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STONE AGE INSTITUTE PUBLICATION SERIES
*NUMBER 3*
*Series Editors Kathy Schick and Nicholas Toth*

# THE CUTTING EDGE:
## New Approaches to the Archaeology of Human Origins

*Editors*

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*COVER CAPTIONS AND CREDITS*

*Top: Homo habilis Utilizing Stone Tools. Painting by artist-naturalist Jay H. Matternes. Copyright 1995, Jay H. Matternes. Inspired by a prehistoric scenario by K. Schick and N. Toth in Making Silent Stones Speak: Human Origins and the Dawn of Technology (1993), Simon and Schuster, New York. Pp.147-149.*

*Lower right: Whole flake of trachyte lava from the 2.6 million-year-old site of Gona EG-10, Ethiopia. Reported by S. Semaw (2006), "The Oldest Stone Artifacts from Gona (2.6-2.5 Ma), Afar, Ethiopia: Implications for Understanding the Earliest Stages of Knapping" in The Oldowan: Case Studies into the Earliest Stone Age, eds. N. Toth and K. Schick. Stone Age Institute Press, Gosport, Indiana. Pp. 43-75. Photo courtesy of Tim White.*

*Lower left: Prehistoric cut-marks from a stone tool on Sterkfontein hominin partial cranium StW 53. Reported by T. Pickering, T. White, and N. Toth (2000) in "Cutmarks on a Plio-Pleistocene hominid from Sterkfontein, South Africa". American Journal of Physical Anthropology 111, 579-584. Scanning electron micrograph by N. Toth.*

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# CHAPTER 6

# The Oldest Occupation of Europe: Evidence from Southern Spain


## Beatriz Fajardo



### Abstract

Research into the early phases of human dispersion out of Africa into Eurasia, especially into Western Europe, has increased in the last decade, involving both fieldwork at already-known sites and the discovery of new localities, and now points to a very old occupation of this region. This paper presents an updated version of the actual state of knowledge of this question, complementing the discussion of technological characteristics of the oldest European archaeological assemblages presented by Fernando Díez-Martín in volume 2 of this series. It gives special emphasis to lesser-known sites in the southeast Iberian Peninsula, Barranco León and Fuente Nueva 3, which provide some of the best well-preserved paleontological and archeological evidence for the Early Pleistocene in Europe.


### When and Why Did Humans Colonize Eurasia?

Palaeoanthropological studies started with the assumption that Africa was the birthplace for genus *Homo* and that the first species leaving the continent to start the colonization of Eurasia was *Homo ergaster or early Homo erectus* around 1.7-1.9 Ma. This species is associated with hot, dry conditions, and preferred the grasslands, open scrub, and woodlands of East Africa after 1.7 Ma, avoiding environments that also contained permanent water (Dennell, 2003).

For many years, questions concerning possible causes for hominid migration have been explored. Vrba (1995) and deMenocal (1995) have suggested that major evolutionary events in East Africa are directly related to climatic conditions. Cooler, dryer conditions developed after 2.8 Ma and intensified at 1.7 and 1.0 Ma, with a pronounced dry period between 1.8-1.6 Ma. Those climatic events coincided with faunal changes occurring between 2.0 and 1.6 Ma, especially in suids (White, 1995). Changes in the regional vegetation from forest and grasslands to sparse dry steppe, and in the climate from sub-humid to semiarid/arid, are explanations for the migration of hominids to the north. Assuming hominids were primarily carnivores and scavengers, annual ranges would increase northwards during periods of aridity when food resources were diminished.

### When Did Humans Arrive in Western Europe?

Over the past 20 years, acceptance of the presence of early Paleolithic sites in Europe has been questioned, leading to the formation of the three following chronological hypotheses for the first dispersals of humans in Europe (Dennell, 1983; Carbonell et al., 1995).

1. *Young Europe* or *Short Chronology* (Roebroeks 1994; Roebroeks & van Kofschoten, 1994; Roebroeks & Tuffreau 1995). This hypothesis is supported by a lack of evidence regarding hominin fossil remains older than 0.5 Ma, the lack of clearly hominin-made lithic artifacts from sites older than 0.5 Ma, a lack of evidence of hominin occupation associated with *Mymomis savini* in early Pleistocene sites in Europe, and all the claimed findings from before 0.5 Ma. deriving from coarse, secondary deposits (Roebroeks, 1994; Carbonell et al., 1995). Thus, according to this hypothesis, the clear settle-

ment of Europe began 0.5 Ma, and any earlier, more sporadic occupation could be accepted only if an Early Pleistocene site in primary context were to be discovered (Roebroeks, 1994).

2. *Mature Europe* (de Lumley, 1976; Colotori et al., 1982; Cremaschi & Peretto, 1988; Carbonell et al., 1995) This hypothesis supports the presence of clearly hominin-made lithic assemblages in the Early Pleistocene, including after Vallonet (France) and Monte Poggiolo (Italy) along with somewhat younger sites such as Isernia la Pineta (Italy) dated to the early Middle Pleistocene, and sites such as Mauer (Germany) dated to at least 0.6 Ma. These open-air and cave sites found in Europe and claimed to date to between 1.0 and 0.7 Ma present the possibility of an older occupation in the continent, although the lack of hominin remains still hasn't fully convinced the scientific community.

3. *Old Europe* (Bonifay, 1991; Gibert & Palmquist, 1995; Carbonell et al., 1995). This hypothesis is supported by the discovery of the hominin fossils at Dmanisi (Republic of Georgia), the supposed *hominin* remains at Venta Micena (Orce, Spain), and several sites in the French Massif Central, such as Saint-Elbe, with lithic assemblages dated to more than 2.5 Ma. (Bonifay, 1991), and Chilhac, dated between 1.8-2.0 Ma (Guth, 1974; Bonifay, 1991). This hypothesis argues that the first human settlement in Europe in the late Pliocene-Late Pleistocene emerged through two possible routes, the Strait of Gibraltar or the Palestine Corridor, simultaneous with the origin of genus *Homo* in Africa.

Two major limitations exist in the development of Eurasian Lower Paleolithic research. First, the chronology of most of the archaeological sites in Eurasia is based largely on biostratigraphic studies and, in those few instances where it is available, palaeomagnetic studies. The second limitation is in the different taxonomic systems used in the study of the stone artifact assemblages. The more traditional system of the French typology school (empirical and descriptive) is used by some of the prehistorians (e.g. de Lumley, 1988), while a technological system of classification according to a Système Logique Analytique (SLA) (or 'Analytical Logical System') (Carbonell, 1992) is used by others, with a similar problem also affecting paleontological studies in Europe and Asia.

Almost all of the research on prehistoric Europeans exhibits a somewhat limited approach to the paleontological and archaeological record. For instance, it has focused on a restricted geographical area of reference (i.e. Europe) and has been limited to the remains of specimens of the genus *Homo*. It would appear, however, from recent years of research on the oldest African sites, that for a more coherent approach, focusing only on the chronological aspects or the anatomical characteristics of Eurasian hominids is not sufficient. Only with a general view that includes the technological and functional skills of the hominins, derived from the study of lithic assemblages as well as the climate and ecology of the area, will we be able to understand the first occupations outside of Africa.

The oldest occurrences described in the European sample were in the French Massif Central, which contained very small assemblages of artifacts or even isolated lithic pieces, most of them described as geofacts produced by volcanism in the region (Raynal et al., 1995; Diez-Martin, 2006). Other sites, Chilhac III (attributed to an age of 1.8 Ma.) and Soleihac (0.9 Ma.), published in the early 1990s as archaeological sites, present problems with regard to the dubious nature of their artifacts and the possible disturbed nature of their stratigraphic context (Chavaillon, 1991; Villa, 1991; Raynal et al,, 1995; Diez-Martin, 2006).

The case of Vallonet cave (de Lumley et al., 1988; Yokoyama et al., 1988) is different: there is strong evidence for its date of 0.9 Ma., based on biostratigraphic, palaeomagnetism and ESR, but the nature of the lithic assemblage presents problems. At the moment, the collection consists of 94 pieces, most of them in limestone and sandstone, with sporadic presence of quartzite and flint. All of the materials exhibit different degrees of alteration on their surface and have been found in deposits that contain sand and natural limestone cobbles. Currently, the two theories that attempt to explain the origin of this assemblage are:

1. Natural processes of sedimentation such as wave action could have produced natural fractures in pebbles (Roebroeks & van Kolfschoten, 1994);

2. The archaeological accumulation might be the mixture of different assemblages in a secondary context, based on the relative homogeneity of the assemblage and its lack of patterned spatial distribution within the stratigraphy as well as studies of post-depositional site formation (Villa, 1991; Raynal et al., 1995; Fajardo, 2004).

In 1998, El Aculadero (Querol & Santonja, 1983) was considered to be the most compelling proof of the oldest human settlement in the Iberian peninsula. Upon reconsideration of the geomorphological sequences in the area, however, this site is now placed at the end of the Pleistocene (Raposo & Santonja, 1995).

All of this controversy concerning the evidence for the *Mature Europe* and the *Old Europe* hypotheses helps reinforce the concept of the *Short Chronology* hypothesis, supporting the idea that around 0.5 Ma. *Homo heidelbergensis* occupied the continent, bringing in an already well-developed Acheulean technological complex. This is corroborated by several documented Acheulean sites across Europe. The discovery of the site of Dmanisi (Republic of Georgia), however, and its strong evidence of hominid migration into Eurasia at a very early date, has generated renewed hope of finding old sites in Western Europe.

The scenario in Western Europe changed in 1995 with the publication of the hominid remains now as-

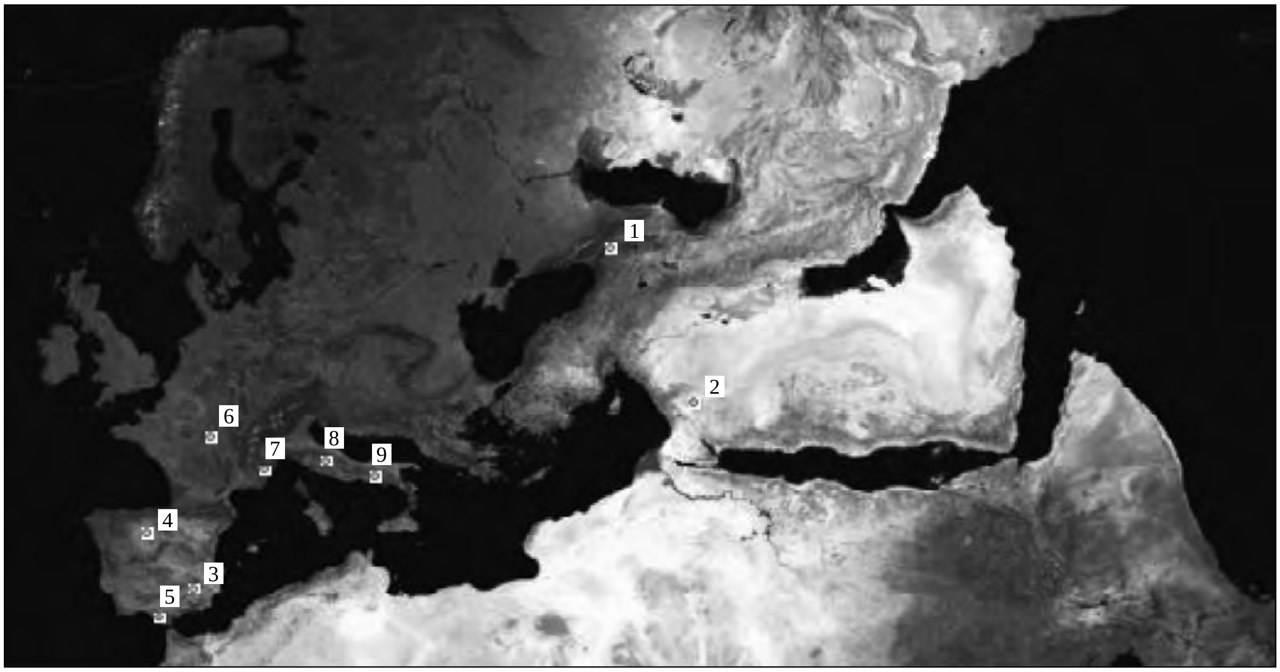



*Figure 1. The oldest sites in Western Europe cited in the text: 1: Dmanisi (Republic of Georgia), 2: Ubeidiya and Yiron (Israel), 3: Barranco León and Fuente Nueva 3 (Spain); 4: Sierra de Atapuerca, TD 6 and Sima del Elefante (Spain); 5: El Aculadero (Spain); 6: French Massif Central (France); 7: Le Vallonnet (France); 8: Monte Poggiolo (Italy); 9: Ceprano (Italy).*

cribed to a new species, *Homo antecessor* (Bermudez de Castro et al., 1997) from Atapuerca site TD6 (in Northern central Spain, Duero basin), dating to more than 780,000 years ago (Carbonell et al., 1995). In view of the hominid's age and its association with a rich faunal and lithic assemblage (Carbonell et al., 1999) in a cave context at Aurora stratum, the *Mature Europe* hypothesis, or the *Long Chronology* idea supported by the Atapuerca team, was strengthened (Carbonell et al., 1995). Further support of this hypothesis was added with the discovery in 1994 during the construction of a road of a human skull fragment in Ceprano (Italy), with characteristics reported at first to be like those of *Homo erectus* (Ascenci et al., 1996, 2000). Recent studies place the Ceprano specimen as a bridge between *H. ergaster/erectus* and *H. heidelbergensis* (Manzi et al., 2001; Diez-Martin, 2006). The hypothesis that this Italian fossil might be the first adult cranial specimen of *H. antecessor* is also possible (Diez-Martin, 2006).

According to Aguirre and Carbonell (Aguirre & Carbonell, 2001), three migration waves out of Africa can be identified with actual paleoanthropological data:

1. The first *Out of* Africa wave: Appearance of *Homo erectus (sensu strict)* in Indonesia in the same period as the creation of the Sunda Sea, in the later Olduvai magnetic subzone (Watanabe and Kadar, 1985; Semah, 1997). This is corroborated by the dating of earliest land mammal faunas of Java, near the end of the Olduvai event. The change in temperature recorded after 1.9 Ma points to colder and more arid conditions. The first appearance of *H. ergaster* occurred between 1.8-1.7 Ma.

2. The second *Out of* Africa wave: Appearance of Dmanisi hominids in the Republic of Georgia by 1.8 to 1.6 Ma), somewhat after the appearance of *H. erectus* in Indonesia. From a morphological point of view, the Dmanisi mandible is closer to the African *H. ergaster* and shows progressive *modern* traits not seen in *H. erectus* mandibles of Java (Rosas and Bermudez de Castro, 1998).

Around 1.7-1.6 Ma, open vegetation and increased aridity are recorded in Africa, and at around 1.5 Ma the sea level rises, the climate warms, woodlands in Africa improve, and lakes expand. The Eburonian cool climate vegetation interval is recorded in European mid-latitudes between 1.8 and 1.5 Ma. Between 1.8 and 1.6 Ma. important changes are recorded in the paleoanthropological register in Eastern Africa, with the evolution of *H. ergaster* and disappearance of *H. habilis*, and the first appearance of the Acheulean technological complex.

3. The third *Out of* Africa wave: The movement of hominids with Acheulean technology into Israel, as indicated by archaeological evidence of hominids at the site of Ubeidiya. The faunal assemblages at the Ubeidiya site included faunal elements from upper Olduvai Bed II, indicating an age older than 1.25 Ma as well as Eurasian species, and the archaeological evidence shows the appearance of Acheulean Technological complex in western Asia by this time.

A few early Pleistocene sites with hominid remains have been found in Eurasia, which can be usefully divided into three geographical areas for the purpose of this discussion (Arribas et al., 1999). As Europe is a political entity defined by historical attributes, and hominids probably wouldn't have the same conception of frontiers that we have now, we have to consider Eurasia as a geographical unit for the study of the first human dispersal out of Africa. The paucity of hominin and archaeological remains in this vast area can be explained two ways. First, taphonomic processes may be an important factor, as there is currently little representation of late Pliocene-Early Pleistocene assemblages in fine-grained sedimentary context. Secondly, and most importantly, insufficient fieldwork in deposits of suitable age in this region could also play a major role (Figure 1).

## 1. East Eurasia

The latest radiometric ages of several human remains of *Homo erectus* from Java, using the single-crystal Ar/Ar method (Swisher et al. 1994), have yielded dates between 1.6 and 1.8 Ma. This would suggest that the first occupation of this area was in the latest Pliocene, coinciding with the arrival in Java of several species of mammals that had originated in Asia (Satir fauna, 1.7 Ma, Semah, 1997; Arribas et al., 1999). The earliest finding in Java include the Modjokerto cranium, dated to 1.81±0.04 Ma, and the earliest specimens of Sangiran, dated about 1.6-1.7 Ma. The reexamination of the Bapang Formation (Kabuh, South East quadrant of the Sangiran), where almost 80 specimens of *H. erectus* were found, initially dated to between 1.51 and 0.08 Ma, are now suggested to date to before 1.5 Ma. Different teams do not agree with those dates, however (Semah et al., 2000), and argue a younger date of 1.3-1.0 Ma for the first appearance of hominids in Java.

At Longupuo Cave at Wushan, Sichuan Province in China (Wanpo et al., 1995) has yielded a mandible and teeth originally attributed to *Homo* but which probably represent an ape (Swartz, 1996; Wu, 2000). Ambiguous lithic pieces (two specimens) have also been reported for this site. Palaeomagnetic, biostratigraphical and geochronological (ESR) studies placed the levels in the late Pliocene, corresponding with the normal Olduvai event (1.96-1.78 Ma).

The presence of hominids at Dongyaozitou and Renzingdong at approximately 1.5 Ma. are regarded as not proven (Bar-Yosef et al 2001). The earliest nonambiguous well-dated evidence of hominids in China appears at Xiaochangliang at 1.36 Ma in the form of large assemblages of artifacts (Zhu et al., 2001).

## 2. Central Eurasia

Ronen (Ronen, 2006) has claimed that the earliest evidence of Out of Africa is in Israel, evidenced by a small series of flint artifacts (flakes, a core and retouched flakes) found in a gravel bed in 1980 at Yiron, dated between two basalt beds at 2.4 Ma. The site of Ubeidiya (Israel) situated south of the Lake of Galilee in the Erq el-Ahmar formation provides important assemblages of lithic artifacts representing early Acheulean technology as well as fauna remains dated biostratigraphically to around 1.4-1.3 Ma. Other sites such as Gesther Benot Yaaqov (GBY, in the northern Jordan Valley) are dated to approximately 0.8 Ma and also represent the Acheulean technological complex.

The strongest evidence of earliest settlements in Central Eurasia is in the Plio-Pleistocene site of Dmanisi (Republic of Georgia in the Caucasus region). An age for the site has been derived through K/Ar dating of the basalts below the deposits to be approximately 1.8-1.6 Ma, with magnetostratigraphy placing it in the Olduvai event and biostratigraph information supporting this date. The discovery of remains of several hominids include complete skulls of different individuals, which have been classified as an early type of *H. ergaster* or a new taxon, *Homo georgicus* (Gabunia et al., 2000; Lordkipanidze, et al., 2007). These hominids are associated with more than 4,000 lithic artifacts from six different beds. These artifacts have been classified by de Lumley et al. (2005) according to their technological and typological characteristics, particularly the absence of small retouched tools, as a "Pre-Oldowayen" cultural horizon (Lumley de et al., 2004). This is in line with the somewhat outmoded notion that tool-makers between 2.6-2.0 Ma such as at Gona sites in Ethiopia (EG10, EG12) have less knapping skill than later Oldowan tool-makers (Chavaillon 1976; Kibunjia et al. 1992; Kibunjia 1994: Piperno 1989, 1993; Roche 1989). The application of this concept to younger assemblages at Dmanisi seems to be non-evolutionary, in view of the evidence that early *Homo* originated in Africa and that the oldest lithic assemblages known at Gona in Ethiopia are classified as Oldowan technology rather than "Pre-Oldowan" (Semaw, 2000).

## 3. Western Eurasia

The oldest lower Pleistocene sites currently known are located below the lower limit of the Jaramillo Normal Subchron (>1.07Ma.) in the Orce-Venta Micena sector of the Guadix-Baza Basin, Barranco León and Fuente Nueva 3 (discussed below). In the Guadix-Baza Basin, other younger sites have been discovered, such as Cullar-Baza 1 dated to 0.8-0.7 Ma. and la Solana del Zamborino dated to the Middle Pleistocene.

*Homo antecessor* remains and Mode 1 stone tools have been found in the karstic site of Atapuerca (Burgos, Spain) at the Gran Dolina (A-TD 4-6) locality. These were found stratified in beds which, according to palaeomagnetic studies, are located below the Bruhnes-Matuyama reversal, indicating an age greater than 0.78 Ma (Carbonell et al., 1999; Pares et al., 1995). Another Atapuerca locality at Sima del Elefante (A-TE) (Carbonell, et al., 1999; Pares et al., 2006) corresponds to the Jaramillo subchron (0.990-1.070 Ma.), where stratigraphied deposits also contain Mode I artifacts. Thus, the lithic industries of Atapuerca suggest continual on long-term hominid occupation of southwestern Europe at the end of the Lower Pleistocene.

Some lithic artifacts made from flint were discovered in secondary stratigraphic context localized in three

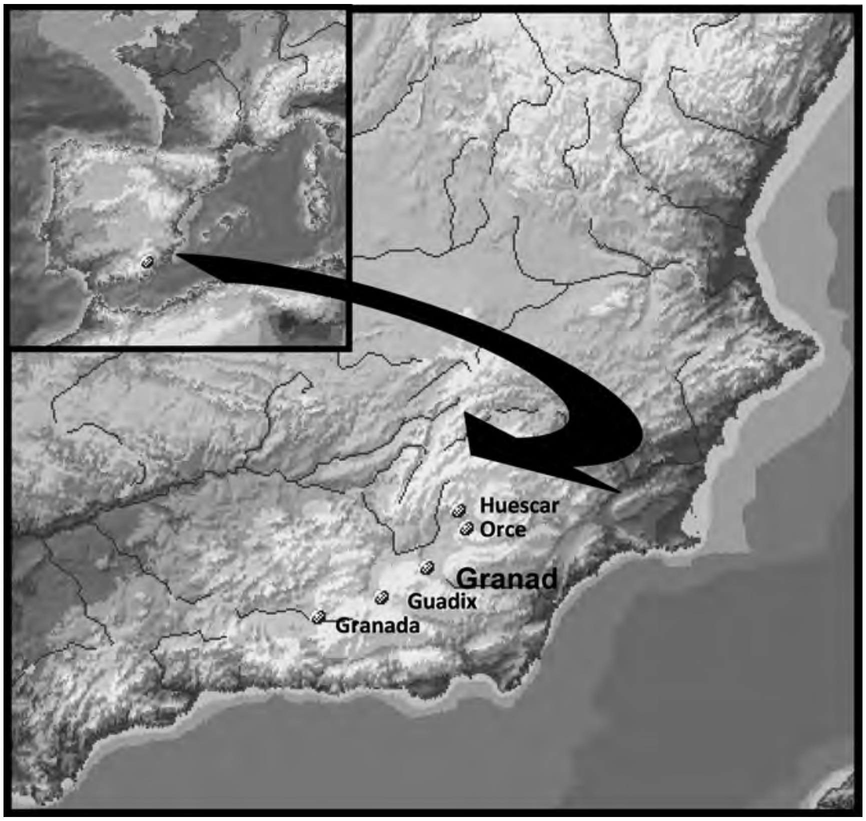



*Figure 2. Locale of the Guadix-Baza basin (After Toro et al., 2003).*

technological complex.

The Orce-Venta Micena sector (eastern part of the Guadix-Baza Basin) is at present a plateau situated at 900 m above sea level surrounded by the Massif mountains to the North and South. The badland system caused by erosion allows access to the 100 m thick sedimentary beds and supplies evidence of an ancient lake that existed from Pliocene times (Agustí et al., 2000; Martínez Navarro et al., 1997; Toro et al., 2003).

The research in the Guadix-Baza basin has been embroiled in debate since the 1982 discovery of a purported hominid cranial fragment (VM-0), unearthed while prospecting for beds with micromammals for dating this basin. According to its discoverers, the specimen can be attributed to *Homo sp*. and represents the oldest fossil hominid in Europe (Gibert et al., 1983; Martinez-Navarro, 2002). After this discovery, systematic prospecting was carried out looking for other ancient sites in the basin. Further archaeological sites were discovered at Barranco León and Fuente Nueva 3 among others.

different fissures at the Pirro Nord site in southern Italy and are dated between 1.3-1.7 Ma. (listed in the bibliography as a paleontological site, Apulia, Italy). The lithic industry currently consists of only three cores found in different fissures, plus some flakes found associated with an Early Pleistocene vertebrate fossil assemblage. In the absence of studies into the process of formation at the site, *the disarticulated, sometimes worn, or deeply abraded bones suggest fluviatile transport and preburial effect* (Arzarello et al., 2007), and also in view of the small size of the lithic assemblage, it would appear too early to consider this site as the oldest in Western Europe.

## The Case of the Early Stone Age at Orce, Barranco León and Fuente Nueva 3

One of the best examples of early occupation of western Europe is localized in the Betic Range of southern Spain, in the Guadix-Baza Basin at Orce (Figure 2). Some prehistorians believe that early Paleolithic assemblages in Europe have little value, as they are composed of small assemblages, and their ascription to Oldowan or Mode 1 (Clark, 1969) technologies is too ambiguous for the limited sample of tool-kits (Villa 1983, 2001; Kuman, 1998). Recent fieldwork at the archaeological Orce sites (Barranco León and Fuente Nueva 3), however, have increased the number of artifacts found in one representative sample, providing evidence that these artifact assemblages can be associated with the Oldowan

The specimen (VM-0, called *la galleta*) was published before it was fully cleaned, and initially only the external surface was studied. Controversy surrounding the fragment caused poor scientific reception of these sites, also complicated by the fragmentation of the original team. The research in this area continued after 1999 under the direction of Isidro Toro (Director of Granada Archaeological Museum), Jordi Agustí (a participant in the discovery of the polemic fragment, VM-0) and Bienvenido Martinez-Navarro (ICREA, Area de Prehistoria, Universitat Rovira i Virgili-IPHES).

The latest research by Martinez-Navarro concludes that the anatomy and size of the VM-0 specimen indicate it is the juvenile female of a large ruminant species (Martinez-Navarro, 2002). Currently, the only evidence of definitive human presence in the Early Pleistocene in the Orce region consists of the lithic artifacts recovered from Barranco León and Fuente Nueva3 (Martınez-Navarro et al., 1997; Oms et al., 2000; Toro et al., 2003; Fajardo, 2004). Bitterness over the controversy is still alive, however, so that even now, more than twenty years later, many focus on the problematic human nature of the fossil fragment rather than on the direct evidence of human occupation contained in the lithic assemblages from Barranco León and Fuente Nueva 3.

The geology of the Guadix-Baza basin (southeast of the Iberian Peninsula) became known in the 1970s,

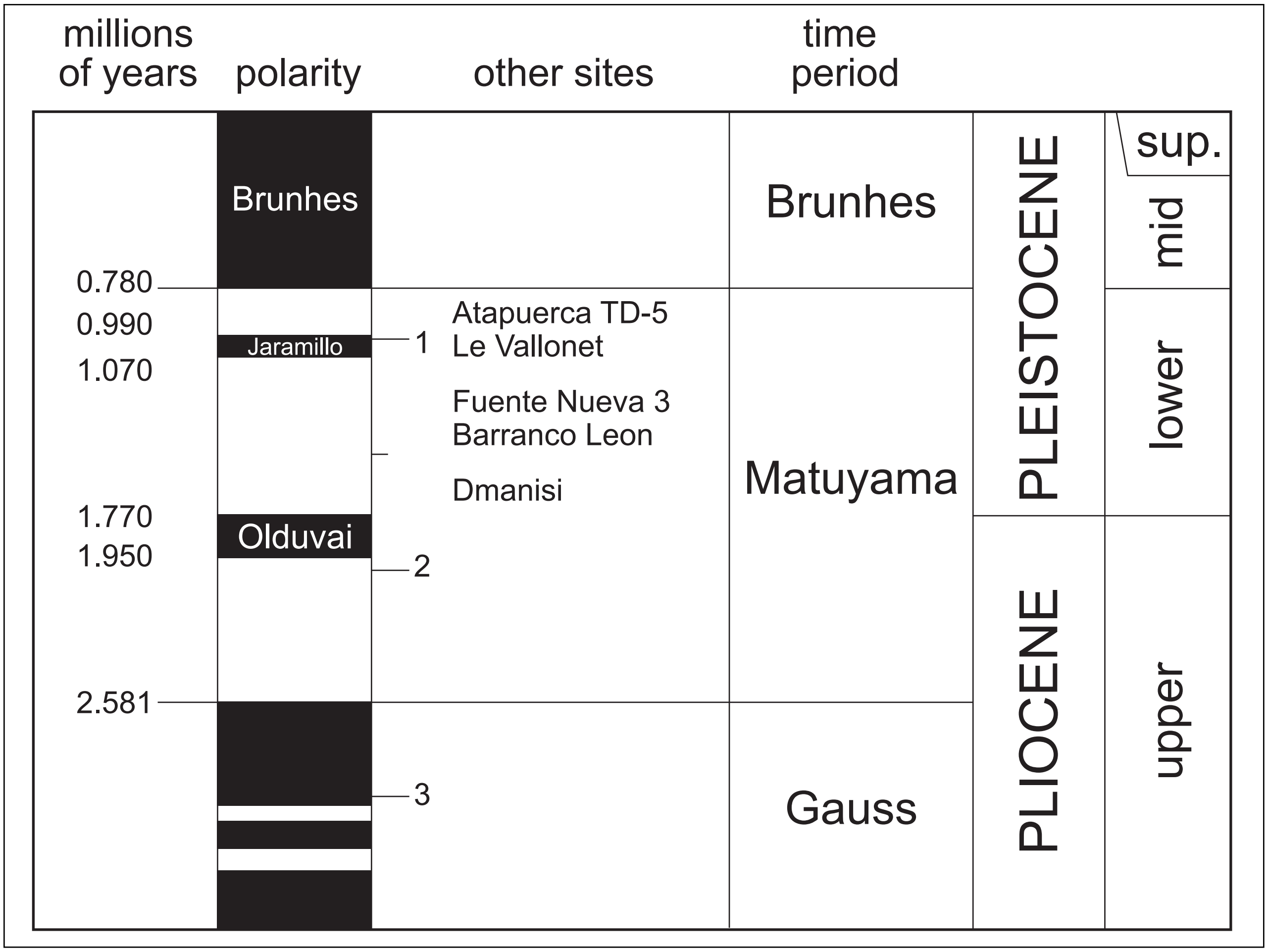



*Figure 3: Correlation between the sections of Barranco León and Fuente Nueva 3 and the paleomagnetic time scale (Oms 2003).*

thanks to the work of Prof. Juan Antonio Vera (Vera, 1970). The author divided the depression into two main areas–the basins of Guadix and Baza. The first, Guadix, is dominated by a torrential fluvial system, mainly with sedimentary input from the Sierra Nevada. The second, Baza, is dominated by a lake system with evaporitic sediments (limestone, gypsum and salt). This depression has been capped since the late Miocene, but retains an exceptional Pliocene paleontological record as well as an archaeological and paleontological record from the Lower Pleistocene to the Late Middle Pleistocene. More recent lake sediments within this depression has yielded a locality with Acheulian lithic assemblages, La Solana Zamborino (Botella et al., 1979; Martinez-Navarro et al., 2003). The basin was captured at the Upper Pleistocene by a tributary of Guadalquivir River (Calvache et al., 1997).

## Dating and fauna

Barranco León and Fuente Nueva 3 are open-air sites located in a lacustrine/wetland context and contain lithic artifacts associated with a fauna largely composed of big mammals. Several conclusions can be reached from the biostratigraphic register (Figure 3) and palaeomagnetic analysis from both Barranco León and Fuente Nueva 3. First, the two deposits are within sections of dominant reverse polarity. This gives them an age before the Brunhes Normal Chron and places them in the Matuyama Reversed Chron (an assignment to earlier reversed Subchrons are ruled by the biostratigraphic data). Secondly, the magnetic and biostratigraphic evidence indicate that these deposits are older than reversed Jaramillo Subchron but more recent than normal Olduvai Subchron (Figure 4) (Oms et al., 2000, 2003).

Faunal remains from the new excavations are currently under study, but preliminary data from one indicating the presence of species has been published (Martinez-Navarro et al., 2003; Martinez-Navarro et al., in prep). Large mammals show a faunal break at the Plio-Pleistocene boundary, marked by the arrival of African and Asian species. In the excavated faunal assemblage, we can find bones modified by the action of carnivores (specifically from one very big hyena, *Pachycrocuta brevirostris*) and also hominid cutmarks.

More than 3,000 faunal remains are present in both sites. Preliminary study of the materials up to 2003 shows that 52.9% at Barranco León are identifiable, and 45.7% at Fuente Nueva 3. Both sites show a quite similar faunal composition (Table 1) and similar skeletal element representation, although there are some key differences

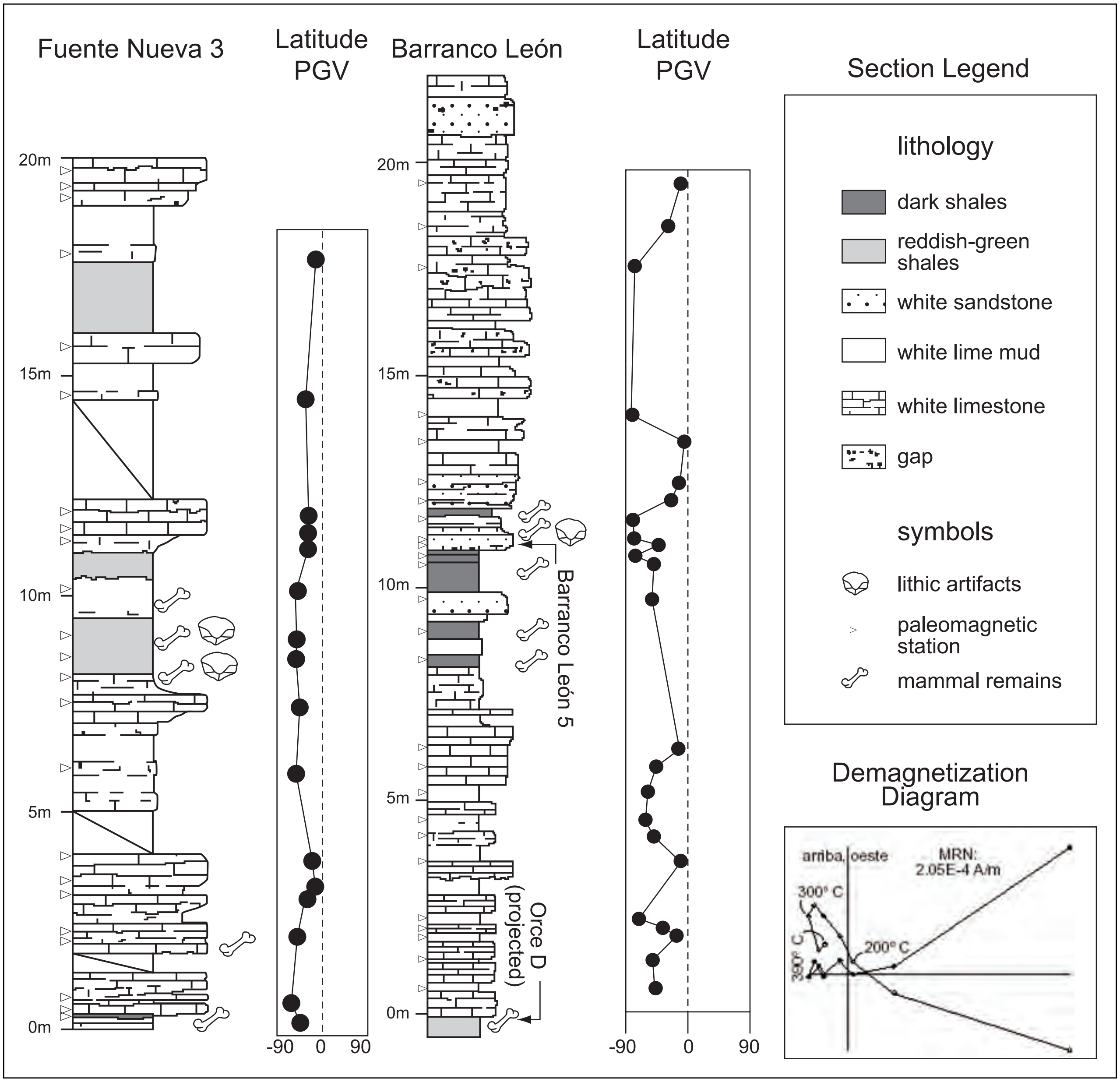



*Figure 4. The stratigraphic sections at Barranco Leon and Fuente Nueva-3 showing the locations of paleomagnetic samples taken, the mammalian localities, and the archaeological sites. (after Oms et al., 2000).*

between the two localities in the former, primarily in the relative abundance of different megaherbivore species. In Barranco León, *Mammuthus meridionalis* is practically absent, while at Fuente Nueva 3 it is one of the best represented species, especially in the Upper Bed. *Hippopotamus antiquus*, however, is abundant in Barranco León but scarce in Fuente Nueva 3.

## Taphonomic state of the materials

The statistical probability of the faunal differences between these sites being due to a sampling error is practically nil. These differences in faunal components are almost certainly related to real faunal differences tied to the very different environments of these two sites–a lacustrine environment with occasional clastic sedimentation in the case of Barranco León, and a lacustrine/wetlands environment with areas of pools in the case of Fuente Nueva3 (Espigares et al., in press).

The faunal remains at Fuente Nueva 3 show little evidence of hydraulic transport. Very few remains have polished or rounded surfaces, and some articulated elements have even been found in this locality. The analysis of bone orientation is not possible, as only a small number of remains are available for such analysis, so such study awaits retrieval of a larger data set (Espigares et al., in prep). On the other hand, at Barranco León, in the lower part of Bed D represented by sands (D2) and gravels with pebbles (D1), including some of great size, are numerous faunal elements with polished or rounded surfaces as well as stone artifacts in D1 that show pati-

*Table 1: Animal species at Barranco León and Fuente Nueva 3 according to Martinez-Navarro (in prep)*

| **Fuente Nueva 3** | **Barranco León** |
|---|---|
| *Homo* sp. (Only lithic assemblages) | *Homo* sp. (Only lithic assemblages) |
| *Ursus* sp. | *Ursus* sp. |
| *Canis mosbachensis* | *Canis mosbachensis* |
| *Lycaon lycaonoides* | *Lycaon lycaonoides* |
| *Vulpes* cf. *praeglacialis* | *Vulpes* cf. *praeglacialis* |
| *Pachycrocuta brevirostris* | *Pachycrocuta brevirostris* |
| Felidae indet. | Cf. *Homotherium* sp. |
| *Lynx* sp. | |
| *Felis* cf. *silvestris*. | |
| *Meles* sp. | *Meles* sp. |
| *Pannonictis cf. nestii* | cf. *Pannonictis* |
| Mustelidae indet. (small size) | |
| *Mammuthus meridionalis* | |
| *Stephanorhinus hundsheimensis* | *Stephanorhinus hundsheimensis* |
| *Equus altidens granatensis* | *Equus altidens granatensis* |
| | *Equus suessenbornensis* |
| *Hippopotamus antiquus* | *Hippopotamus antiquus* |
| *Bison* sp. | *Bison* sp. |
| *Ammotragus europaeus* | |
| *Hemitragus* cf. *albus* | *Hemitragus* cf. *albus* |
| *Praemegaceros* cf. *verticornis* | *Praemegaceros* cf. *verticornis* |
| *Metacervocerus rhenanus* | *Metacervocerus rhenanus* |
| | *Oryctolagus* cf. *lacosti* |
| Erinacenae indet. | Erinacenae indet. |
| *Crocidura* sp. | *Crocidura* sp. |
| Sorex minutus | Sorex minutus |
| *Sorex* sp. | *Sorex* sp. |
| *Galemys* sp. | *Galemys* sp. |
| *Asoriculus gibberodon* | *Asoriculus gibberodon* |
| *Allophaiomys* aff. *lavocati* | *Allophaiomys* aff. *lavocati* |
| *Allophaiomys* sp. | *Allophaiomys* sp. |
| *Mimomys savini* | *Mimomys savini* |
| *Castillomys crusafonti* | *Castillomys crusafonti* |
| *Apodemus* aff. *mystacinus* | *Apodemus* aff. *mystacinus* |
| *Hystrix* sp. | *Hystrix* sp. |

nation. The analysis of orientations of elements in Bed D1 indicates a prominent SW-NE orientation, in line with the paleocurrent in the area. The upper part of the layer, however, contains much finer-grained sediments, primarily fine sands, indicating lower-energy deposition. This is supported by the presence of conjoining artifacts as well as some bones in anatomical connection and coprolites.

The spatial distribution of fossil remains at Barranco León does not reveal patterning in either a horizontal or vertical sense, as both bones and lithic remains are fairly uniformly distributed in the deposit. In Fuente Nueva 3, however, stone artifacts are especially concentrated in the Lower Bed but are scarce within the Upper Bed (although the fact that the Lower Bed has been excavated more extensively than the Upper Bed could potentially help bias this apparent pattern). The relative abundance of coprolites of *P. brevirostris* in the different levels of this site would indicate a relatively greater impact of hominids in the Lower Bed as opposed to relatively greater impact of carnivores in the Upper Bed. Overall, the accumulation of remains presents evidence of modification through a variety of means, including anthropic, carnivore and rodent activity as well as by purely diagenetic processes (Espigares et al., in press).

## Stratigraphic position

### *Barranco León*

The site of Barranco León (Figure 5) is at the moment the oldest site yet found in the Guadix-Baza Basin. It is situated 3 km of east of Orce within a ravine that runs from north to south, from the base of the bell tower of Sierra of Umbría to Cañada de Vélez,

The stratigraphy proposed by Anadón & Juliá (Anadón & Juliá; 2003) is the following:

The observable succession from the bottom of the ravine to the top of the plain can be traced along a gentle slope in the lower, more northerly part of the ravine, where primarily fine-grained, marly lutite sediments, reddish and whitish, are exposed (Red detritic member). Above these layers are carbonates containing quartz sand, silt and clay, which form the steeper parts of ravine (Upper muddy limestone member). Within these strata the archaeological Bed BL 5 (Turq et al., 1996) has been identified, in which the following sedimentary sequence can be observed in the excavation trench and in nearby

*Figure 5. Barranco León September 2007 (B. Fajardo).*

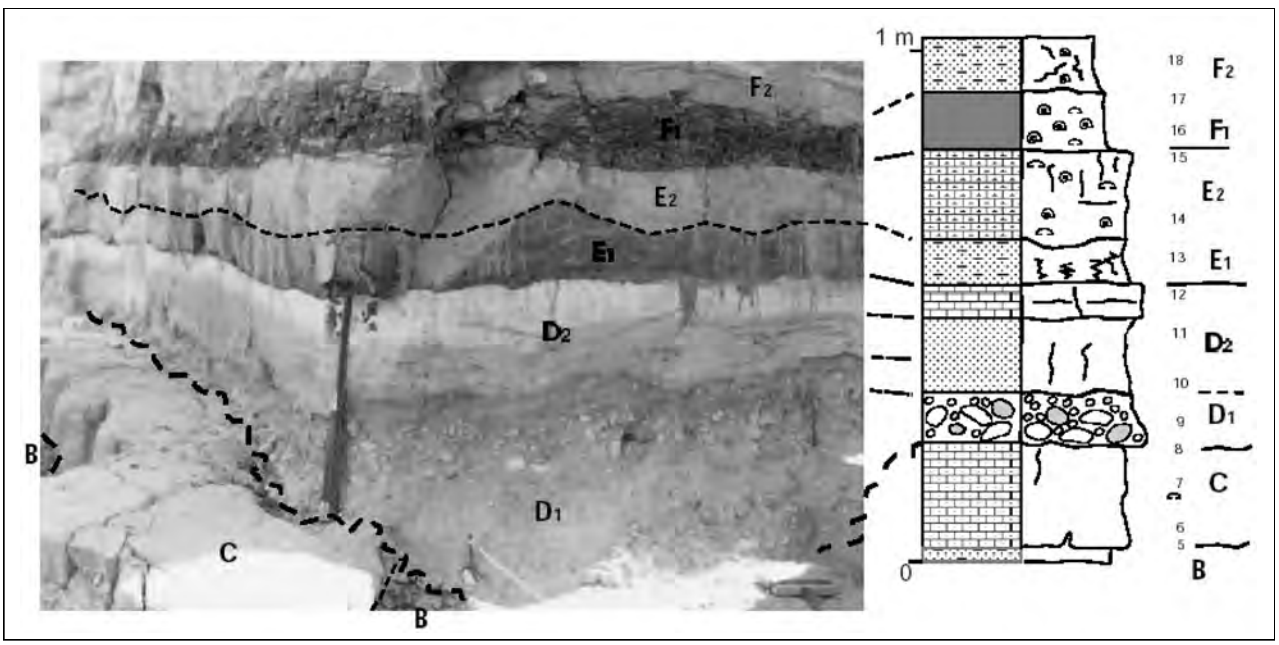



*Figure 6. Synthetic stratigraphy of Barranco León (after Toro et al. 2003).*

outcrops, from the bottom to the top (Figure 6):

A) (Not shown in Figure 6). Bed of variable prominence around one meter in thickness, exposed in the southern excavation area and composed of calcarenite-calcisiltite with plentiful gastropods. This Bed corresponds to the base of the Bed “d” of the profile LD of Anadón & Juliá (1987) and is situated at the level of sands and blackish and reddish luttites in the big extension trench (Beds L 2-3 according to Anadón & Juliá, 1987).

B) 25-32 cm of variable thickness, formed by sandy beds of different colors, grey, green, blackish, with inclusions of the sandy lutites with quartz. Sands consist of grains of quartz and feldspars. Certain beds show laminations and ferruginous spots.

Figure 7. Fuente Nueva 3, (after Toro et al., 2003)

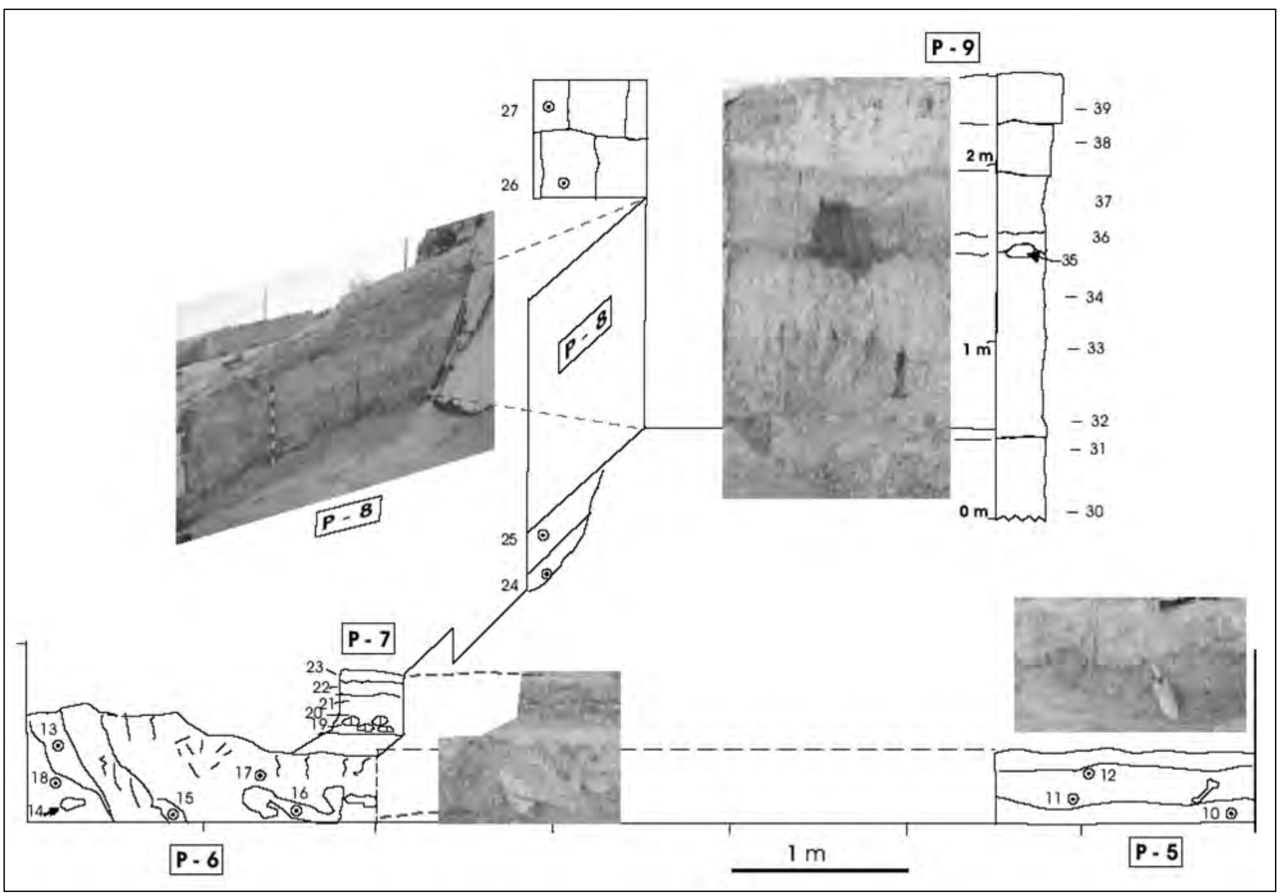



Figure 8. Synthetic stratigraphy of Fuente Nueva 3 (after Duval et al., in prep.).

*Figure 9.* Mammuthus meridionalis *from the Upper Bed of Fuente Nueva 3. (After Toro et al., 2003).*

C) 20-30 cm, calcisiltites in beige calcarenites with ostracods and numerous bivalves (Spaeriidae). There are visible vertical tracks of bioturbation and some faunal remains of isolated vertebrates.

D) 5-65 cm, Turq et al., 1996 correlated by Turq et al., (1996) with the Bed BL-5 described by Turq and Gibert (Gibert et al., 1998). In the area of the excavation, this bed can be divided into two sub-beds, the lower one, D1, characterized by variable sandy gulleys and irregular erosive basal contact. Above, is the sub-Bed D2, 22 cm of sands with gray quartz bioclastics, which present yellowish irregular spots which end in a bed of white limestone full of ostracods and gyrogonites of charophytes (casts of stonewort fruit).

E) 32-35 cm, this can be subdivided into two beds. The uppermost, E1, consisted of a basal bed of sands made up primarily of quartz and feldspar, reddish, ochre and greenish colors, about 5 cm thick. Bed E2, approximately 27 cm thick, is a layer of gray, marly-calcareous sediment with numbers of gastropods, ostracods and gyrogonites of charophytes.

F) 22cm, a layer of blackish lutites and gastropods (F1, 12 cm thick.) topped by a 10 cm layer of gray green, finely stratified quartz-bioclastic sands. At its upper contact with the overlying bed are small white nodulary concretions.

G) Beige bioclasitic calcareous sands, with a high percentage of large siliciclastic rocks as well as scattered shells of ostracods.

## *Fuente Nueva 3*

The site of Fuente Nueva 3 (Figure 7) is situated approximately 8 km to the east of Orce, in the extension of the Fuente Nueva excavation, close to the ruins of a church and old fountains after which the site is named.

The deposits are characterized by carbonate deposits and major secondary oxidations which make reading the stratigraphic sequence difficult. At the base, 11 sedimentary layers can be grouped into five lithostratigraphic units, containing two layers of human occupation. The sequence is made up of fine-grained carbonate deposits (clays to fine sand). At the base is a limestone (ULS I), followed by the marly-calcareous deposits (ULS II) which contain the lower archaeological bed. The ULS III, with the upper archaeological Bed, constitutes a sedimentary break in the sequence, with beds of relatively hardened. At the top is a very thick marly deposit (ULS IV) capped by layers of limestone (ULS V), (Figure 8). (Duval, et al., in prep).

*Table 2: General breakdown of the lithic assemblages.*

| Artifact categories | BL | | FN3 N. INF | | FN3 N. SUP | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| **Nucleus** | 23 | 1.80 | 25 | 2.72 | 0 | 0 |
| **Whole flakes** | 191 | 14.95 | 230 | 25.03 | 25 | 12.14 |
| **Flake fragments** | 99 | 7.75 | 108 | 11.75 | 22 | 10.68 |
| **Angular fragments** | 4 | 0.31 | 77 | 8.38 | 39 | 18.93 |
| **Hammerstones** | 14 | 1.10 | 33 | 3.59 | 4 | 1.94 |
| **Modified pieces** | 23 | 1.80 | 32 | 3.48 | 3 | 1.46 |
| **Unmodified pieces** | 75 | 5.87 | 67 | 7.29 | 25 | 12.14 |
| **Retouched pieces** | 26 | 2.03 | 12 | 1.31 | 1 | 0.49 |
| **Anvils** | 0 | 0.00 | 10 | 1.09 | 0 | 0 |
| **Debris** | 823 | 64.40 | 325 | 35.36 | 87 | 42.23 |
| **Total** | 1278 | 100.00 | 919 | 100.00 | 206 | 100 |

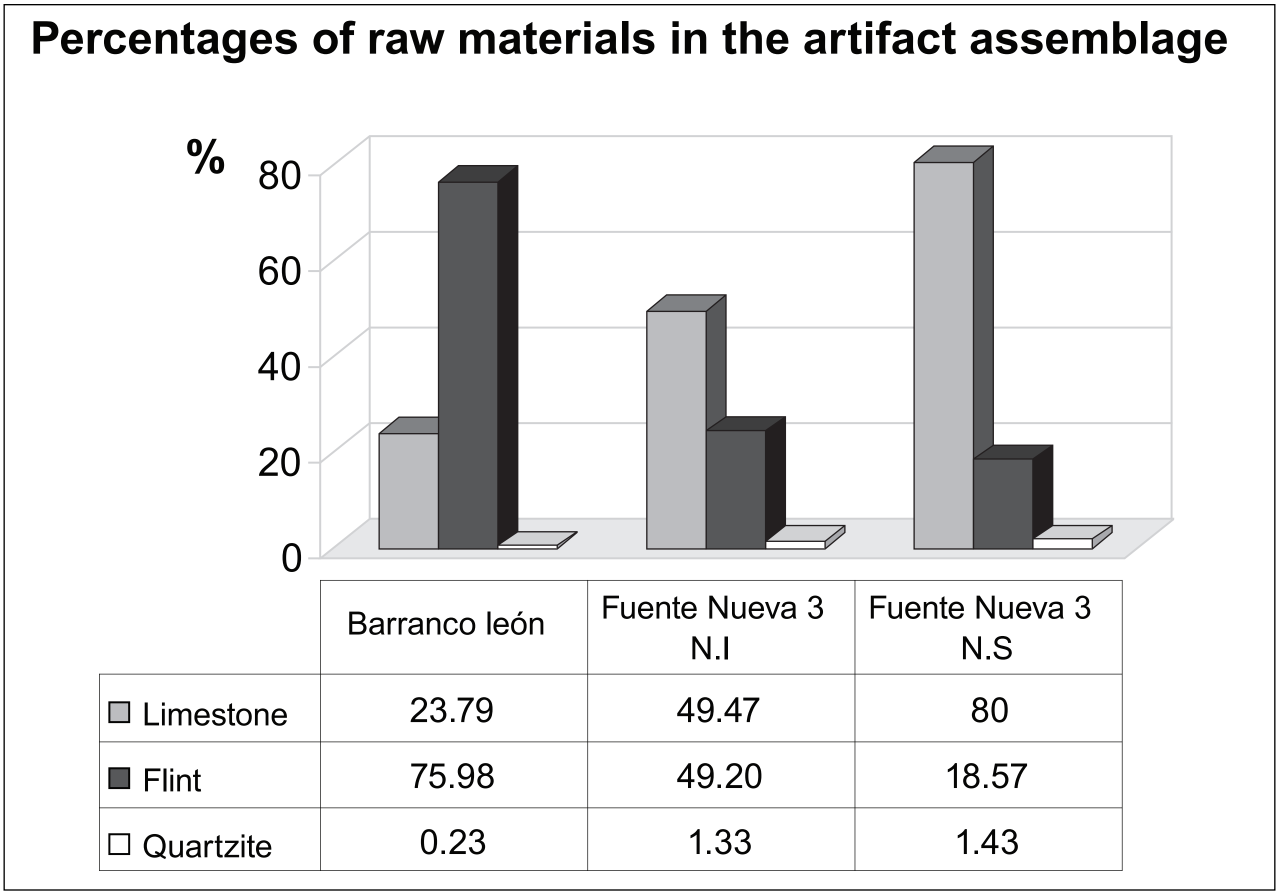



*Figure 10. Raw materials distribution in the lithic assemblage of each site.*

## Overview of the Oldowan Lithic Assemblages from Barranco León and Fuente Nueva 3.

The systematic archaeological and geological survey and excavation at Barranco León and Fuente Nueva 3 sites (Orce, Spain) during the last decade led to the discovery of well-flaked stone artifacts, which are currently some of the oldest known from Europe, along with a faunal assemblage, stratified within fine-grain sediment.

At Barranco León the area of excavation is 40 m$^2$ with a 0.6 m depth of deposit for Beds D1 and D2 combined. At Fuente Nueva 3, the excavation area in the Upper Bed comprises 65 m$^2$ (with 8 m$^2$ occupied by the

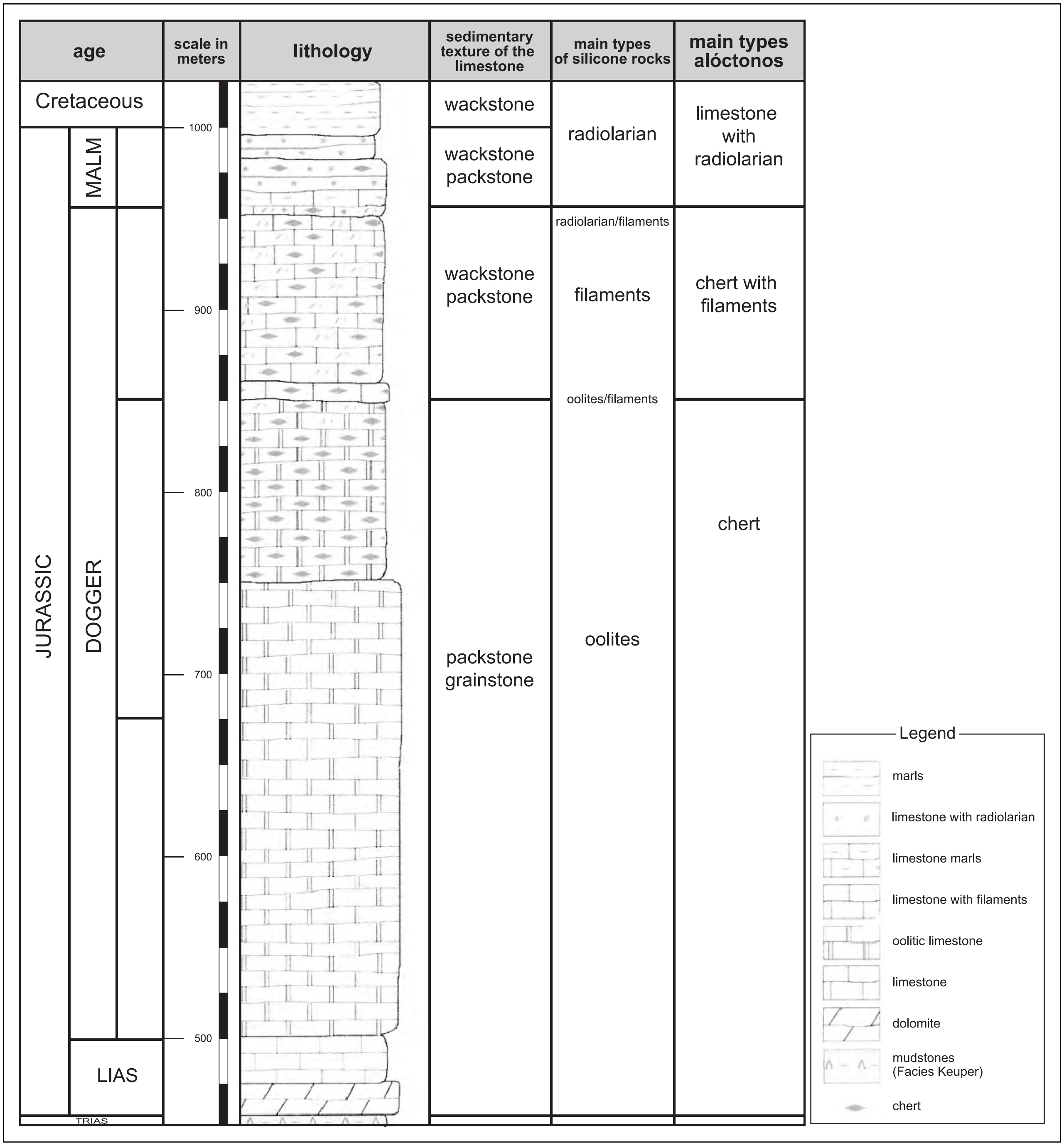



*Figure 11. Synthetic stratigraphy of montain system south of the sites at Sierra de Orce and Sierra de Maria (after Ramos Millán et al., 1991).*

skeleton of a *Mammuthus meridionalis*) (Figure 9) with a deposit depth of 0.30 m), and the excavated area in the Lower Bed extends 50 m$^2$ with a 0.5 m depth of deposit.

The composition and characteristics of the artifact assemblages from Barranco León and Fuente Nueva 3 are broadly similar to other Lower Pleistocene assemblages assigned to the Oldowan Industrial Complex or Mode I technology, characterized by a low degree of standardization (simple core forms and débitage). Both assemblages consist of cores, hammerstones, whole and broken flakes, a high density of angular fragments, as well as a few retouched pieces. The majority of the artifacts fall into the débitage category, including whole and broken flake debris and angular fragments. Flint and limestone were the best represented raw materials, and a few pieces of quartzite are also present. The raw material sources for the Orce tool-making hominids, accessible from nearby ancient streams, were small cobbles and tabular fragments.

In spite of the simplicity of the technology and the accidents of débitage, the tool-makers managed to produce good quality flakes. This is evident not only in terms of the technical mastery of flaking, but also in terms of the choice of good quality raw materials, which denotes

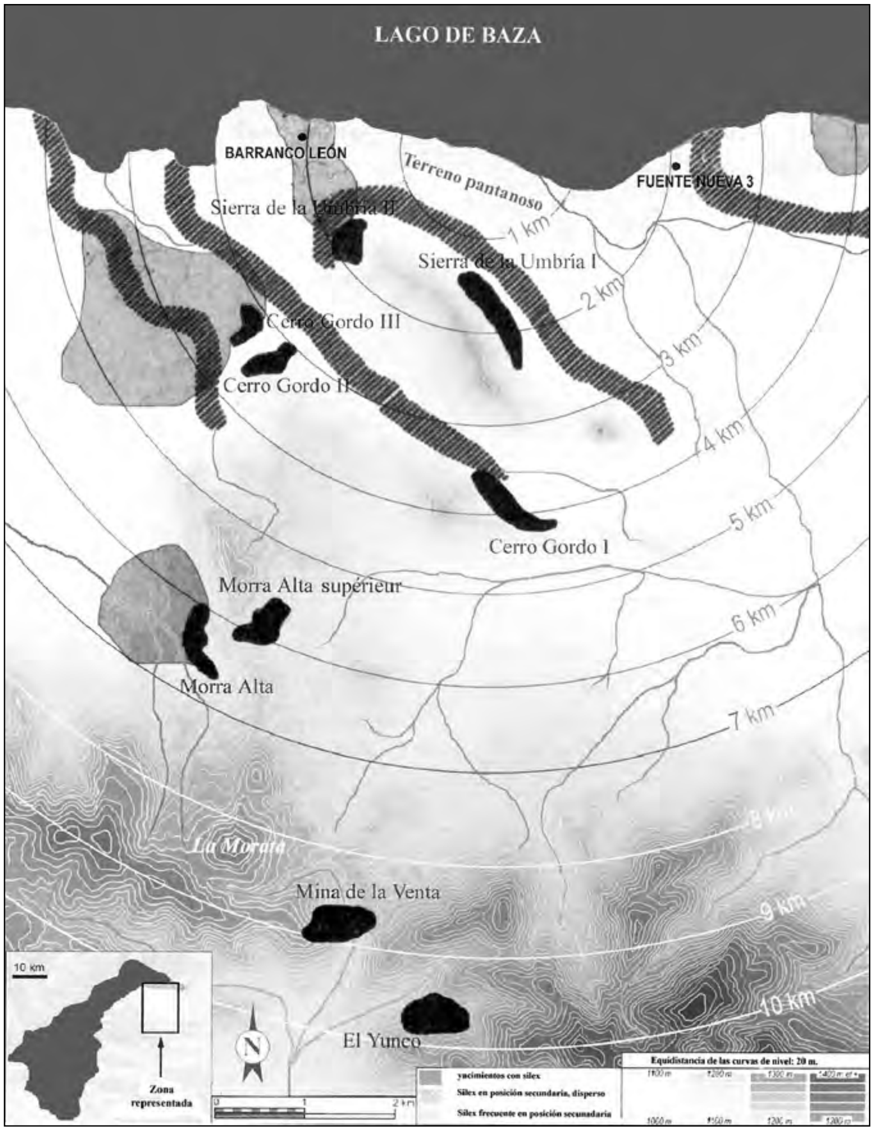



*Figure 12. Zones of Jurassic flint and localization, (in black) of flint in secondary position (in gray), in the hydrographic area and in the slope deposits (after Toro et al. in prep).*

knowledge of the properties of stone sources available. The flakes define the finality of the production, and of the relatively simple strategies of débitage.

The Barranco León lithic assemblage is composed of 1,278 pieces, the Fuente Nueva 3 Lower Bed assemblage of 919 pieces, and the Fuente Nueva 3 Upper Bed assemblage of 206 pieces (Table 2). These assemblages are composed of technological types in the following categories: cores, whole flakes, flake fragments, angular fragments, hammerstones, modified pieced, unmodified pieces, retouched pieces, anvils and debris. The presence of small pieces < 2 cm in the assemblages of both sites suggests minimal disturbance by depositional or post-depositional process at the sites.

## Raw materials

Most of the artifacts present at Barranco León and Fuente Nueva 3 are made of flint and limestone, with the exception of a few quartzite pieces, and manufactured through hard hammer percussion (n=961, 75.20% in flint, n=290, 22.69% in limestone and n=3, 0.23% in quartzite in Barranco León, and for Fuente Nueva 3 N=371, 50.96% in inferior Bed and for the Superior Bed n=168, 80% in limestone; n=39, 18.57%, in flint and n=3, 1.43% in quartzite) (Figure 10).

The flint, which formed during the Jurassic period, is present in different colors and textures. The original form of the flint used was in the form of tabular pieces. Overall, the flint was of poor quality, coarse grained, and in a variety of colors ranging from yellow to green. The green flint is the best quality and is the most abundant in the Barranco León assemblage. In the case of Fuente Nueva 3, the most abundant flint is white in color, indicating that it had been leached of most of its silica by post-depositional processes not yet identified. The Jurassic limestone present in both sites is of two different qualities - marly limestone and siliceous limestone.

Both types of raw material are found in geologi-

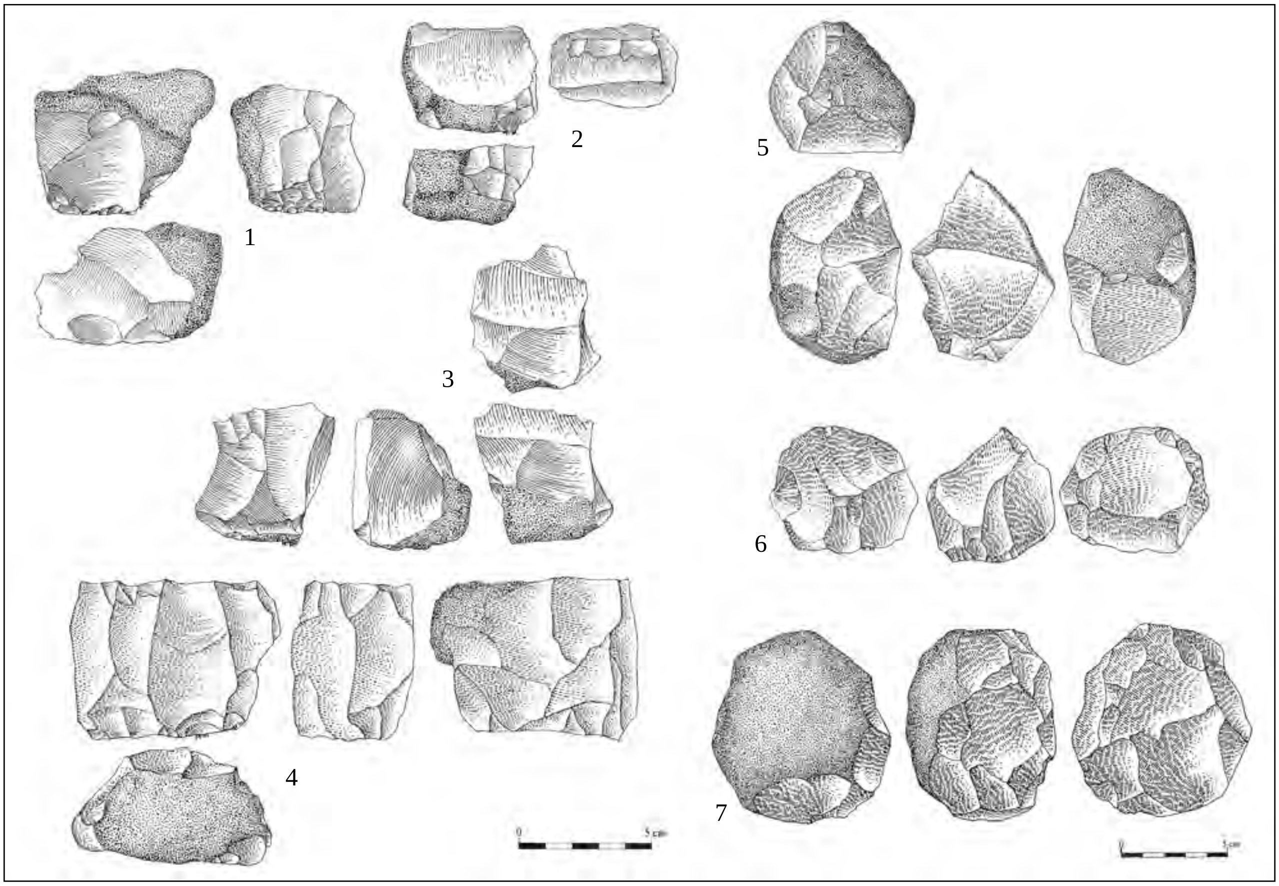



*Figure 13. Cores from Barranco León: 1-4 cores in flint, 5-7 cores in limestone, made by direct percussion with hard hammer, except number 4, which was produced by bipolar technique with an anvil. The size difference between both raw materials is clearly evident.*

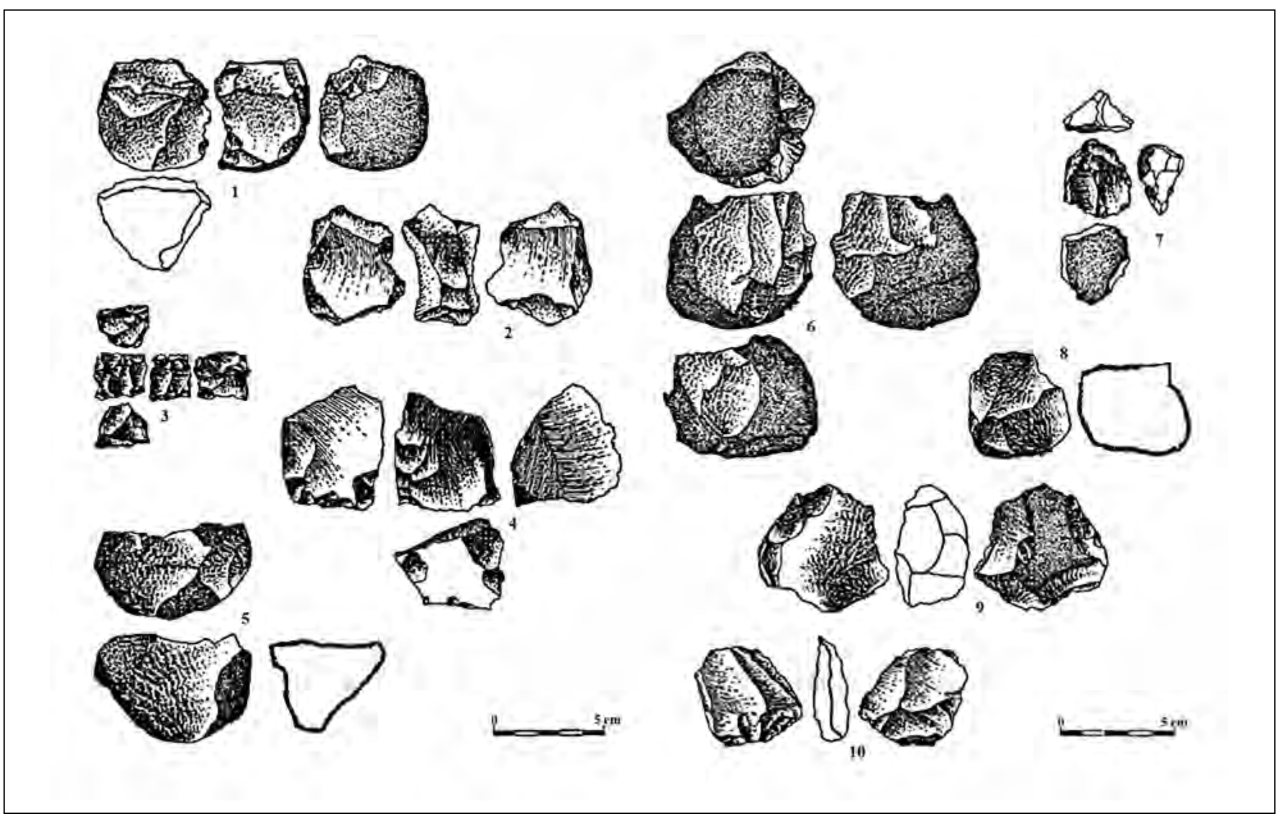



*Figure 14. Cores from Fuente Nueva 3. 1: core in quartzite; 2, 3, 4, 7, 9, 10: cores in flint; 5, 6, and 8: cores in limestone.*

*Table 3. Whole flake dimensions (in mm) and weight (g) at Barranco León, at Fuente Nueva 3 N. I, and at Fuente Nueva 3, N.S.*

| | Statistics | Mean | Std. Dev. | Range |
|---|---|---|---|---|
| **Barranco León** (n=191) | Length | 26.98 | 11.02 | 6-65 |
| | Breadth | 22.27 | 9.36 | 1-55 |
| | Thickness | 8.72 | 4.55 | 1-26 |
| | Weight in grams | 7.36 | 9.48 | 1-83 |
| | Ratio L/B | 1.35 | 1.03 | 0.38-15 |
| | Ratio B/T | 3.02 | 1.83 | 2-17 |
| **Fuente Nueva 3, N.I.** (n=230) | Length | 34.47 | 15.19 | 7-131 |
| | Breadth | 30.38 | 16.92 | 7-121 |
| | Thickness | 10.82 | 7.39 | 1-55 |
| | Weight in grams | 22.01 | 91.03 | 1-1086 |
| | Ratio L/B | 1.26 | 0.47 | 0.15-3.57 |
| | Ratio B/T | 3.44 | 2.08 | 0.93-16 |
| **Fuente Nueva 3, N.S.** (n=25) | Length | 30.92 | 14.48 | 9-65 |
| | Breadth | 28.08 | 12.59 | 6-59 |
| | Thickness | 9.64 | 6.74 | 2-30 |
| | Weight in grams | 23.37 | 3.16 | 1-236 |
| | Ratio L/B | 1.21 | 0.58 | 0.47-3 |
| | Ratio B/T | 3.65 | 1.93 | 1.13-9.5 |

cal primary context in the mountain system south of the sites, in the Sierra de Orce and the Sierra de Maria (figure 11), within 2 km of the sites, but the hominids probably used raw materials available from nearby ancient streams (Figure 12).

Comparison of frequencies of raw materials between Barranco León and Fuente Nueva 3 Inferior Bed, and Superior Bed is somewhat problematic. First, there is significant difference in the excavated area of the two sites, and secondly, there was selective recovery of artifacts in the first years of fieldwork by different teams working at the sites after their discovery. We can see different overall distributions of raw materials between Barranco León and Fuente Nueva 3, with limestone more prevalent in the latter site, but in both cases the débitage is predominantly flint. The percentage of retouched pieces is low, but most of these are made of flint. Relatively small proportions of cores are found in the assemblages of both sites, and cores are in fact absent in the Superior Bed of Fuente Nueva 3. The dimensions and technological patterns observed in the cores are largely dependent upon the original form and quality of the raw material, with the final typological assignment also corresponding to the different stages of flaking. Hard-hammer direct percussion is the only technique used by the hominins at Orce sites, with the application of this technique always adapted to the size and original form of the raw material.

Twenty-three cores are identified at Barranco León and twenty-five at the Inferior Bed of Fuente Nueva 3. The dimensions are variable, depending on the original form and quality of the raw material, and there are no stereotypical forms. In general, the cores made of limestone are bigger than those of flint, probably the result of more intensive flaking of the finer-quality flint. Most of the cores preserved the residual cortex. The number of scars varies among cores produced through unidirectional, bidirectional or multidirectional methods. Most cores can be classified (according to Mary Leakey's typology) as choppers, subspheroids and polyhedrons (Figure 13, 14).

A total of 198 whole flakes are present at the assemblage of Barranco León (Figure 15) (92.2% in flint, 6.5% in limestone and 1.4% in quartzite); 229 at Fuente Nueva 3, 204 in the Inferior Bed (79.41% in flint, 19.12% in limestone and 1.47% in quartzite) and 25 in the Superior Bed (60% in flint and 40% in limestone). The general dimension of the flakes is small and, as we can see in table 3, they are not standardized in shape.

Following the flake types of N. Toth (Toth, 1985):

- Type I: Cortical platform and cortical dorsal surface.
- Type II: Cortical platform and partially cortical dorsal surface.
- Type III: Cortical platform and non cortical dorsal face.
- Type IV: Non cortical platform with total cortical dorsal surface.
- Type V: Non cortical platform with partially cortical dorsal surface.

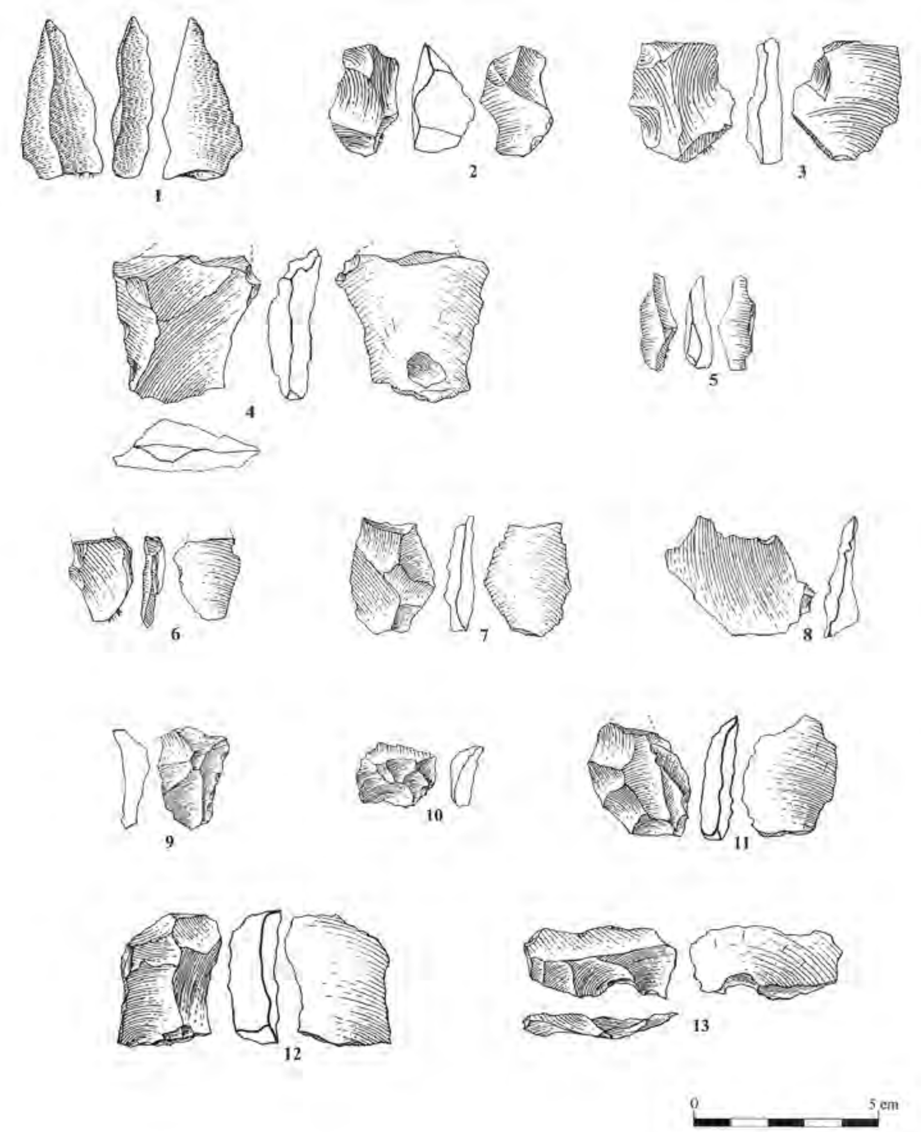



*Figure 15. Examples of flakes from Barranco León. Note the relatively small size and the lack of standardization.*

Type VI: Non cortical platform with non cortical dorsal surface.

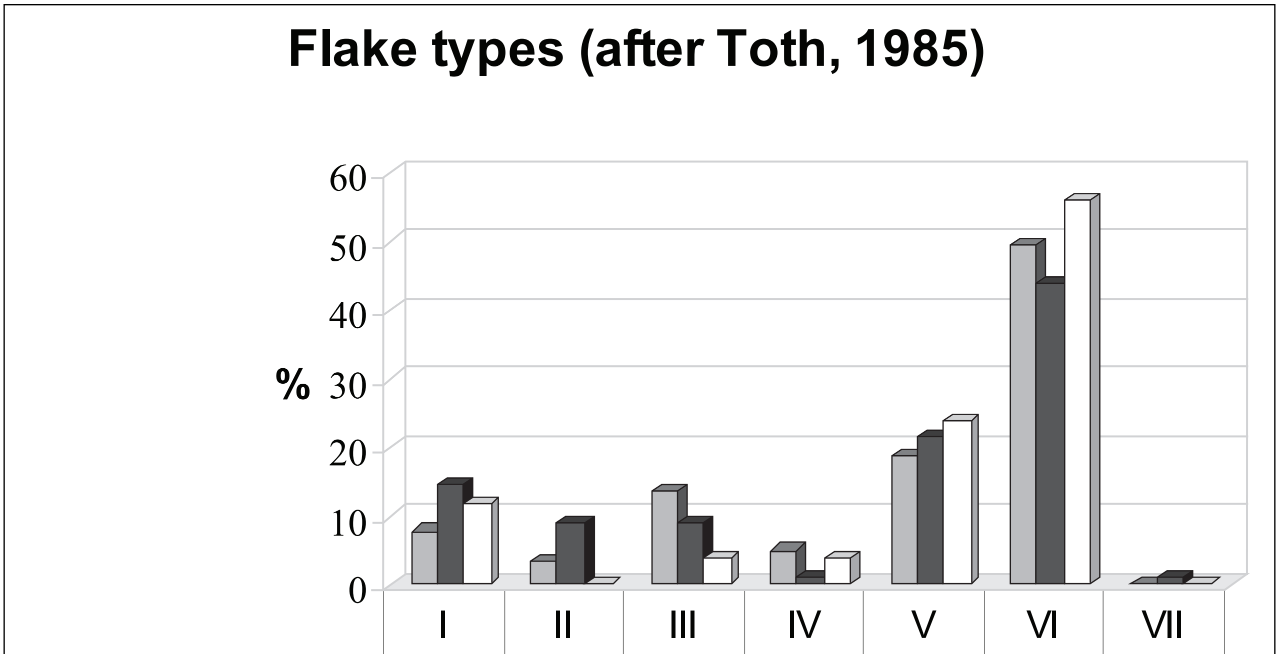
Type VII: Indeterminate.

We can see that in general all flake types are represented, but types V and VI are the most abundant (figure 16). This indicates that the earliest stages of flaking were possibly carried out away from the site, which can be interpreted as a sign of hominid transport of better quality raw materials after they had tested their flaking characteristics in the nearby ancient streams. The sites are not totally excavated, however, and further fieldwork to be necessary to investigate whether there are signs of intra-site transport of the rock between episodes of flaking.

The retouched pieces are not very well represented in either assemblage– 49 pieces in total (2.03% of the assemblage at Barranco León, and at Fuente Nueva 3, 1.3% of the assemblage in the Inferior Bed and 0.49 of the assemblage at the Superior Bed) (Figure 17). Also, they are not visibly standardized in terms of the choice of a blank, the application of the retouch, or in stylistic forms produced. They are primarily made in flint and include types such as scrapers, denticulates and notches. Several pieces show retouch on sharper edges, which may also be produced through use, as indicated by experimental and micro-wear studies, and may not represent deliberate retouch as such.

## Summary

Presently, the sites of Barranco León and Fuente Nueva 3 are the oldest and most well preserved in Western Europe in open-air context. The continuation of research work in the area of Guadix-Baza Basin is one of the keys to help us understand the dispersal and evolution of our ancestors–the first adventurers who peopled




| | I | II | III | IV | V | VI | VII |
|---|---|---|---|---|---|---|---|
| BL (n=217) | 7.83 | 3.23 | 13.82 | 5.05 | 18.89 | 49.77 | 0.00 |
| FN3,N. I (n=204) | 14.71 | 8.82 | 8.82 | 0.98 | 21.57 | 44.12 | 0.98 |
| FN3 N. S. (n=25) | 12 | 0 | 4 | 4 | 24 | 56 | 0 |

*Figure 16. Flake type breakdown from each site.*

this part of the European continent.

Several conclusions can be extracted from the preliminary analysis of the lithic assemblages from Barranco León and Fuente Nueva 3. These conclusions can be traced to the characteristics observed in the first Oldowan assemblages recognized in Africa, and show opportunistic and non-systematic reduction patterns viewed as a least-effort system for the production of sharp edges (Toth, 1985; Isaac, 1997).

- Flint and limestone are the two best represented types of rocks used to manufacture the artifacts. They were available in the alluvial formations of the paleo-channels that fed the lake, in the form of small cobbles or tabular fragments. There is no evidence of stone transport over great distances to the sites, but it is obvious that the hominids were selective of the shapes of the raw materials.
- Two principal techniques used for knapping were hard-hammer percussion and direct unipolar and bipolar technique (using an anvil). The choice of technique, is related to the sharpness and quality of the original form of the raw material.
- The final morphology of the artifact assemblage is not related to a stylistic conception, rather, it depended on the original form and quality of the raw material. The high quality flint allowed more intensive core reduction.
- The flint cobbles and tabular fragments appear to have been favored for production of flakes with sharp cutting edges. Limestone was also used for to produce core forms, battered precursors and débitage, but in lower proportion and with less intensity.
- The study of the cores and the flakes shows a lack of prepared platforms, indicating a relatively opportunistic character to these assemblages.
- The goal of these hominids seems to be the production of flakes. The distribution of flake populations (according to Toth's flakes types; Toth, 1985) together with the high proportion of debris, broken flakes and conjoined pieces found recently in preliminary work, shows that the débitage was *in situ*. Though all flake types are represented, the most abundant represent the final stages of flaking. That is most likely a result of probable transport of raw material from the paleo-channels to the sites after testing their potential.
- The proportion of retouched artifacts is low but present, and they do not show stylistic standardization. Forms present may be categorized primarily as denticulates and notches.
- Considering the Oldowan hominids as opportunistic omnivores (Schick & Toth, 2006), the high propor-

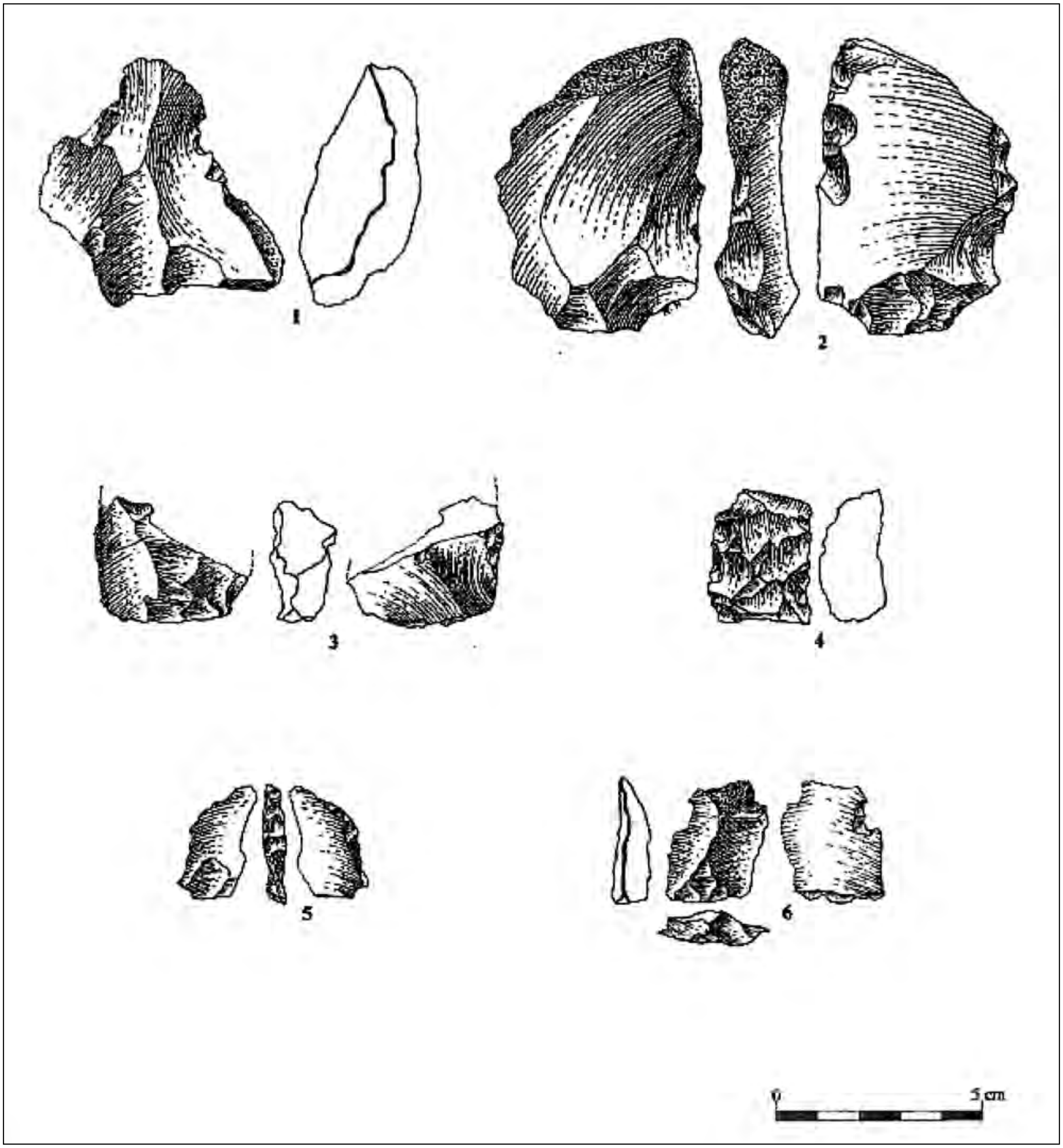



*Figure 17. Some examples of retouched pieces in flint from Fuente Nueva 3, Inferior Bed.*

tion of both herbivore and carnivore animal bone remains, together with the presence of the big hyena *Pachycrocuta brevirostris* and lithic artifacts, would indicate these localities to be probable scavenger sites.

- Study of the patterns of cut-marks, tooth marks and patterns of fractured bones (in progress) will need to be undertaken in order to determine if hominids here had primary or secondary access to the carcasses left behind by predators.

The proportions of animal remains including both herbivores and carnivores, the open-air context of these sites on the border of the lake, and the association of the bones with the artifact assemblages would support an interpretation of these Orce localities as scavenger sites. Ongoing taphonomic studies will help address the question as to whether hominids had primary or secondary access to the herbivore remains at these sites.

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