence in level IX is evidenced by the presence of identifiable remains and bone shafts with percussion and cut marks (7 modifications at Cone of Dejection and 62 in IX level). The proportion of identifiable bones with traces of human activity is very low and appear associated to four species: Cervus elaphus, Equus ferus, Bos/Bison, Coelodonta antiquitatis and Megaloceros giganteus, whereas on others, like Rangifer tarandus, we have seen no signs of human activity. In the case of Equus ferus and Bos/Bison traces are concentrated on long bones, which are the best represented skeletal elements in this assemblage (Arrizabalaga & Altuna, 2000). This suggests that, apart from animals which fell down in the cave, there is a preferential transport of the most nutritional parts of preys obtained and initially butchered elsewhere. On the other hand red deer which shows a more equilibrated pattern of representation of the different anatomical parts (Altuna & Mariezkurrena, 2000), a significant proportion of these belong to animals that fell into the cave accidentally. Nevertheless human activity marks are also in this case concentrated in extremities, which open the possibility of transport of selected anatomical parts of animals butchered elsewhere. This pattern of bones with signals of carnivore or human activity alongside with bones with no mark at all suggests that different processes created the faunal record of layer IX: natural death, scavenging and human transport.

The lithic artefact assemblage from layer IX inf is composed by 81 pieces, 10 of them retouched. Some pieces were also recovered from the cone of dejection, among them a distal fragment of Chatelperron point, a side-scraper made on ferruginous material and a burin spall that refits with a burin found in IX inf level (Arrizabalaga, 1992a). This suggests that these materials can be probably attributed to the Chatelperronian occupations.

Preservation of the assemblage is quite good. Almost all the materials present some kind of ancient fracture, but they occurred outside the site. Other macroscopic alterations as those caused by trampling have been noted but they are not significant. There are however certain chemical microscopic alterations, such as desilification, or glossy aspect, and a slight mechanical alteration (abrasion, bright spots). In addition, some objects have calcite adhered to their
surfaces. Although the sample is heterometric, it can be observed an absence of very small artefacts that can be explained by the range of activities developed at the site. In conclusion post-depositionary processes had low influence in assemblage composition.

The raw materials used in Level IX at Labeko Koba are dominated by flint (85% of the total). The flint types are mainly varieties from the north of the watershed (Flysch) and from the south (Urbasa and Treviño). The other raw materials are iron nodules and silicified limestone.

From the technological point of view, the assemblage is characterised by a high proportion of blades. The format is relatively standardised with widths of about 15 mm and flat trapezoidal sections, within a high frequency of bipolar production and the specific preparation of the platforms by faceting. This type of blade production seems characteristic of the Chatelperronian (Pelegrin, 1995; Grigoletto et al., 2008) and may be connected with the need to obtain straight blanks especially suited to the shaping of backed points. Within this blade production, there is also evidence of narrower blanks (<10 mm), attested by reviving core flanks and some micro-blade blanks. In contrast, objects made from flakes are practically absent. It is also remarkable the presence of iron nodules purposefully brought to the site.
The high ratio between unretouched and retouched objects (5:14), the absence of cores, the fragmentation of the reduction sequences and the absence of knapping waste suggest that lithic production and maintenance was not developed in situ. The presence of hammerstones is not related with knapping but with other kind of work as bone breaking. The twelve formal tools (summing IXinf and the Dejection Cone) documented in the level are insufficient to carry out an exhaustive modal and morphological study. They can be empirically classified as one multiple dihedral burin; three characteristic Chatelperron points; an atypical Chatelperron point (on the limit with an oblique truncation); one oblique truncation; one retouched blade; two side-scrapers; three retouched bladelets.

<table>
<thead>
<tr>
<th>TAXON</th>
<th>Cone of Dejection</th>
<th>IX level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gnawed</td>
<td>Punctures</td>
</tr>
<tr>
<td><strong>Cervus elaphus</strong></td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td><strong>Megaloceros giganteus</strong></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Rangifer tarandus</strong></td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td><strong>Bos/bison</strong></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Equus ferus</strong></td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td><strong>Coelodonta antiquitatis</strong></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Ursus spelaeus</strong></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Crocuta crocuta spelaea</strong></td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Identifiable</strong></td>
<td>34</td>
<td>16</td>
</tr>
<tr>
<td><strong>Non Identifiable</strong></td>
<td>20</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>54</td>
<td>69</td>
</tr>
</tbody>
</table>

Table 2. Remains of each species with modifications due to carnivores and human activity at Labeko Koba. Megaloceros giganteus was identified by five antler fragments. These elements, all of them deciduous, must be collected by humans to be employed as soft hammers (Mujika, 2000). At the same time, these five pieces were gnawed, probably by Crocuta crocuta spelaea (Altuna & Mariezkurrena, 2000).
Multidisciplinary approach to two Chatelperronian series in Basque Country

Large numbers of Ursus spelaeus remains, 97.94% in Sub-level Xa and 48.74% in Sub-level Xb (Altuna & Merino, 1984).

In Sub-level Xa, the few ungulate-bone remains were brought by carnivores or humans and quantitatively make up 0.68% of the assemblage. A total of 16 identifiable remains belong to ungulates while another 793 unidentified remains. Out of this small number, only one bone with cut-marks has been identified, a Cervus elaphus tibia fragment. In addition seven non identifiable fragments exhibit cut-marks or helicoid fractures, while two fragments display signs of burning. These evidences can be related with butchery, bone breaking (helicoid fractures) for marrow extraction (Johnson, 1985; Yravedra, 2006), and possibly with the presence of some kind of combustion structure.

Carnivore activity is found above all on Rupicapra pyrenaica remains. The destructions are characterized by partial fracture of the epiphysis and pits and scores on the shafts of long bones. These damages are concentrated in specific parts of the skeleton and don’t affect the whole individuals. The small amount of damage caused suggests that Vulpes vulpes was primarily responsible (Andrews & Nesbit, 1983; Borrero, 1990; Hewson & Kolb, 1975).

Besides, these species constitute only a small part of faunal assemblage, which is formed basically by cave bear remains, with a total of 2245 NISP (97.94% of the total), belonging to a minimum of 124 individuals (MNI=124). Age class distribution is composed by 32 juvenile, 49 sub-adults and 43 adults. Sexual dimorphism has been investigated inside this later group. A total of 112 lower canines have been used for this study, of which 46 come from adults. TD size distribution of lower canines has been analyzed using Mixture Analysis (Figure 5: Mixture Analysis of the transversal diameter,

Ekain

Layer X of Ekain cave was divided into sub-levels Xa and Xb. The former, upper, level contained the whole lithic assemblage and in Sub-level Xb, excavated only in 1 m², we have only succeeded in identifying two faunal remains with evidence of anthropic action. Both sub-layers are characterised by containing other pieces not classified as formal tools exhibit retouching or use-marks of certain significance.

A sample of 35 artefacts was analyzed from the functional point of view (Rios-Garaizar, 2008). 51.4% (18) of the knapped objects presented use-wear marks, some of them (6) in more than one active zone. Also, two of the six limonite cobble-stones analysed exhibit macroscopic signs of their use. Various activities have been identified. Some of them are related with carcass processing as butchery or percussion on hard materials (bone). Two of the Chatelperronian points have diagnostic impact fractures and were probably discarded in the site as a rearming practice. Other activities are also present (hide, antler or bone work), but the limited extension of traces suggests that they were part of tool maintenance activities.

Although evidences of carcass processing are not very intensive all the activities identified in bone assemblage (butchery and bone breaking) have been also observed through use-wear analysis. Lithic assemblage composition suggests also that some of the tools initially brought by humans to the site were transported out, and that they discarded some of them including wasted tools and heavy hammerstones. This fits with an interpretation of the site as a hunting camp where limited activities, including some carcass processing, were developed (Rios-Garaizar et al., 2012).
suggests that at the time of the formation of Level Xa, functioned as a hibernation den, where the *Ursus spelaeus* females gave birth to their young and hibernated in successive years (Andrews & Turner, 1992; Kurten, 1958; Torres, 1984a, 1984b).

Although sub-level Xb did not yield any lithic implements, the fauna in this level is especially interesting to understand the different occupation phases in the cave. The faunal sample is small, composed only by identifiable remains, which suggest some biases in collection. Carnivores still make up the largest group; 62.63%, compared with 36.35% herbivores. Most of the assemblage consists of *U. spelaeus* remains (48.76%), while amongst the ungulates *Rupicapra pyrenaica* is the most common species (20.66%). The great proportion of modifications due to carnivores activity (Haynes, 1980), as scores, pits, and punctures, over the ungulates (Johnson, 1982, 1985; Alcántara García et al., 2006) suggests that chamois and red deer remains were brought to the site by carnivores. Albeit some red deer and bison (*Bison priscus*) remains present human made modifications (Gee, 1993; López González et al., 1999; Pandolfi et al., 2011; Sala et al., 2010) as cut marks or intentional breakage. The absence of non-identifiable remains, together with the limited surface digged and the “paleontological characteristics” of the Xb sub-level, could be indicative of a different methodology of excavation, (probably without a sistematic screening of the sediment) (Altuna, 1984).

Lithic artefacts have been found only in Xa sub level. The assemblage consists of eleven pieces, six retouched and five unretouched. Then of them are in made flint from Urbasa and Flysch varieties, one piece is made on lydite. From the technological point of view, we can highlight the presence

Two groups have been identified, one composed by 24 samples with a mean of 16.5 mm, attributed to females, and other composed by 22 elements which corresponds with male population, with a mean of 20.40 mm. Overlapping between two groups produced around 18 mm, with few elements concerned. This size distribution is similar to that observed in Cova de Eiros collection (Grandal, 1993).

The mortality pattern of the cave bear population in Layer Xa has also been analysed. We have divided the population into three sets: juveniles, including neonates and individuals in the first year of life; sub-adults, the individuals with slight tooth wear and open roots; and adults, with a closed tooth root system and appreciable wear on the crown (Stiner, 1994). This study has also been based on the lower canine (C₁), which in the case of Ekain is the most common anatomical part in the three sub-sets.

Age class distribution shows an attritional pattern (Klein, 1982) with a larger proportion of juvenile individuals (49.10%) than of sub-adults (15.17%) and adults (25.89%). This suggests that it is a natural accumulation in which formation no other agents, either carnivores or humans, have intervened. However, the low number of juvenile individuals should be noted, since at European sites they use to reach higher proportions, around 75% (Kurtén, 1958). On the other hand the results coincide with the proportions observed at the Pyrenean and Cantabrian sites (Torres et al., 1991; 2007; Rabal-Garcés et al., 2012), where the deaths were attributed to natural causes or predation caused by other carnivores, and therefore weaker animals, both juvenile and senile individuals, were more common.

The greater abundance of females and the large numbers of immature individuals
of medium-sized blades (∼12 mm wide), with a straight profile, flat trapezoidal section and bipolar negatives. The specific preparation of the percussion platform by faceting has been only seen in one case, and specific preparation by the abrasion of crests and the use of soft hammers is attested by the presence of linear platforms.

The composition of this assemblage is heterogeneous from the empirical typology point of view, as there are two examples of Chatelperron points, a microgravette, a blade with totally backed edge, a blade with a partial and marginal backed edge, a blade with simple lateral retouching and a Dufour bladelet. The modal analysis reveals the predominance of abrupt retouch (four pieces) contrasting with a single piece with simple retouch. There is also great similarity at the typological level (3 LD, 2PD and 1R).

Use-wear analysis reveals that the complete Chatelperron point, the fragmented point and the microgravette were used as projectiles. There is also a fragment of an unretouched blade with a burin-like fracture which seems to be the consequence of an impact. The blade with totally backed edge, which could be interpreted as a Chatelperron point fractured during the preparation of the back, displays bifacial flaking on the edge opposite the back, probably related with cutting activities. These characteristics of the assemblage in Level Xa at Ekain correspond to a very short occupation, in which the activities that have been identified

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**Table 3. Ekain Taxonomical distribution.**

<table>
<thead>
<tr>
<th>Taxon</th>
<th>EKAIN NISP</th>
<th>MNI</th>
<th>%NISP</th>
<th>%MNI</th>
<th>Xa NISP</th>
<th>MNI</th>
<th>%NISP</th>
<th>%MNI</th>
<th>Xb NISP</th>
<th>MNI</th>
<th>%NISP</th>
<th>%MNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bos/Bison</td>
<td>2</td>
<td>1</td>
<td>0.08</td>
<td>0.75</td>
<td>2</td>
<td>1</td>
<td>1.65</td>
<td>5.88</td>
<td>2</td>
<td>1</td>
<td>1.65</td>
<td>5.88</td>
</tr>
<tr>
<td>Rupicapra pirenaica</td>
<td>11</td>
<td>2</td>
<td>0.47</td>
<td>1.5</td>
<td>25</td>
<td>2</td>
<td>20.66</td>
<td>11.76</td>
<td>25</td>
<td>2</td>
<td>20.66</td>
<td>11.76</td>
</tr>
<tr>
<td>Cervus elaphus</td>
<td>3</td>
<td>1</td>
<td>0.13</td>
<td>0.75</td>
<td>16</td>
<td>1</td>
<td>13.22</td>
<td>5.88</td>
<td>1</td>
<td>1</td>
<td>0.82</td>
<td>5.88</td>
</tr>
<tr>
<td>Capreolus capreolus</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>1</td>
<td>0.82</td>
<td>5.88</td>
<td>1</td>
<td>1</td>
<td>0.82</td>
<td>5.88</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>16</td>
<td>4</td>
<td>0.68</td>
<td>3</td>
<td>44</td>
<td>5</td>
<td>36.35</td>
<td>29.4</td>
<td>44</td>
<td>5</td>
<td>36.35</td>
<td>29.4</td>
</tr>
<tr>
<td>Ursus spelaeus</td>
<td>2245</td>
<td>124</td>
<td>97.94</td>
<td>93.23</td>
<td>59</td>
<td>8</td>
<td>48.76</td>
<td>47.05</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Ursus arctos</td>
<td>4</td>
<td>1</td>
<td>0.17</td>
<td>0.75</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Panthera pardus</td>
<td>3</td>
<td>1</td>
<td>0.13</td>
<td>0.75</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Crocuta crocuta spelaea</td>
<td>6</td>
<td>1</td>
<td>0.26</td>
<td>0.75</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Canis lupus</td>
<td>11</td>
<td>1</td>
<td>0.47</td>
<td>0.75</td>
<td>14</td>
<td>2</td>
<td>11.57</td>
<td>11.76</td>
<td>2</td>
<td>1</td>
<td>1.65</td>
<td>5.88</td>
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<tr>
<td>Vulpes vulpes</td>
<td>7</td>
<td>1</td>
<td>0.30</td>
<td>0.75</td>
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<td>1</td>
<td>1.65</td>
<td>5.88</td>
<td>--</td>
<td>--</td>
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<td>--</td>
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<tr>
<td>Martes martes</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2</td>
<td>1</td>
<td>1.65</td>
<td>5.88</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>2292</td>
<td>129</td>
<td>99.27</td>
<td>96.98</td>
<td>77</td>
<td>12</td>
<td>62.63</td>
<td>70.57</td>
<td>121</td>
<td>17</td>
<td>99.98</td>
<td>99.97</td>
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<tr>
<td><strong>Identifiable</strong></td>
<td>2308</td>
<td>133</td>
<td>99.95</td>
<td>99.98</td>
<td>121</td>
<td>17</td>
<td>99.98</td>
<td>99.97</td>
<td>121</td>
<td>17</td>
<td>99.98</td>
<td>99.97</td>
</tr>
<tr>
<td><strong>Non Identifiable</strong></td>
<td>793</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>TOTAL (NRT)</strong></td>
<td>3101</td>
<td></td>
<td></td>
<td></td>
<td>121</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>
are practically exclusively connected with the repair or replacement of points.

Discussion

The archaeozoological and typo-technological analysis of Labeko Koba (Cone of Dejections and IX level) and Ekain (X level) Chatelperronian layers, have succeeded in reconstructing the dynamics of alternative occupations between carnivores and humans during the early Upper Palaeolithic at the east side of the Cantabrian Region.

At Labeko Koba, the morphology of the cave directly influenced the composition of the faunal assemblage, Cervus elaphus remains are the 55.4% at the Upper Cone of Dejections and the 65% at IX lower sublevel. The location of the cave on the slopes of Kurtzetxiki mountain, a few metres above the floor of the Deba valley (Arrizabalaga et al., 2010), and its overhanging roof and stepped interior made this cave a natural trap for the animals that fell into it over the millennia, from a young Mammutthus primigenius (NISP 8, MNI 1) to seven Coelodonta antiquitatis (NISP 92, MNI 7) individuals (Arrizabalaga & Altuna, 2000).

The taphonomic analysis of Labeko Koba have revealed the presence of multiple bone remains with carnivore modifications, at the Cone of Dejections there are 54 gnawed remains and 69 bones with scores and punctures. The 28.37% of the remains of the Cone of Dejections are modified by carnivores, the same index at the IX level fall down until the 12.48%. On the other hand, the modifications due to anthropic activity raise between the Cone of dejections (n=7) and the IX level.

<table>
<thead>
<tr>
<th></th>
<th>Prob.</th>
<th>Mean</th>
<th>Stdev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.55</td>
<td>16.57</td>
<td>0.66</td>
</tr>
<tr>
<td>Male</td>
<td>0.44</td>
<td>20.40</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Figure 5. Mixture analysis of the transversal diameter (TD) of the lower canine (LC) of Ursus spelaeus from Ekain Xa. Mixture analysis (AIC: 100.8 Log I: hood: -45.91 N:46) of Ekain Xa sublevel, Ursus spelaeus lower canine DT shows a clear dimorphic distribution. Females (n=24) and males (n=20) are divided in to conjuncts with a slow number of elements which could be considered as non-identifiable (n=2).
(n=62). Human activity in Labeko Koba produced a reduced lithic assemblage, with evidences of different activities, among them hunting weapon replacement, butchery and bone breaking are related with faunal captures and carcass processing. These activities left also his signal in a significant part of the faunal assemblage, contributing to the particular taphocenosis of the site. We can thus interpret Labeko Koba as a site that functioned as natural trap, occasional den or scavenging place for hyenas, and occasional hunting camp for humans.

Ekain, lower layers (X and IX) were mainly occupied by *Ursus spelaeus* (93.23% in sub-level Xa and 47.05% in sub-level Xb) for hibernation and breeding (Torres, 1984b), with a higher presence of females and cubs than adult males. The limited lithic assemblage from sub level Xa suggests that the cave was used as an episodic stand where some weapons were repaired. Punctual activity on faunal assemblage has been observed in *Cervus elaphus* and *Bison priscus* remains both in Xa and Xb sub-levels. Other herbivores as *Rupicapra pyrenaica* remains were consumed (specially at the Xb sub-level, n=24) by medium size carnivores. Finally, despite the absence of lithic artefacts in sub-level Xb, we have succeeded in attesting, through the taphonomy, a slight human presence.

Both sites, Ekain and Labeko Koba represent hunting stations during the Chatelperronian. Differences among them are related with intensity of the occupation and the variety of the activities developed by humans. The strategic position of Labeko Koba can explain a longer occupation which was profited to make occasionally other activities non related directly with hunting. In Ekain, activities were practically related only with weapon repair and reflect probably overnight stay. Both caves have been used also by different carnivore species (*Crocuta crocuta spelaea* at Labeko Koba and *Ursus spelaeus* and middle size carnivores at Ekain) which created very different faunal assemblages.

**Conclusion**

In this paper we have tried to develop a multidisciplinary analysis (combining
Figure 8. Scavenged Ursus spelaeus remains at Ekain Xa.

Above, EK.1V-395, Ursus spelaeus femur proximal diaphysis, probably gnawed by Crocuta crocuta spelaea. Multiple pits and scores. (scale: 1cm)

Below, EK.1A-410, Ursus spelaeus right mandible. This element present consumption evidences at the ramus and on the basal side. (scale: 2cm)

Above, EK.9A-375, Ursus spelaeus femur proximal epiphysis. This sort of modification around the femur head (caput femoris) probably were made by another bears during the consumption of the carcasses. (scale: 3cm)

Image gnawed Rupicapra remains. Gnawed Rupicapra pyrenaica remains, scapula and calcaneus from Ekain Xa sublevel. The small size of the chamois remains and the morphology of the alterations suggests the activity of canids, as foxes.
Multidisciplinary approach to two Chatelperronian series in Basque Country

During the formation of Level X, Ekain cave, like many other caves in northern Spain, was occupied by *Ursus spelaeus* for hibernation and breeding (Altuna, 1992; Torres, 1984a, 1984b; Grandal, 1993). A reduced assemblage of ungulate remains (NISP: 16 in Xa sub-level and NISP: 43 in Xb sub-level), together with the limited evidence of lithic industry in sub-level Xa, indicates the sporadic presence of humans, related with the preparation of hunting activities.

Despite the differences, both sites are clear examples of hunting stations during Archeology, Lithic typology and technology) of two Chatelperronian layers in the basque region of northern Spain, Labeko Koba (Level IX) and Ekain (Level X). Through the archaeozoological, taphonomic and technotypological study of the assemblages, we have succeeded in reconstructing the use of both sites at that time.

Carnivores and humans occupied Labeko Koba alternatively, attracted by the animals trapped, or by its strategic position over the Deba valley. Both, carnivores (*Crocuta crocuta spelaea*) and humans used the cave for short periods. It was neither a den nor an habitation cave. Labeko Koba was a place where carnivores could occasionally find a source of food in an opportunistic way and humans found a strategic shelter where they could take refuge and prepare hunting activity, as the techno-typological analysis have shown.

**Tabla 4. Table: Remains of each species with modifications due to carnivores and humans activity at Ekain. *In the Xa sub-level two non identifiable remains are burnt bone fragments.**

<table>
<thead>
<tr>
<th>TAXON</th>
<th>Xa sub-level</th>
<th>Xb sub-level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gnawed/punctures</td>
<td>Scores/Concretions</td>
</tr>
<tr>
<td><em>Cervus elaphus</em></td>
<td>1 -- -- -- --</td>
<td>1 9 7 2 --</td>
</tr>
<tr>
<td><em>Bos</em>/<em>bison</em></td>
<td>1 2 -- -- -- --</td>
<td>--</td>
</tr>
<tr>
<td><em>Rupicapra pyrenaica</em></td>
<td>2 1 -- -- -- --</td>
<td>8 16 --</td>
</tr>
<tr>
<td><em>Capreolus capreolus</em></td>
<td>-- -- -- --</td>
<td>-- 1</td>
</tr>
<tr>
<td><em>Ursus spelaeus</em></td>
<td>19 15 -- -- --</td>
<td>6 -- 2</td>
</tr>
<tr>
<td><em>Canis lupus</em></td>
<td>1 -- -- -- --</td>
<td>3 --</td>
</tr>
<tr>
<td>Identifiable</td>
<td>24 16 -- --</td>
<td>1 26 24 4</td>
</tr>
<tr>
<td>Non Identifiable</td>
<td>7 3 2 --</td>
<td>1 16 --</td>
</tr>
<tr>
<td>Total</td>
<td>31 19 2</td>
<td>1 17 26 24 4</td>
</tr>
</tbody>
</table>

516
the Chatelperronian, at the eastern side of the Cantabrian Region. The overlying levels in Labeko Koba (VII-IV), attributed to the Proto-Aurignacian and Aurignacian would also have their origin in hunting activity. At Ekain, the Aurignacian level IXa, shows a similar behaviour. The characteristics of the posterior occupations in both caves, suggests certain continuity in strategies along the early Upper Paleolithic.

Acknowledgments

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Villaluenga et al.
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