A wildcat (*Felis silvestris*) butchered by Neanderthals in Level O of the Abric Romaní site (Capellades, Barcelona, Spain)

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**A R T I C L E  I N F O**

**A B S T R A C T**

The most common prey of humans during the European Middle Palaeolithic was large and medium-sized ungulates. In contrast, evidence of human processing of small animals and carnivores is very scarce in this chronology. In Level O of the Abric Romaní site, dated to 55 ka, various evidence of human activity has been identified in *Cervus elaphus, Bos primigenius* and *Equus ferus*, but also in *Felis silvestris*. The present paper focuses on the specific case of this felid. The main aim is to explain the anthropogenic use of the wildcat, taking into account actualistic and archaeological studies. An analysis is undertaken of skeletal part representation, surface modifications (cutmarks), bone breakage pattern (one or both epiphyses missing from certain limb bones) and the spatial dispersion of the remains (clustered and unevenly distributed). The results indicate that all the remains belong to a nearly complete individual that was processed and consumed by Neanderthals inside the rock shelter. This case is compared with the other taxa identified in Level O, with other carnivores recovered from the Abric Romaní site and with other sites with a similar chronology. It is suggested that Neanderthals had a more diverse diet and more variable subsistence strategies than previously thought.

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1. Introduction

In general terms, most faunal assemblages accumulated by humans during the European Middle Palaeolithic are dominated by large and medium-sized ungulates. Accordingly, many studies have traditionally attributed to Neanderthals a narrow diet in which ungulates were the main source of energy. Several researchers have argued that the use of other animal resources emerged in Upper and Epi-Palaeolithic periods, indicating a widening of the diet in this chronology (Stiner et al., 2000; Aura et al., 2002; Hockett and Haws, 2002; Lupo and Schmitt, 2002; Jones, 2006).

Nevertheless, some assemblages pre-dating the Upper Palaeolithic show evidence of anthropogenic processing of animals other than ungulates, such as carnivores or small prey (<20 kg). Among the latter, Stiner (2001) distinguishes between slow or sessile species (e.g. shellfish and tortoises), fast-running animals (e.g. hares and rabbits) and quick-flying animals (e.g. birds). Among these groups, fast-running and quick-flying species require greater skills and/or more complex procurement techniques (Stiner et al., 2000; Stiner and Munro, 2002). In addition, various disciplines such as dental microwear analysis, carpology and phytolith analysis have brought to light that the Neanderthal diet included a wide range of plant foods (Barton et al., 1999; Pérez-Pérez et al., 2003; Lev et al., 2005; Gaudzinski and Roebroeks, 2011; Henry et al., 2011).

The earliest evidence of small prey consumption dates back to the Plio-Pleistocene or Lower Pleistocene (Fernández-Jalvo et al., 1999; Güleç et al., 2009; Braun et al., 2010), but this evidence is very scarce. In Europe, a few cutmarks on avian (level TE9a), lagomorph (level TE12a) and tortoise (levels TE14c and TE11) remains from Sima del Elefante (Sierra de Atapuerca, Spain) demonstrate the use of small animals during the Early Pleistocene (Huguet, 2007; Blasco et al., 2011).

From the Middle Pleistocene, evidence of the anthropogenic consumption of small prey comes to be more frequent, particularly in the Mediterranean Basin. For instance, anthropic consumption of tortoises is known from Middle Palaeolithic sites from Israel and southern Europe (Stiner, 1994; Arribas et al., 1997; Stiner et al., 2000; Speth and Tchernov, 2002; Stiner, 2005; Blasco, 2008;...
Morales Pérez and Sanchis Serra, 2009). There is also considerable evidence of anthropic processing of birds and leoprids (Mourer-Chauviré, 1975; Mourer-Chauviré, 1989; Fiore et al., 2004; Soressi et al., 2008; Sanchis Serra and Fernández Peris, 2008; Blasco and Fernández Peris, 2009; Cochar et al., 2012). Consumption of marine and river resources has also been documented in southern Europe during the Middle Palaeolithic (Stiner, 1994; Roselló Izquierdo and Morales Muñiz, 2005; Stringer et al., 2008).

In assemblages, the human use of small animals is an exception to the general context, in which the use of ungulates is most common. However, in a few cases the systematic exploitation of these animals has been demonstrated. A clear example is Layer 4 of Les Canalletes (Mediterranean France), where Cochard et al. (2012) suggested the recurrent use of leoprids as a source of food by Neanderthals. Likewise, anthropic consumption of small prey (tortoises, birds and rabbits) seems to have been regular in Bolomor Cave (Blasco, 2008; Sanchis Serra and Fernández Peris, 2008; Blasco and Fernández Peris, 2009, 2012).

On the other hand, the hominin use of carnivores has also been documented in a few Pleistocene sites. The most common anthropogenic evidence takes the form of cutmarks, mostly related to skinning activities and in some cases to defleshing and disarticulating activities. For instance, cutmarks are shown by Ursus dolininensis and Vulpes praeglaucalis remains from Level TD6-2 of the Gran Dolina site (Atapuerca, Spain), dated chronologically to more than 780 ka (Saladí et al., 2011). Diagnostic elements of anthropic activity (cutmarks and bone breakage) have been identified in lion bones from another level (TD10-1) of the same site, dated to between 250 and 350 ka (Blasco et al., 2010). Cueva de los Torregones (Spain) has also provided evidence of human processing of felids, this time on a leopard dated to the first half of the Upper Pleistocene (Arribas, 1997). Likewise, an ulna, a femur and a coxal from Crocota crocota from the Sala de los Huesos site (Maltravieso Cave, Spain, around 120 ka BP) show cutmarks (Rodríguez-Hidalgo, 2010; Rodríguez-Hidalgo et al., 2011). In some sites butchering activities have been observed on canid remains, such as a tibia from Valdo and河西 (Madrid, Spain), probably from a fox (Yravedra, 2007), and a dhole mandible from Cova Negra (Valencia, Spain) (Pérez-Ripoll et al., 2010). Finally, Auguste (1995) documented the anthropic processing of ursids in Biache-Saint-Vaast (Pas-de-Calais, France).

As in the case of small prey, carnivores were generally exploited opportunistically and sporadically (e.g. Arribas, 1997; Blasco et al., 2010). Nevertheless, a few Middle Palaeolithic sites show evidence of regular, systematic and even specialized exploitation of these animals. A clear example is the ursids from Biache-Saint-Vaast (Pas-de-Calais, France) (Auguste, 1995).

Against this background, the present paper discusses the case of Level O of the Abric Romani site. In this level, various evidence of human activity has been identified in Cervus elaphus, Bos primigenius and Equus ferus, but also in a nearly complete individual of Felis silvestris. With the aim of understanding the anthropogenic activities associated with this felid, surface modifications, breakage patterns and the spatial dispersion of the remains were analysed. Furthermore, actualistic data (from ethnoarchaeological and experimental studies) were used to help interpret the human use of the wildcat. Finally, this case is compared with other taxa from Level O, with other carnivores recovered from Abric Romani, and with other sites with a similar chronology.

2. The Abric Romani site and Level O

2.1. The Abric Romani site

The Abric Romani site is a travertine rock shelter located in the town of Capellades (Barcelona, Spain), in the north-eastern corner of the Iberian Peninsula (Fig. 1). The rock shelter lies about 280 m a.s.l., and its coordinates are 41°32’N and 1°41’E. It opens northwards from the “Cinglera del Capelló”, a cliff associated with a waterfall system, intermittently active during the Pleistocene, which connected regional aquifer springs with the Anoia River. This river cuts through the Catalan Pre-Coastal Range and connects two structural areas: the Ebro Basin and the Vallés-Penedès Basin (Fig. 1).

The archaeological site was discovered in 1909 by Amador Romani, who excavated it intermittently until 1930. Eduard Ripoll resumed work between 1956 and 1961. Finally, a team led by Prof. Eudald Carbonell has been undertaking archaeological work at the site from 1983 to the present.

The stratigraphic sequence is composed of more than 20 m of well-stratified carbonate sediments produced by fluvial and gravitational transport. It contains at least 25 archaeological levels interbedded between several travertine platforms (Fig. 1). The platforms were formed when the Capellades water spring was active, whereas the archaeological levels correspond to periods of low or no presence of water inside the rock shelter. This archaeological sequence has been dated by radiocarbon analysis and U-series methods to between 40 and 70 ka (Bischoff et al., 1988).

Except for the uppermost level (Level A), all the archaeological levels correspond to the Middle Palaeolithic (Carbonell et al., 1996). Palynological analyses indicate a succession of five different climatic phases, between the final phase of MIS 5 and the Hengelo Interstadial (Burjachs and Julià, 1994; Burjachs et al., 2012). Hundreds of combustion structures and wood imprints — from natural wood or wood tools — have been documented, along with Mousterian lithic tools, faunal remains and other materials (Carbonell et al., 1996; Carbonell, 2002, 2012, among others).

The faunal assemblages are dominated by red deer (Cervus elaphus) and the horse (E. ferus), which are present in all levels (Table 1). In some levels, aurochs (B. primigenius), rhinoceros (Stephanorhinus hemitoechus) or other ungulates are also present. In contrast, carnivores (Ursus sp., Canis lupus, Panthera leo spelaea, Panthera pardus, Lynx sp., F. silvestris and Crocota crocota) are scarce.

### Table 1

<table>
<thead>
<tr>
<th>Macromammal taxa</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A B C D E F G H I J K L M N O</td>
</tr>
<tr>
<td>Ursus sp.</td>
<td></td>
</tr>
<tr>
<td>Canis lupus</td>
<td></td>
</tr>
<tr>
<td>Panthera leo spelaea</td>
<td></td>
</tr>
<tr>
<td>Panthera pardus</td>
<td></td>
</tr>
<tr>
<td>Lynx sp.</td>
<td></td>
</tr>
<tr>
<td>Felis silvestris</td>
<td></td>
</tr>
<tr>
<td>Crocota crocota</td>
<td></td>
</tr>
<tr>
<td>Proboscoidea</td>
<td></td>
</tr>
<tr>
<td>Stephanorhinus hemitoechus</td>
<td></td>
</tr>
<tr>
<td>Equus ferus</td>
<td></td>
</tr>
<tr>
<td>Cervus elaphus</td>
<td></td>
</tr>
<tr>
<td>Bos primigenius</td>
<td></td>
</tr>
<tr>
<td>Rupicapra sp.</td>
<td></td>
</tr>
</tbody>
</table>

2.2. Level O

This level was excavated between 2004 and 2011 over an area of about 300 m². U-series dates yield an age of around 55 ka (Bischoff et al., 1988; Vaquero et al., 2013). It corresponds to a cold period at the beginning of MIS 3 (Burjachs et al., 2012; López-García et al., 2014).
More than 40,000 remains were recovered and coordinated from Level O, including lithic tools (23273), faunal remains (9299), charcoals, and other materials. Also, some wood imprints and thirty combustion structures were documented (Vallverdú et al., 2012).

The faunal assemblage is dominated taxonomically by C. elaphus, B. primigenius and E. ferus, and anatomically by limb and cranial elements (Gabucio, 2007; Gabucio et al., 2012; Gabucio and Bargalló, 2011; Gabucio et al., submitted for publication). Carnivores are represented by two canines from Ursus sp. and a partial skeleton of F. silvestris (Table 2). Previous zooarchaeological and taphonomic analyses have suggested that the origin of the faunal remains from Level O is mainly anthropogenic (Gabucio, 2007; Gabucio et al., 2012; Gabucio and Bargalló, 2011; Gabucio et al., submitted for publication).

### Table 2

<table>
<thead>
<tr>
<th>Taxa</th>
<th>NISP</th>
<th>MNE</th>
<th>MNI</th>
<th>AGE</th>
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<tbody>
<tr>
<td>S. hemitoechus</td>
<td>12</td>
<td>3</td>
<td>2</td>
<td>1 ad., 1 im.</td>
</tr>
<tr>
<td>B. primigenus</td>
<td>93</td>
<td>32</td>
<td>4</td>
<td>3 ad., 1 im.</td>
</tr>
<tr>
<td>Equus ferus</td>
<td>58</td>
<td>19</td>
<td>4</td>
<td>3 ad., 1 im.</td>
</tr>
<tr>
<td>Ursus sp.</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1 ad.</td>
</tr>
<tr>
<td>Cervus elaphus</td>
<td>207</td>
<td>43</td>
<td>4</td>
<td>2 ad., 1 ad./sen., 1 im.</td>
</tr>
<tr>
<td>Capra pyrenaica</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1 ad.</td>
</tr>
<tr>
<td>Felis silvestris</td>
<td>100</td>
<td>72</td>
<td>1</td>
<td>1 ad.</td>
</tr>
<tr>
<td>Birds</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1 ad.</td>
</tr>
<tr>
<td>O. cuniculus</td>
<td>50</td>
<td>29</td>
<td>3</td>
<td>3 ad.</td>
</tr>
<tr>
<td>Large size</td>
<td>1087</td>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Medium size</td>
<td>1892</td>
<td>13</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Small size</td>
<td>270</td>
<td>10</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Very small size</td>
<td>56</td>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Unidentified</td>
<td>5466</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9299</td>
<td>234</td>
<td>19</td>
<td>14 ad., 1 ad./sen., 4 im.</td>
</tr>
</tbody>
</table>

### 3. Material and methods

This study includes all faunal remains identified as F. silvestris from Level O of the Abric Romani site (NISP 100), recovered during the seasons of 2004 and 2005. These remains were identified anatomically, indicating laterality (left or right), portion (relative to the length of the complete skeletal element) and side (anterior, posterior, and medial). The age at death was established by means of teeth (sequence of tooth eruption and replacement) and the epiphyseal fusion.

In order to assess the completeness of the sample, various parameters were calculated: NISP (Number of Identified Specimens), MNE (Minimum Number of Elements), MNI (Minimum Number of Individuals) and % Skeletal Survival Rate (Brain, 1981; Lyman, 1994). Next, the % Skeletal Survival Rate was correlated with shape-adjusted volume density (VDSA) values of Ornycotulus cuniculus provided by Pavao and Stahl (1999), using Spearman’s rho test. This step was carried out to assess the effect that density-mediated processes may have had on the skeletal profile.

Bone breakage was taken into account for this study. The completeness of bone fragments, in length and in circumference, was examined (Bunn, 1983). In addition, the features of the fracture surfaces (outline, angle and edge) of limb bones were analysed following Villa and Mahieu (1991). Finally, the results obtained from this assemblage were compared with those from other archaeological and actualistic studies, providing criteria for distinguishing among the agents that modified the bones of very small-sized animals (<20 kg) (Jones, 1983; Hockett, 1991, 1995; Hockett and Bicho, 2000; Hockett and Haws, 2002; Ibáñez and Saladié, 2004; Saladié, 2009; Cochard et al., 2012).

Modifications on bone surfaces were also analysed. Both macroscopic and microscopic techniques (Olympus SZ11 stereomicroscope and ESEM FEI QUANTA 600) were used. Damage observed on the assemblage included cutmarks, burning, grooves (related to plant activity), rounding and polishing (related to water activity), cracking and cementation. No carnivore activities are identified on bones.

Cutmarks were analysed according to their type (incisions, scrape marks, sawing marks and chopmarks), location (on the anatomical element), distribution (isolated or clustered, parallel or crossed) and orientation (oblique, longitudinal or transverse in relation to the longitudinal axis of the remnant) (Binford, 1981; Potts and Shipman, 1981; Shipman, 1983; Shipman and Rose, 1983; Bromage and Boyle, 1984; Noe-Nygaard, 1989). These features allow us to identify different butchery activities (skinning, defleshing, viscera removal, etc.), comparing the results of this study with data provided by previous actualistic and archaeological studies (Yravedra, 2007; Lloveras et al., 2009; Val and Mallye, 2011).

Burning causes various modifications on bones, among which colour change is probably the most obvious. In this work, a modification of the stages proposed by Stiner et al. (1995) was used: 0) unburned bones, 1) bones with brown stains, 2) homogeneously brown bones, 3) black bones (charred), 4) grey bones, 5) white bones (completely calcined).

Plant activity was also identified in the assemblage. Plants lead primarily to a chemical alteration of bone surfaces. Different types of corrosion were detected in the assemblage: sinuous grooves, perforations and stained surfaces (Lyman, 1994; Cáceres, 2002).

Water activity was identified in the assemblage through the presence of rounding and polishing on part or over the entire surface of the remains. Such modifications are caused by the friction of the sedimentary particle content in water. For this study, water activity was analysed in terms of the degrees of rounding and polishing proposed by Cáceres (2002) and previously applied to all the faunal remains from Level O (Gabucio et al., 2012). These degrees range from value 0 (no modification) to 3 (remains completely modified).

Cracks and fissures can result from the action of several taphonomic mechanisms, such as weathering, burning and changes in humidity. Among the F. silvestris bones, three stages of fissures were identified following Cáceres et al. (2012): 1) initial stage (the edges are not yet separated), 2) developed stage (with the edges separated from one another), and 3) final stage (cracks featuring exfoliations and/or loss of tissues).

Cementation is a mechanism of taphonomic alteration involving the addition of mineral components (Fernández López, 2000). This was also analysed here, in each case indicating whether it is present on the entire surface or only a part of the remain in question.

Finally, the spatial distribution of the remains was explored. Three-dimensional location was used to draw both surface maps and profile projections. These plots allowed the distribution of the different skeletal segments to be analysed and also the case of F. silvestris to be compared with other taxa. In addition, some refits (both anatomical connections and conjoined fragments of the same bone) were detected and located in space.

### 4. Results

Level O contains 100 remains of F. silvestris (NISP 100). These are grouped into 72 elements (MNE 72) belonging to a single adult individual (MNI 1) (Tables 2 and 3). The % Skeletal Survival Rate shows that some skeletal elements, such as the mandible, upper limbs and pelvis, are very well represented, followed by hind limbs and metapodials, while other elements are scarcer (vertebrae, ribs, carpals and tarsals) or even not present (cranium, scapulae).
Examining the % Skeletal Survival Rate by skeletal segments, the proximal appendicular skeleton is the most complete (83.33% Surv.), whereas the axial skeleton is lacking most elements (23.19% Surv.) (Fig. 2). The non-coordinated remains from the bags of general finds and wet sieving were checked for another study (Gabucio et al., submitted for publication), and the few remains of *F. silvestris* recovered have also been considered in this study. Therefore, the anatomical bias is not due to the excavation process. This anatomical bias, moreover, does not correlate with the bone density values provided by Pavao and Stahl (1999) (Table 3).
Regarding bone breakage, nearly half of the remains are complete elements (NISP 44) (Fig. 3). In addition, seven other remains are almost complete elements (lacking less than 1/5 of the complete element). Most of these elements are phalanges or articular bones, but there are also larger elements such as metapodials, ribs and vertebrae. Most of the other remains constitute at least half (both in length and in circumference) of the entire element.

On the other hand, some long bones are marked by the absence of one or both of their epiphyses (Fig. 3). Thus, the right humerus lacks the proximal epiphysis; the left humerus lacks the proximal epiphysis and the end of the distal one; the left femur (the only femur identified) shows no distal epiphysis; and the right tibia (the only tibia identified) is actually a shaft cylinder (Fig. 4). Analysis of the fracture surfaces of these elements is not easy because of the thinness of the cortical bone. However, it seems that transverse and V-shaped outlines, right and oblique angles, and irregular edges are most common.

Microscopic analysis of bone surfaces revealed the existence of cutmarks on four bones from the wildcat (Figs. 3 and 5, Table 4). The tibia shows four incisions on the medial side of the proximal diaphysis, distributed in two groups: one group with two parallel oblique marks and the other with two parallel transverse marks. The right hemimandible presents a transverse incision on the ventral side of the proximal diaphysis. Finally, two second phalanges each shows an incision (one transverse and the other oblique) on the ventral side of the proximal diaphysis.

Cutmarks Burning Sinuous grooves Stained surfaces Rounding Polishing Cracks fissures Cementation

<table>
<thead>
<tr>
<th>Cutmarks</th>
<th>NISP</th>
<th>% Wildcat</th>
<th>% Level O</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6</td>
<td>50</td>
<td>4.90</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td>78</td>
<td>1.46</td>
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<tr>
<td>23</td>
<td>21</td>
<td>36</td>
<td>17.96</td>
</tr>
<tr>
<td>36</td>
<td>28</td>
<td>15.84</td>
<td></td>
</tr>
</tbody>
</table>

There were also 29 remains affected by burning (Table 4). Seven bones (Humerus 2, Ulna 2, Scapula 2, and others) show the initial stage of burning (degree 1), seven others (Mandible 2, Patella 2, Tibia 2, and others) show the developed stage, and only three the final stage. Cementation affects 29 remains (Table 4). However, none of them shows this alteration over its entire surface. On the contrary, the cementation is isolated (NISP 14), concentrated on a portion of the bone (NISP 5) or dispersed across the bone surface (NISP 10). Finally, other taphonomic modifications (striae caused by trampling and manganese oxide pigmentation) were also observed on the remains identified as *F. silvestris*, but in numbers too low to draw any conclusions.

As for spatial distribution, it should be noted that all the remains identified as *F. silvestris* were concentrated within 5 m² at the theoretical SW of the Level O surface (grid squares M-O/58-59) (Figs. 6–8). In fact, most of the remains were recovered from grid squares N58 (NISP 35) and O58 (NISP 28). The item that is furthest...
from the rest of the remains (approximately 1.20 m from the centre of the accumulation) is the only wildcat bone recovered from grid square M58. Profile projections indicate that archaeostratigraphically the bones of the wildcat are very close to each other (Fig. 6).

A differential distribution depending on skeletal segments can be noticed. Broadly speaking, proximal appendicular elements (stylopodia, zygodon and patellae) are more dispersed than the other elements (Fig. 8). The remains belonging to the cranial skeleton, for instance, are clustered into two groups: one associated with the upper teeth (grid square N59) and the other with the lower teeth (grid square N58) (Fig. 8). Likewise, all the remains identified as part of the pelvis (coxals and sacrum) are located very close to each other. Axial elements are located in the top right-hand corner of the area. Distal appendicular elements (with a few exceptions in the lower zone) are distributed along the central belt of the area (Fig. 8). There are even some phalanges in anatomical connection.

In contrast, proximal appendicular elements are more distant from each other. In addition, an anatomical refit indicates that some of the elements that are furthest apart are actually part of the same limb (right humerus, radius and ulna) (Fig. 8). Other refits have been detected: an anatomical connection between the left radius and ulna (the latter divided into two halves separated by an ancient fracture); a group of three remains that make up the right fibula;

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**Fig. 3.** Recovered elements (in red) and approximate location of cutmarks (black straight lines). Side-undetermined elements are represented on the right side. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

**Fig. 4.** From left to right: both humerus, the femur and the tibia of *Felis silvestris* recovered from Level O.

**Fig. 5.** Cutmarks identified on *Felis silvestris* remains from Level O. Left: two of the four incisions located in the proximal tibia. Right: microscopic images (ESEM FEI QUANTA 600) of a cutmark on a second phalanx.
and an anatomical refit between the left femur, both coxals and the sacrum (Fig. 8).

5. Discussion

The MNE and the MNI indicate that all the remains identified as *F. silvestris* from Level O of Abric Romaní belonged to a single, nearly complete adult individual (Table 3). Several refits, both anatomical and mechanical, confirm this point. Likewise, spatial analysis (surface maps and profile projections) supports the idea that the accumulation of all these remains was the result of a single event, which was very well delimited both in space and in time (Fig. 6).

Post-depositional processes did not significantly alter the original position of the remains belonging to the wildcat. Various evidence points in this direction, such as the anatomical connection between some phalanges and the proximity of some elements from the same skeletal segment (for instance pelvic elements and the cranial elements grouped into upper teeth on the one hand, and lower teeth on the other). In addition, taphonomical analysis indicates that natural processes did not result in significant displacements of material. The very low degrees of rounding and polishing observed on some bones indicate that, although water was present, there were no water flows that could have transported the remains (Table 4). The effect of plant activity on the assemblage was quite strong (Table 4), but the projection profiles show that this process did not cause major vertical movements (Fig. 6). This is probably due to the fact that mosses (which played a key role in the formation of travertine platforms at Abric Romaní) could have been the main agent of this alteration, and these lack powerful roots (Gabucio et al., 2012). Likewise, the skeletal profile does not seem to have been biased by a natural density-mediated agent (Table 3).

On the other hand, there is enough evidence to attribute the presence of the wildcat to Neanderthals. The identification of cutmarks on some bones demonstrates anthropogenic use of this animal. This is also suggested by the breakage pattern and the distribution of limb bones. In contrast, there is no evidence of other potential accumulators, such as carnivores. From all this, it can be deduced that the wildcat was acquired by Neanderthals, who introduced its entire body into the rock shelter. It should be taken into account that wildcats are very fast and agile and that as carnivores they are certain to have shunned humans.

Cutmarks located on phalanges and on the mandible indicate that the animal was skinned, removing the fur of the limbs up to the second phalanges (Figs. 3 and 5). The absence of many caudal
vertebrae and almost all third phalanges (Fig. 3) suggest that a large number of these elements remained in the fur, and were probably carried elsewhere. This pattern fits with the theoretical model previously proposed to interpret fur exploitation in the Upper Palaeolithic (Fontana, 2003; Val and Mallye, 2011).

According to the results of the experimental study on small carnivores conducted by Val and Mallye (2011), the cutmarks on the tibia (four incisions on the medial side of the proximal diaphysis) are also consistent with skinning activities. Nevertheless, some authors have related similar cutmarks on tibia with defleshing activities, both in small carnivores (Yravedra, 2007) and in leporids (Lloveras et al., 2009). In any case, the distance between refitted elements (particularly between the right humerus, radius and ulna) suggests that some proximal appendicular elements were disarticulated and defleshed.

Regarding bone breakage, the thinness of the bones and the overlapping of sinuous grooves make it impossible to determine the state of the bones at the time of breakage. However, the fragmentation pattern of both humeri, the left femur and the right tibia (lacking one or two epiphyses, Fig. 4) is very similar to that documented ethnoarchaeologically in small animals processed by humans in order to obtain marrow (Jones, 1983; Hockett, 1991, 1995: Hockett and Haws, 2002; Saladié, 2009). Several archaeological studies have also reported similar breakage products in rabbit bones (especially tibia shaft cylinders), interpreting them as evidence of anthropogenic marrow removal (Hockett and Bicho, 2000; Ibáñez and Saladié, 2004; Coillard et al., 2012). It must be noted that the tibia, humerus and femur are precisely the elements that contain most marrow. In contrast, other appendicular elements with lower quantities of marrow, such as the radius and metapodials, do not show the same breakage pattern in Level O. Therefore, we think that the breakage pattern of proximal appendicular elements is related to anthropogenic marrow consumption. In turn, the anthropogenic breakage of these elements would confirm that defleshing activities had previously been carried out.

As regards the fragmentation of the rest of the skeletal elements, analysis has not provided significant evidence pointing to any concrete agent. Some remains present cracks and fissures, probably caused by humidity changes (taking into account the high number of remains affected by water activity, the low number of burned bones and the low number of cracks featuring exfoliations). However, these fissures rarely separate the elements into fragments, as deduced from the high number of complete elements (Table 4).

Regarding the skeletal part representation, it is possible that the absence of some elements (basically: the cranium, right femur, left tibia, both scapulae and many vertebrae, ribs and phalanges) was related to human activity. As previously mentioned, the distal phalanges and caudal vertebrae probably remained in the fur, after skinning. Likewise, the right femur and left tibia might have been destroyed in the process of removing the marrow, or transported to another place in order to perform this activity there. Ethnographic studies have documented the grinding of the vertebral column with stones (Hockett, 1995), suggesting that human processing may involve the destruction of part of the vertebrae. This pattern also seems to be common in archaeological assemblages, including those from the Middle Pleistocene (Sanchis Serra and Fernández Peris, 2008; Blasco and Fernández Peris, 2012). In fact, human consumption of small prey usually results in an under-representation of vertebrae (Hockett and Haws, 2002). Finally, the location of the upper teeth grouped together in a small area suggests that the cranium was there. The calotte was possibly broken (perhaps by Neanderthals, to consume the brain) into several fragments unidentifiable at a taxonomical level.

The fact that the proximal appendicular elements were more dispersed than the other skeletal segments could also fit well with the hypothesis of meat and marrow consumption by Neanderthals. Broadly speaking, the F. silvestris remains appear to have been recovered in almost the same position in which humans discarded them. Seen in this light, it is curious that the elements with the greatest utility as marrow, and associated with a substantial amount of meat, are those that are most dispersed. The selective

Fig. 7. Surface map showing the spatial distribution of the main identified taxa from Level O.
human consumption of these especially nutritive anatomical parts could explain this distribution. Some bones present a low degree of burning consistent with cooking (Hockett, 1991; Hockett and Haws, 2002; Lloveras et al., 2009). It is thus possible that the wildcat was roasted. Actualistic and archaeological studies indicate that it is the skeletal parts least protected by flesh, such as feet and the epiphysis of long bones, that tend to be the most affected by fire during roasting (Hockett, 1991; Hockett and Haws, 2002; Lloveras et al., 2009). Although three of the six burned remains of the wildcat from Level O are phalanges, the low number of burned remains prevents any conclusion from being drawn. In addition, taking into account the presence of hearths in the area, these bones could have been burned after their deposition or even after their burial (Stiner et al., 1995; Bennett, 1999). Finally, the brownish coloration showed by many remains makes it difficult to identify burning, and therefore data on this mode of alteration should be treated with caution.

The case of the wildcat examined in this paper represents an exception within the faunal assemblage of Level O. The assemblage is dominated taxonomically by red deer (C. elaphus), aurochs (B. primigenius) and horses (E. ferus) (Table 2). Various evidence (the abundance of skeletal parts with high nutritive values, the location of cutmarks and diagnostic elements of anthropogenic breakage on the diaphysis and metaphyses, the predominance of adult animals, the identification of cutmarks related with viscera removal, the scarcity of remains modified by carnivores, and the overlap of tooth marks on cutmarks) indicates that Neanderthals repeatedly had primary and immediate access to these ungulates (Gabucio, 2007; Gabucio and Bargalló, 2011; Gabucio et al., 2012; Gabucio et al., submitted for publication). Inside the rock shelter, ungulates were intensively processed and consumed. There is thus evidence of skinning, viscera removal, disarticulation, roasting, defleshing and periosteum and marrow removal (Gabucio, 2007; Gabucio and Bargalló, 2011; Gabucio et al., 2012; Gabucio et al., submitted for publication). After meat and marrow consumption, the resulting bone fragments were discarded across the surface, sometimes onto the hearths (Gabucio, 2007; Gabucio and Bargalló, 2011; Gabucio et al., 2012; Gabucio et al., submitted for publication).

Consequently, ungulate remains appeared dispersed across the entire surface of Level O, covering about 300 m² (Fig. 7). This spatial dispersion is also related to the fact that ungulate remains were the result of different, overlapping events. In addition, obtaining and processing their carcasses is certain to have involved numerous people, who would have then shared the food. Leporid and bird remains are also dispersed (Fig. 7), but the absence of anthropogenic marks suggests a natural origin for these animals (Gabucio et al., 2012).

In contrast, all the remains identified as F. silvestris are accumulated in a small area of 5 m² (Figs. 6–8). The spatial concentration of the wildcat remains is probably due to a convergence of several factors. Firstly, all the remains of the felid correspond to a single temporal event. Secondly, it certainly involved very few people. The latter idea is supported by ethnoarchaeological work suggesting that small animals are shared by fewer people and over shorter distances than large animals (Marshall, 1994, 1998). Thirdly, the human use of the wildcat (involving skinning and meat and marrow consumption) might have been less intensive, more focused on particular elements or just different technically from that observed in ungulates.

Apart from the wildcat, just one other carnivore has been identified in Level O: Ursus sp. This taxon is represented by only two upper canines, whose laterality (one right and the other left) and wear use pattern (very similar in both) suggest that both might belong to the same individual. The presence of these remains inside the rock shelter is perhaps due to Neanderthals, but there is no clear evidence of anthropogenic use.

A wildcat butchered by Neanderthals is also an exceptional case in the context of the Abric Romàni site. Large and medium-sized herbivores, especially red deer (C. elaphus) and horses (E. ferus), predominate throughout the sequence (Table 1). As in the case of Level O, taphonomic and zooarchaeological analyses indicate that these animals were accumulated and intensively processed by humans (Cáceres, 2002; Cáceres et al., 2012; Rosell et al., 2012). Rabbits (O. cuniculus) have also been identified, though not in an anthropogenic context, but interpreted as a result of natural intrusions.
Carnivore remains are uncommon, particularly in the lower part of the sequence (Levels F–O). Due to the greater proximity of the floor and the ceiling of the rock shelter, the higher levels (A–E) probably provided more favourable conditions for use as carnivore dens or refuges. The identified carnivores are Ursus sp., C. lupus, P. leo spelaea, P. pardinus, Lynx sp., F. silvestris and C. crocuta (Estévez, 1979; Sánchez, 1989; Rosell et al., 2012) (Table 1). Sometimes the remains of these animals were not recovered within the archaeological levels, but in the platforms interbedded among them (as in the case of P. leo spelaea and P. pardinus; see Table 1), suggesting an intrinsic urge (Cáceres et al., 1993). However, a lynx radius from the archaeological unit DCN 2 showed cutmarks related to defleshing activities (Saladié and Aimene, 2000). This case and the wildcat from Level O discussed in this paper are the only evidence of the human use of a carnivore identified so far in the Abric Romani site.

The focus of hunting on large and medium-sized ungulates in the Abric Romani is favoured by ecological features. The site is located in an ecotone formed by the contact between lowland and mountain ecosystems. The Anoia River cuts through the Pre-Coastal Range, functioning as a natural corridor between the coastal plains (Vallès-Penedès Depression) and the internal plains (Ebro Basin). The Abric Romani is located at the entrance to this canyon, a strategic place to control animal resources. Migratory animals, as horses and aurochs certainly were, could use this corridor in their seasonal movements. In addition, the mid-mountain forest of the Pre-Coastal Range was a good habitat for deer.

The landscape close to the Abric Romani was also a suitable habitat for other animals, such as chamois, rabbits and felids. This favoured the occasional use of some of these animals by Neanderthals. In this sense, the human use of the F. silvestris individual from Level O should be understood as an opportunistic and isolated episode. The same applies to the lynx from the archaeological unit DCN 2 (Saladié and Aimene, 2000).

Similar carnivore processing has been documented in other pre-Upper Palaeolithic sites of the Iberian Peninsula (Arribas, 1997; Yravedra, 2007; Blasco et al., 2010; Pérez-Ripoll et al., 2010; Rodríguez-Hidalgo, 2010; Rodríguez-Hidalgo et al., 2011; Saladié et al., 2011). For instance, Blasco et al. (2010) describe an opportunistic and sporadic episode of hunting and processing (skinning, viscera removal, defleshing and marrow removal) of a lion in Level TD10–1 of the Gran Dolina site (Atapuerca, Spain), dated to the Middle Pleistocene. Likewise, Arribas (1997) attributed to the hominins of the first half of the Upper Pleistocene the accumulation, the skeletal representation and the skinning of a leopard from Cueva de los Torrejones (Spain).

However, there is some evidence of frequent, repeated and systematic exploitation of carnivores during the Middle Palaeolithic. For example, Auguste (1995) concluded that Ursus arctos was systematically hunted, processed and consumed by Neanderthals in Biache-Saint-Vaast (Pas-de-Calais, France).

On the other hand, zooarchaeological evidence from several levels of Bolomor Cave (Valencia, Spain) indicates generalist human behaviour based on a broad-spectrum diet, including tortoises, birds and rabbits (Blasco, 2008; Blasco and Fernández Peris, 2009, 2012). Likewise, Cochard et al. (2012) also suggest a variation in diet breadth prior to the Upper Palaeolithic on the basis of an analysis of the faunal assemblage from Layer 4 of Les Canalettes (Aveyron, France), dominated by rabbit remains. Some authors have related this dietary broadening to different factors, such as the ecological diversity near the archaeological sites, climate instability, human mobility patterns, the demography of prey animals—prey dynamics and/or the technological complexity of human groups (Stiner et al., 2000; Hockett and Haws, 2002; Blasco and Fernández Peris, 2012; Cochard et al., 2012).

In conclusion, the wildcat from Level O of the Abric Romani should be added to the increasing body of evidence that foraging strategies during the Middle Palaeolithic were more varied and flexible than previously thought. The “wildcat event” may be a one-off, but it reveals real variability in Neanderthal behaviour. Despite being rare, the human use of animals other than ungulates, including carnivores and fast small-bodied taxa, was among the repertoire of subsistence strategies developed by Neanderthals. Thus, it seems that the biological difference between human groups was not the factor determining the exploitation of a greater variability of taxa, but rather environmental and social constraints were what fostered the exploitation of other resources.

6. Conclusions

Various lines of evidence demonstrate the anthropic use of an individual of F. silvestris recovered from Level O of the Abric Romani site, dated to around 55 ka. Data relating to the skeletal part representation, breakage patterns, bone surface modifications and spatial distribution indicate that the wildcat was acquired and butchered inside the rock shelter by Neanderthals, not only for skinning but also for food. The human use of this wildcat represents an isolated case in the context of Level O, and also in the context of the Abric Romani, where, as in many Middle Palaeolithic sites, the main prey were ungulates. There are other Lower and Middle Palaeolithic sites where the human use of animals other than ungulates, such as carnivores, has been documented. The case of the wildcat reported here, in conjunction with other, similar evidence, indicates that subsistence strategies during the Middle Palaeolithic were more varied and flexible than previously attributed to non-anatomically modern human groups. Neanderthals had the skills needed to exploit the different animal resources available in the nearby natural environment, including carnivores, and they could adapt their foraging strategies to the environmental and social factors of each specific moment.

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