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The Lower Paleolithic of Spain and Portugal[1]

Manuel Santonja[2,3] and Paola Villa[4]

To most English readers the Lower Paleolithic of the Iberian peninsula is known mainly through a few sites such as Torralba and Ambrona, whose age and behavioral significance remain controversial. In fact, the archaeological data base for this period and region is much larger and more varied than is generally appreciated and includes primary-context sites such as Aridos that have provided unique combinations of evidence on hominid exploitation of elephant carcasses. This paper is both a comprehensive synthesis of our current knowledge and a first attempt to see patterns in the data. Every major occurrence is presented in its regional and geochronological framework; each is critically assessed for data quality and behavioral significance. Major issues addressed in this paper include the working out of regional sequences and intersite correlation, the age and significance of the oldest occurrences, the density and preferred areas of settlement within each region, temporal variation within the Acheulean, and the strength and weaknesses of the data and of our approaches to it.

KEY WORDS: Lower Paleolithic; Spain; Portugal; Acheulean; Middle Pleistocene.

GEOGRAPHIC AND ENVIRONMENTAL FRAMEWORK

The Iberian peninsula, some 580,000 km^2 in area, can be roughly divided into two areas: the littoral zone and the interior. The interior itself comprises three units. In the north, the Northern Meseta is a flat area with a mean elevation of 800 m above sea level (asl). The Southern Meseta, separated from

[1] M.S. is responsible for the research and form of this paper; P.V. is responsible for translating, editing, and revising certain sections in consultation with the senior author.

[2] Museo de Salamanca, Patio de Escuelas 2, 37008 Salamanca, Spain.
[3] To whom correspondence should be addressed.
[4] The Museum, University of Colorado, Boulder, Colorado 80309-0315.

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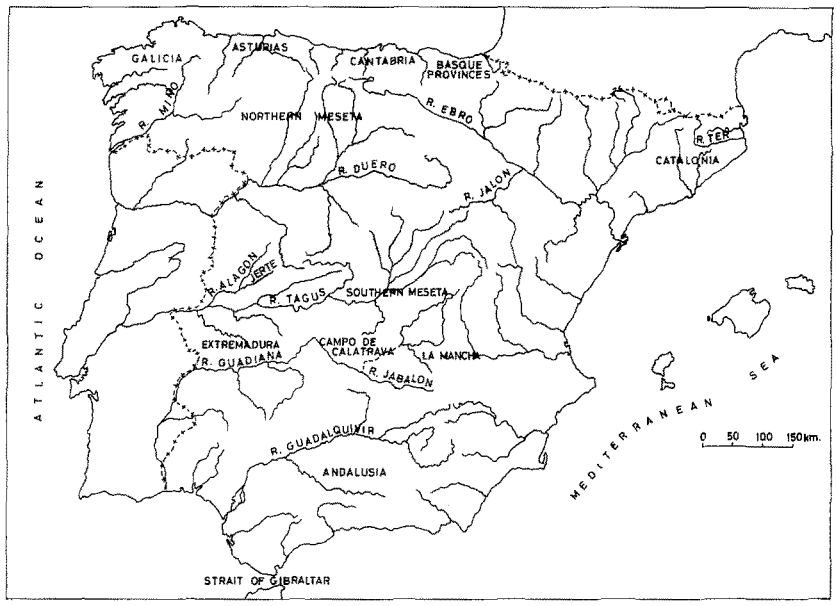

Fig. 1. Map of the Iberian peninsula showing regions, rivers, and other physiographic features mentioned in the text.

the Northern Meseta by the mountains of the Sistema Central, is more diverse (including the Tagus and Guadiana basins and the plateaux of Extremadura), lower (at about 600 m asl), and warmer in climate. The two areas share a continental climate with marked seasonal and diurnal temperature variations (Fig. 1).

A third natural region is the valley of the Ebro in northeastern Spain, which flows into the Mediterranean, unlike the Duero, Tagus, and Guadiana that drain the Meseta into the Atlantic. In addition, the Guadalquivir basin in the south is a diverse area, bordered by the Mediterranean and the Atlantic coasts and broadly coinciding with the traditional region of Andalusia.

The mountain ranges that separate these regions channeled human movement through natural passes. The main drainage systems provide links between the Atlantic littoral and the interior tablelands, facilitating movement across the steep gradient (> 600 m). Natural routes between the two Mesetas are provided by the right-bank tributaries of the Tagus, which have carved deep canyons in the Sistema Central, facilitating access to the Northern Meseta. Thus the headwaters of the Rio Alagón (a Tagus tributary) are very close to the Duero basin watershed, from which the Tormes river offers easy passage into the northern tableland. Likewise, the Medinaceli watershed, where the Torralba and Ambrona sites are located, provides a

link between the Tagus (through the Henares river valley) and the Mediterranean (through the Jalón and Jiloca river valleys).

The mountains are generally below 2500 m; only the central ranges of the Sierra Nevada and of the Pyrenees rise above 3000 m. These high ranges were glaciated in the Pleistocene, but pre-Würmian glacial deposits have been identified only in the Pyrenees and they are less extensive than Late Glacial deposits (Serrat, 1979; Actas de la Reunión del Cuaternario Iberico, Lisbon, 1985). There is no evidence of severe climatic conditions in the Meseta lowlands during the Middle Pleistocene; typical periglacial phenomena were probably restricted to the mountains. Similarly, Pleistocene faunas (except those from northernmost Spain) do not indicate periglacial environments. Temperatures definitely lower than modern are documented only by Upper Pleistocene assemblages. The pollen diagram from the Padul core (at 740 m asl near Granada) records only five moderately cold oscillations during the Middle Pleistocene, before a very cold episode which can be correlated with Würm I (Menendez Amor and Florschütz, 1964).

SITE DISTRIBUTION AND DENSITY

While Lower Paleolithic sites occur in most of Spain, there are empty areas (Ebro valley, the Mediterranean coast) and differences in site densities. However, human settlement was not restricted to a few specific, isolated microregions, as older surveys suggest (Freeman, 1975). The western sector of the Northern Meseta, the Asturian coast, the region of Catalonia, the Manzanares, Jarama, and Tagus valleys, the middle Guadiana valley, and the Atlantic littoral have all been intensively surveyed and many sites are known. Other areas, such as the Mediterranean coast, have been surveyed with less success (Fig. 2).

The Coasts

Open-air sites older than the Upper Pleistocene occur throughout the Cantabrian coast, except at the western end of the Pyrenees. The only preserved cave deposits of this age are the basal levels of Castillo, in the province of Santander (Cabrera, 1984). Biface assemblages are also numerous in intensively surveyed areas of Galicia, such as the Miño valley, showing that the continental interior was settled during the Middle Pleistocene, although site density is definitely higher on the coast. Except for Budiño, none of these open-air occurrences is in stratigraphic context.

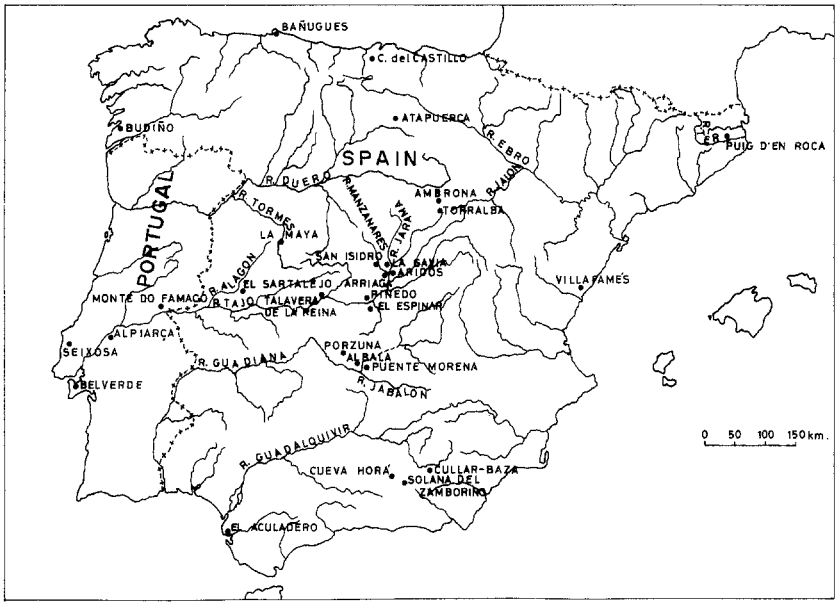

Fig. 2. Location of archaeological sites mentioned in the text.

Surveys in northern Portugal, between the Miño and the Duero valleys, have identified pre-Würmian sites only in the middle Tagus valley (Soares de Carvalho *et al.*, 1982; Raposo *et al.*, 1985). On the coast south of Lisbon, assemblages (Porto Corvo, Rio Mira and Aldeia Nova) have been found stratified in marine deposits at 15 m asl; their typological classification as Late Acheulean is plausible but not secure. Pebble tool assemblages without handaxes also occur in this region but are less well documented than similar assemblages on the Spanish coast between Huelva and Gibraltar, such as El Aculadero (Viguier and Thibault, 1973; Bordes and Thibault, 1977; Querol and Santonja, 1983).

Evidence for Lower Paleolithic on the Mediterranean coast is very poor; relatively large artifact assemblages occur only in Catalonia (Carbonell and Canal, 1979) but their interpretation is problematical.

The Interior

The evidence from the continental interior is derived mostly from stratified alluvial deposits in river terraces (Santonja, 1981). River terraces in the western sector of the Northern Meseta (such as the Tera, Esla, Valderaduey, Duero, Trabancos, Guareña, and Tormes valleys and including the Alagón

river south of the Central Cordillera) have yielded numerous Lower Paleolithic artifacts. The eastern sector has fewer sites, the best known being Atapuerca near Burgos.

In the western river valleys, artifacts occur immediately downstream of narrow canyons and upstream of the wider valley floors, where the dense vegetation and braided channels might have hindered movement. Interestingly, Late Acheulean materials consistently occur on the hilltops (see below).

The numerous sites in the Southern Meseta are mostly in river valleys, but with a few caves (Alferez *et al.*, 1982). Many sites are known in the Tagus basin near Toledo and in the Manzanares and Jarama valleys. The scarcity of sites between Toledo and the Portuguese border is due to the lack of prospecting: sites known in this region are only in intensively surveyed areas, such as the valleys of the Alagón and Jerte (tributaries of the Tagus) and immediately downstream in the Rodão district of Portugal.

To the south, the well-prospected Guadiana basin reveals practically no early sites in the open plains of La Mancha, but a relatively large number in the Campo de Calatrava and in the less well-known Extremadura.

We know very little about settlement in the Guadalquivir basin: biface assemblages occur all along the middle and lower reaches of the river, but the localities cannot be stratigraphically ordered. However, Pleistocene deposits in the Guadix-Baza-Orce depression are very thick and contain sites in primary context.

The Ebro valley has no trace of Lower Paleolithic. Evidence is also very scanty on the Soria tableland, despite the proximity of Torralba and Ambrona (Utrilla, 1981, 1983).

Most of these open-air sites are in alluvial deposits. A few are in primary context in fine-grained floodplain deposits, such as Aridos, Arriaga, and others in the Manzanares drainage system. Most other sites are in secondary position in alluvial gravels. However, at Pinedo, La Maya, and El Sartalejo, there were well-defined artifact concentrations, which are technologically and typologically homogeneous and probably derive from nearby occupation areas in or near the channel bed. Thus, they might be the product of one or a few occupations by a single cultural group (Querol and Santonja, 1979).

HOMINID FOSSILS

The Cueva Mayor/Cueva del Silo karstic system at Atapuerca (Burgos) has yielded fragmentary human remains mixed with thousands of bones of *Ursus deningeri* and other carnivores. The human fossils include (by 1985) 5 mandibular and 38 cranial fragments, 43 isolated teeth, 25 phalanges, and 8 long bone fragments from at least 10 individuals (Aguirre and

de Lumley, 1977; Aguirre *et al.*, 1980, 1987; Carbonell *et al.*, 1986). Preliminary analyses suggest that the cranial material resembles the European "anteneandertals," especially Arago II, Arago XIII, Montmaurin, and Mauer. Some traits suggest a divergence from the Middle Pleistocene North African fossils, which would indicate that any exchanges between the Maghreb and Iberia occurred before the middle part of the Middle Pleistocene (if at all).

A fragment of a humerus and one of a pelvis have been recovered from the Cova del Tossal de la Font, near Villafamés (Castellon), apparently associated with a Middle Pleistocene fauna (F. Gusi, personal communication). However, no definite Middle Pleistocene artifacts have been found in this region.

An upper right permanent molar from a cave at Pinilla del Valle (Madrid) was associated with abundant fauna and microfauna of Middle Pleistocene or early Upper Pleistocene age (Alferez *et al.*, 1982). The Bañolas mandible (Girona) and the Cova Negra parietal (Valencia), classified as anteneandertals (H. de Lumley, 1981; M. A. de Lumley, 1973), are likely to be Upper Pleistocene; the latter is clearly associated with Mousterian (Villaverde, 1984).

CHRONOLOGY

The only absolute dates available for this period are some contradictory ESR and U/Th dates of the Atapuerca fossils; clearly, Spanish prehistorians must develop a program of absolute dating. A relative chronology can be worked out only through terrace sequences. In a few cases, faunal remains and studies of paleosols provide complementary information for correlating sequences from different river basins (Santonja and Pérez González, 1984). These relative chronologies are based on significant stratigraphic sequences, not on isolated episodes. Unfortunately, sites on the coast, such as El Aculadero, cannot be fitted into these inland sequences (Fig. 3).

The modern hydrographic system was formed throughout the Quaternary. Potassium-argon dates indicate that the Campo de Calatrava in the Southern Meseta was formed between 3 and 2 mya (Aguirre *et al.*, 1976). The main drainages of the Meseta river basins were established immediately after this, which thus is the age of the highest terraces (Pérez González, 1979).

Because of the influence of climate, tectonics, and basic lithology, there are at least three models of terrace sequences in the Meseta (Pérez González *et al.*, 1982), the first two referring to regions that had upward movement during the Pleistocene and the third to areas of subsidence. The first (as in the Duero and Henares valleys) consists of a sequence of 14 or more stepped

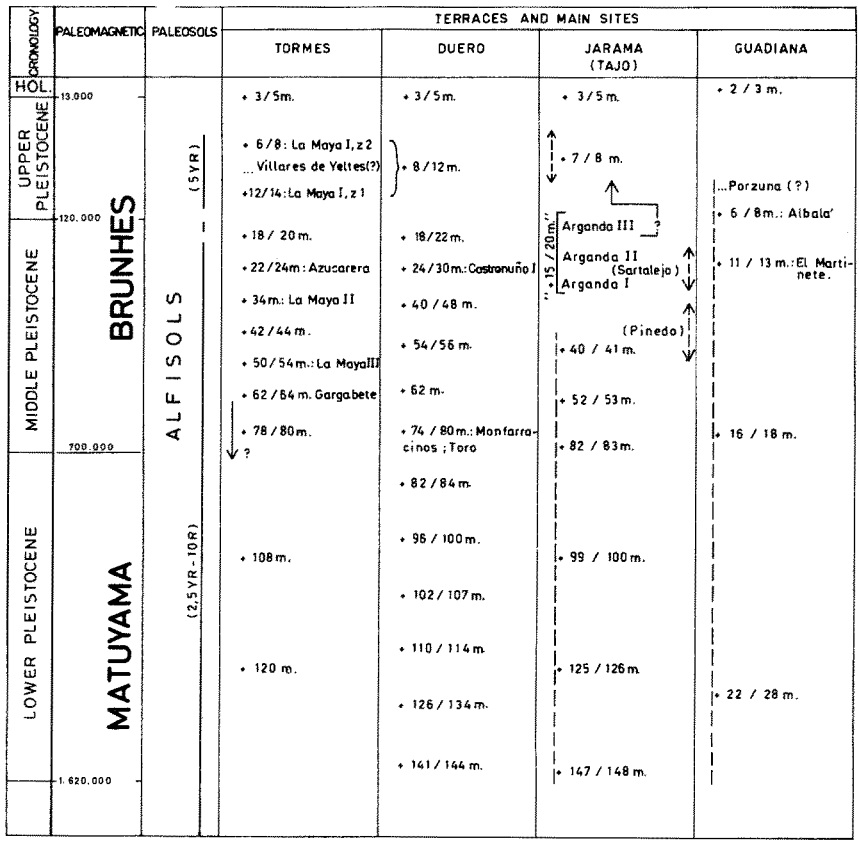

Fig. 3. Chronology and stratigraphy of major river sites in the Meseta. Correlation with the paleomagnetic record is tentative.

terraces, the first at about 150 m above the present channel. The terraces are separated by escarpments of variable height; often two escarpments are higher than the others, thus generating a sequence of high, middle, and low terraces. The second model (as in the Jarama and Tagus) involves about 10 terraces, the upper ones being stepped, rock-cut terraces and the middle and lower ones being complex, cut-and-fill terraces. In this model, the upper terraces have a progressively lower relative height downstream, perhaps due to in-filling of sunken valleys. The third model (represented by the Guadiana in the central plain of La Mancha) includes valleys with a few, low terraces; the highest terrace of the Guadiana is only at + 40 m.

No general time scale exists for the Pleistocene because of the lack of absolute dates and our poor knowledge of climatic events in Iberia. The Alpine sequence is inapplicable, since the interior mountains preserve no

clear evidence of pre-Würmian glaciations. We therefore use a simple division of the Pleistocene into Lower, Middle, and Upper. Even so, assignment of any site to a specific stage is never free from doubt, although regional sequences and intersite correlations are somewhat more secure. In this situation, correlation with deep-sea cores or the paleomagnetic record would be insecurely based and any such proposals are extremely tentative (Fig. 3).

THE EARLIEST SITES

Portugal

Several sites on the Portuguese littoral (Acafora, Magoito, Praia da Aguda, Laredo das Corchas, and Leião) are said to be Lower Pleistocene, but their age is questionable (Raposo, 1985). Dating is based on the archaic appearance of the artifacts, which were surface finds with no stratigraphic context. The collections are also very poor. At Belverde and Seixosa, the age of the deposits is uncertain and the pieces may not be humanly made.

Spain

El Aculadero

In contrast, El Aculadero, on the Spanish coast near Cadiz, has yielded numerous stone artifacts in stratigraphic context. The 2769 true artifacts include 943 pebble tools, 533 flake tools or retouched flakes, 133 cores, and 1160 waste flakes or flake fragments; 91% of the pieces are made on quartzite (Querol and Santonja, 1983). ("Pebble tools" refers to choppers, chopping tools, polyhedrons, and pieces with isolated scars made on river pebbles. It is a general term for this class of artifacts and does not imply the existence of a separate industry or technocomplex.)

The material occurred in a level about 10 cm thick over an area of 98 m^2; no faunal remains were preserved. The stratigraphic sequence begins with Plio-Pleistocene marine deposits; after a period of erosion and karstification, continental deposits were formed, followed by a thick paleosol, on which the archaeological level rests. At the top of the sequence are dune sands alternating with at least two paleosols (Viguier, 1983).

The cultural materials occur in a cobble level [derived from the destruction of an older terrace of the Guadalquivir (Zazo *et al.*, 1985)] deposited over an erosional surface truncating the paleosol. The well-developed B horizon of the paleosol has traces of hydromorphism, indicating humid climatic

conditions during the evolution of the land surface with which the occupation was associated. The cobbles at the base of the level are rubefied and, so, must have accumulated during the last phases of pedogenesis; human occupation occurred while the cobble level was being deposited. The paucity of small flakes, the edge abrasion or aeolization on about 90% of the pieces, and their remarkably uniform vertical and horizontal distributions suggest that the assemblage has undergone some lateral transport over a gently sloping surface, plus mechanical attrition and weathering due to exposure.

The quartzite cobbles used as raw material have an average diameter of 10 cm, so the artifacts tend to be small, with a mean maximum dimension of 3.6 cm. Two interesting features are the presence of discoidal cores (34% of the cores), two-thirds of which have some margin preparation, and the absence of bifaces, cleavers and trihedrals, which are characteristic of Iberian Middle Pleistocene assemblages. This absence need not result from the size of the raw material—the excavators have experimentally made bifaces on quartzite pebbles of this size.

The age of the assemblage is uncertain because of the unknown length of the erosional phase after the marine deposits. The excavators tended to favor a very early age because of its position above well-dated early Pleistocene marine deposits and the absence of bifaces, which suggests that this assemblage may be older than the earliest biface industries of the Guadalquivir basin.

The Interior

The early occurrences in the high terraces of the Northern Meseta consist only of a few simple artifacts within deposits of the 80-m Duero terrace (a retouched flake at Pinar del Canto and several simple flakes at Monfarracinos). The isolated, but stratigraphically early, finds from the Southern Meseta include a chopper and a flake in the 140-m Tagus terrace at Talavera de la Reina and seven similar pieces in the 125- and 100-m terraces of the Alagón river. Slightly younger occurrences, equivalent in age to those of the Northern Meseta, are known from the 70-m terrace of the Tagus (at El Espinar, near Toledo) and in the 20-m terrace of the Guadiana (at Molino de Emperador and Puente Morena, near Ciudad Real).

These poor and isolated occurrences do not prove the continuous presence of human groups in Iberia before the period of the biface industries. If they are really manmade, why are there so few of them? Clearly, more data are needed before we can reach conclusions about their nature and significance.

The Mediterranean Coast

Recent claims of Lower Pleistocene material on the Mediterranean littoral (Carbonell and Canal, 1979; Carbonell *et al.*, 1981) are even more problematical. Some pieces are doubtful (Cueva Victoria) or clearly natural (Almenara); others lack stratigraphic context (Ter terraces). The richest localities are those of Puig d'en Roca, which have yielded several hundred quartz artifacts (choppers, polyhedrons, discoidal cores, and flakes; there are no bifaces). Since they were found on the surface or in secondary position in a recent colluvial deposit above the lowest terrace, their age is unknown. However, the surface pieces are younger than the terraces on which they rest and so are unlikely to be Lower Pleistocene.

MIDDLE PLEISTOCENE SITES

The Northern Littoral: The Vasco-Cantabrian Region, Galicia, and Northern Portugal

Despite intensive surveying, the Basque country has not provided certain evidence of Acheulean. Surface occurrences are numerous in the Santander and Asturias provinces, both on the coast and along the lower reaches of rivers such as the Nalon (Rodriguez Asensio, 1984). In this region, Acheulean materials occur in stratigraphic context only at Bañugues, on the coast of Cabo de Peñas, and in the basal levels of El Castillo cave, in the province of Santander (Cabrera, 1984).

Bañugues

This is typologically a Late Acheulean with numerous quartzite bifaces and cleavers and use of the Levallois technique. No counts are given since the material was not excavated, but collected from the modern surface truncating the source horizon. As well as finely retouched bifaces and flake tools, there are also cruder and simpler pieces such as thick bifaces, choppers, and cleavers on cortical flakes; such a mixture is not unusual in Acheulean assemblages. This material is in secondary context in a soliflucted layer formed during the Last Glaciation; there was no fauna (Rodriguez Asensio, 1978; Rodriguez Asensio and Flor, 1980).

El Castillo

This is the only Cantabrian site with Acheulean in primary context. Unfortunately, the Acheulean levels were excavated at the beginning of this

century, and the material was studied later when much of the contextual information—and some of the artifacts—had been lost (Cabrera, 1984). The preserved collection comes from four levels (from bottom to top: 26, 25b, 25a, and 24) overlain by Mousterian. The tools are mostly denticulates and side-scrapers, and those of the Level 24 are indistinguishable from Mousterian flake tools. In Levels 24–25b, there were also a few irregular and asymmetrical bifaces. Level 26 retains only 127 pieces, including 13 tools: 1 partial biface, 2 choppers, and 10 flake tools. Their typological status cannot be confidently assessed. The deposits are believed to be pre-Würmian, primarily because of their stratigraphic position below the Mousterian.

Budiño

Surface occurrences of presumed Lower Paleolithic are common in Galicia, both on the coast and on the Miño river terraces, but their age and typological assessment are not sure. Biface assemblages are better documented and include Budiño, near Vigo, in a tectonic depression adjacent to the middle Louro valley (a right-bank tributary of the Miño) but forming a separate depositional setting. Recent work by Texier (1984) has distinguished three main groups of deposits.

1. Fluviatile Deposits in Rather Narrow, Shallow Channels, Consisting Mainly of Cross-Bedded Granitic Sands. These were deposited by tributaries of the Louro with their own drainage areas, and thus are not part of the Louro terrace system. Two places (loci 2 and 3) have yielded biface assemblages; pollen spectra indicate cold conditions.

2. Colluvial Deposits Recycling Older Fluviatile and Tertiary Sediments. Locus 5, with a biface assemblage, contains pollen indicating warmer conditions. The radiocarbon dates of 26,700 and 18,000 B.P. (Butzer, 1967) probably date the deposition of the colluvial beds and not the industry, which is in secondary context and is not Upper Paleolithic.

3. Subrecent Peats Without Archaeological Materials.

Due to stratigraphic complexities and selective sampling, the artifact series from Aguirre's excavation of Budiño (Aguirre, 1964b; Echaide, 1971) and those collected by amateurs (Vidal, 1983) cannot be assessed quantitatively. Their general features are that quartzite and quartz are the usual raw materials; several thin, lanceolate, and micoquian bifaces are made with the soft-hammer technique; there are many well-made cleavers, some on Levallois flakes; trihedrals are less common than bifaces and cleavers but are regular in shape and relatively large in size; discoidal cores are common.

However, Vidal's excavations since 1979 have revealed a very complex stratigraphy (Vidal, 1981, personal communication). The site consists of a series of spatially and temporally distinct occurrences. The six areas so far

excavated differ in microstratigraphic context and assemblage composition: locus 5 is a scatter of flake tools, bifaces, cleavers, and some debitage in an apparently primary context; the locus 5 and locus 2 assemblages seem to be typologically older than the others, which have classic Late Acheulean bifaces; assemblages without bifaces are more difficult to assess without detailed studies of the basin's paleotopography and sedimentary history.

No sites are known on the Atlantic coast of northern Portugal. Recent studies (Maury, 1977; Meireles, 1982) have clearly established a Holocene age for all the macrolithic industries; isolated pieces of possible Lower Paleolithic age have been reported but are not adequate to prove human settlement of the region before the Middle Pleistocene.

The Northern Meseta

The density of sites is quite high, especially in the west, from Salamanca to Leoń. Sites are scattered throughout adjoining river valleys, of which the most notable are the Tormes and the Trabancos-Guareña (left bank tributaries of the Duero), the middle Duero, the Esla (right bank tributary of the Duero), the Tera, and the Orbigo (both tributaries of the Esla). This pattern probably reflects a real, although not yet understood, preference on the part of the prehistoric people.

Almost all find-spots are associated with alluvial deposits, usually on, but sometimes within, river terrace sediments which have been used to build regional relative chronologies. Notable exceptions are the sites of Torralba and Ambrona, associated with lacustrine deposits, and the karstic deposits of Atapuerca.

Throughout the area, quartzite and, to a lesser degree, quartz are the most common raw materials. Flint was also used in the districts of Burgos, Soria and Valladolid (as at Torralba and Ambrona).

La Maya

At La Maya, in the Tormes valley, artifacts have been found in stratigraphic context in four superimposed terraces at 50–54, 30–32, 12–14 and 6–8 m; these are named La Maya III, II, and I, the last including the two lowest levels (Santonja and Pérez González, 1984). La Maya is thus a good example of the basic chronological frameworks used for this period in the Meseta and is discussed in detail (Fig. 4).

La Maya III (50 to 54-m Terrace). This high-middle terrace has yielded two series of 15 and 20 artifacts. Noteworthy pieces include a partial lanceolate biface with a very sinuous edge and a few flake tools (scrapers,

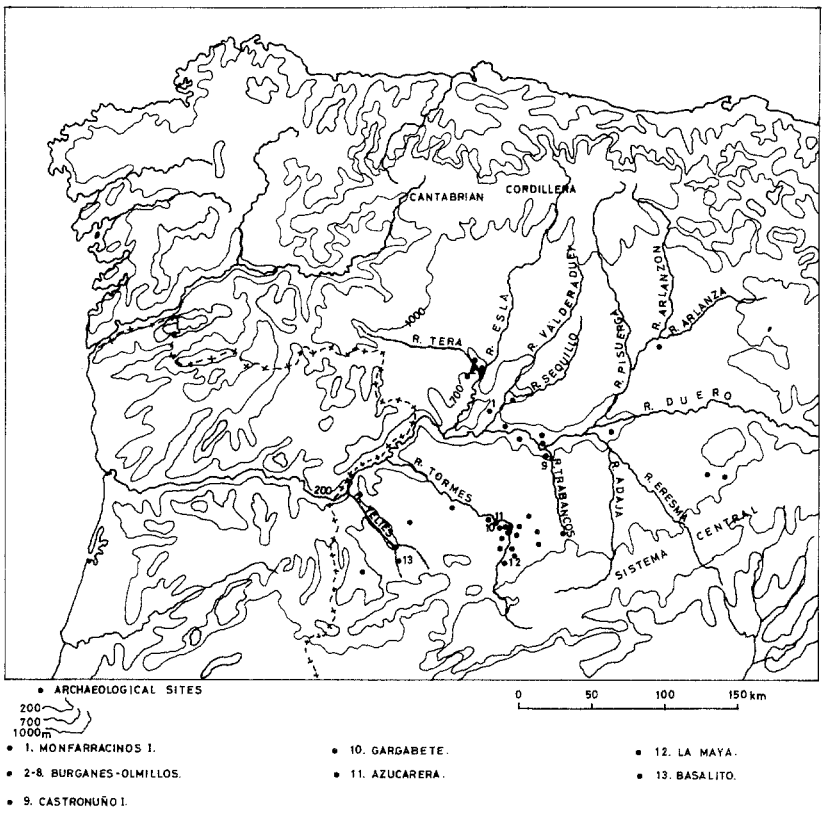

Fig. 4. Map of the Duero basin in the Northern Meseta with major tributaries. Sites mentioned in the text are identified by a number; all other sites (reported in Santonja and Pérez González, 1984) are indicated by a dot.

a burin, and a badly made *bec*); the most common are pebble tools. Some cores show patterned flake-removal, which seems to foreshadow discoidal flaking.

La Maya II (32 to 34-m Terrace). This terrace is immediately below the 50 to 54-m terrace and is separated from La Maya III and I by steep slopes. Sixty-three artifacts have been found within the terrace, of which 45 are retouched tools. There is only one Levallois flake; the 15 bifaces are thick and varied in shape (thick ovates, amygdaloids, and chisel-ended bifaces, showing simple but regular flaking patterns). Of the 12 cleavers, 8 are on noncortical and 4 on cortical flakes with abundant secondary trimming. There is no evidence for the use of the soft hammer. The flake tools (scrapers, denticulates, and flakes with abrupt retouch) are regular in shape and retouch is occasionally deep.

At this locality, the 14-m terrace of La Maya I occurs directly below the 32 to 34-m terrace, but elsewhere in the valley, especially upstream from Salamanca, are intermediate levels at 18–20 and 22–24 m, which have yielded other assemblages. At La Azucarera de Salamanca (22 to 24-m terrace) were bifaces showing some use of the soft hammer technique, and less abundant cleavers. Since the La Maya II and Azucarera assemblages are small, we are not sure that such differences indicate a general trend. However, it is significant that very similar assemblages occur in other valleys of the western region: in the Tera valley, in the Burganes-Olmillos area, and in the Duero valley, at Castronuño (Santonja and Pérez González, 1984).

La Maya I (14-m Terrace). The fluvial deposits here consist of gravel bars, with a total thickness of 60–110 cm, in a shallow channel, which runs along the eastern side of the paleovalley and has a pronounced low watermark, like the modern Tormes. The 12 m^2 excavated yielded 949 pieces, including 608 flakes and unretouched fragments, 115 cores and core fragments, and 226 shaped tools (176 flake tools, 12 bifaces, 3 cleavers, 3 trihedrals and picks, and 32 choppers). The assemblage is in secondary context, redeposited by the Velayos arroyo which here enters the Tormes from the highland to the east (Santonja and Pérez González, 1984, Fig. 118). However, the relatively high proportion of flakes and flake tools to cores and core-tools (ca. 5 : 1) suggest that the sample is still representative.

There are no Levallois flakes, no blades, almost no faceted platforms, and only a few dihedral platforms. There is no evidence for the use of the soft hammer. Most cores are simple and irregularly flaked, but there are a few discoidal and two atypical Levallois cores, indicating occasional use of this technique.

The flake tools are simple side, transverse, and inverse scrapers and denticulates; there are no tools of the Upper Paleolithic group. Fragments of tabular quartzite were often used as blanks; retouch is generally irregular and occurs in a single row, so there is gradation between "denticulates" and "scrapers."

Pebble choppers are the most common core-tools, reflecting the site's location at the source of river cobbles. The few bifaces are thick with sinuous edges and show no trace of soft-hammer trimming; this is also true of the few cleavers and picks, except for one or two symmetrical cleavers. The high proportion of flake tools and low frequency of bifacial tools, especially cleavers, set this assemblage apart from those on the higher terraces. However, the bifaces still suggest a Middle Acheulean assemblage type.

The "archaism" of this is due to the use of tabular quartzite, which breaks irregularly along cleavage planes. Flakes tend to have flat surfaces; it is difficult to make regular retouch and impossible to recognize the use of the soft hammer.

La Maya I (6 to 8-m Terrace). The fluvial gravels are 80–110 cm thick and have been excavated over an area of 6 m^2. The assemblage of 506 pieces is similar in typology, raw material, and technology to the industry from the 14-m terrace; however, some of the bifacial tools are more carefully made and their shapes suggest Upper Acheulean, although none is diagnostic.

Significance of La Maya. The lack of fauna and of preserved site organization greatly limits intrasite behavioral interpretation. Instead, the value of this site lies in its stratigraphy and in that the assemblages come from well-defined concentrations; that is, La Maya can be used in working out a regional sequence. Santonja's and Pérez González's excavations at La Maya and survey of 42 localities in the Duero valley and the valleys of its tributaries provide the following information.

(1) Stone artifacts occur sporadically in the upper-middle 80-m terrace of the Duero [as at Monfarracinos and Toro/Pinar del Canto (see above and Santonja and Pérez González, 1984, pp. 35, 38)] and on the high terraces of the Pisuerga river, a right-bank tributary of the Duero.

(2) Biface industries occur in the 62-m terrace at Gargabete and 50 to 54-m terrace of the Tormes (at La Maya) but are too poor for definition of a separate stage in the sequence.

(3) Typologically Middle Acheulean assemblage with thick, regular bifaces occur in the 32-, 22-, and 18-m terraces of the Tormes.

(4) Similar industries occur in other valleys of the western Northern Meseta western sector, such as the Tera (the Burganes-Olmillos area) and the Duero (Castronuño).

(5) Assemblages from the 14 and 8 to 6-m terraces represent a late Middle Acheulean. Bifaces in the 14-m terrace are similar to those in the 32-, 22-, and 18-m terraces, while the 8 to 6-m terrace contains better-made tools and may be closer in time to Upper Acheulean assemblages.

(6) Classic Upper Acheulean bifaces are never found in any of the Tormes terraces.

(7) Upper Acheulean-style bifaces are found, for example, in the surface series of Basalito in the Yeltes valley (Benito del Rey, 1978) and Burganes III in the Tera valley (in colluvial deposits on top of the 16 to 20-m terrace) and occur preferentially on hilltops or above the valley bottom, while earlier occurrences were usually in channel or floodplain deposits. At present, stratigraphic correlations between the two kinds of assemblages are not possible.

Interestingly, many of the middle terrace sites (La Maya, Galisancho, Castronuño I, Burganes) are at the confluence of major tributaries with the main valley; elsewhere in the main valley artifacts are very sporadic. Thus, people preferred to stay in the minor valleys and habitually moved in the region between the high lands and the valley bottom.

Torralba and Ambrona

These two sites are in the foothills of the Sistema Iberico at about 1100 m asl, in the valley of the Rio Mansegal, a Jalón tributary. Various authors (particularly Butzer, 1971, p. 456) have noted that this valley provides access to the Duero, Ebro, and Jarama-Henares basins and to the Mediterranean littoral by way of the Jiloca river and, thus, could have been a natural route for migratory herbivores. At present, only preliminary information is available for Torralba and Ambrona (Biberson, 1964, 1968; Freeman, 1975, 1978; Freeman and Butzer, 1966; Howell *et al.*, 1962; Howell, 1966; Klein, 1987; Howell and Freeman, 1982).

The two sites are considered to be in the same morphostratigraphic position (remnants of a 40 to 42-m terrace) and to have equivalent sedimentary sequences, with three major complexes (Lower, Middle, and Upper Complex) of fluviolacustrine deposits with a strong colluvial component. The Lower Complex, or Torralba Formation, is the only one with archaeological material. It was subdivided into five units, the upper one with a deeply weathered red soil (the Ambrona soil). At Torralba, 10 major occupation surfaces were recognized within > 1 m of fluvial and colluvial sands and gravels in Unit II; at Ambrona, no occupation surfaces were recognized but the materials were grouped into a Lower Occupation (broadly contemporary with Torralba and including lacustrine deposits) and an Upper Occupation in colluvial sediments at the top of the series (with no equivalent at Torralba). The stratigraphic sequence defined during the first round of excavation has been revised but not yet published; however, we now know that the Upper Occupation at Ambrona is separated by a disconformity from the lower beds. The Ambrona Lower Occupation and Torralba have been called Early Acheulean; the upper unit contains Middle Acheulean (Howell, 1966; Howell and Freeman, 1982).

Both site areas are estimated to be 5000–6000 m^2 (Howell *et al.*, 1962; Biberson, 1964). Cerralbo excavated most of Torralba and Howell excavated about 600 m^2. At Ambrona, Cerralbo dug only a test trench, but some 1600 m^2 has been opened in the Lower Occupation and even more in the upper beds. Artifact density at both sites is extremely low: Torralba had 887 pieces, of which 102 were too rolled to be classified (Freeman, 1975); Ambrona yielded 1100 pieces in the Lower Occupation, a few pieces in the middle levels, and 2000 artifacts in the Upper Occupation (Howell and Freeman, 1982). These numbers indicate densities of < 1 artifact per m^2 per level, with faunal densities being a little higher.

The Torralba assemblage was made on flint, quartzite (one-third of the total but most cores are of quartzite), quartz, and limestone. Waste flakes and fragments constitute 22.5% of the total, and cores 5.9%. According to

Freeman, there are no true Levallois cores or flakes; however, discoidal cores are quite common. The small tools constitute most of the assemblage (260 pieces) and include many denticulates, scrapers, borers, and *becs*. The biface index (calculated for all shaped tools, including seven choppers) is fairly high for a European assemblage—18.6%, or 61 of 328, including the material for all the trenches. However, in the 10 major occupation levels defined by Freeman, bifaces vary from 0 to 15% (they are absent from three levels). The assemblage from the Lower Occupation at Ambrona is similar to that from Torralba, to judge by the only relatively complete description available (Villa, 1983). The similarities include frequencies of raw materials, a predominance of quartzite among the cores, no true Levallois flakes but numerous discoidal cores, and rare use of the soft hammer in biface shaping. The proportion of flakes and fragments at Ambrona [71.8% including the utilized pieces (Villa 1983, Table 32)] seems higher than at Torralba (46.7%), although we do not yet know if this reflects less postdepositional disturbance at Ambrona or a different technological structure.

The interpretations of big-game hunting and collective elephant drives at the sites have been challenged by Binford (1981, 1987) and questioned by others. The rarity of cut marks on the bones (Shipman and Rose, 1983) and, even more, the mortality profiles (Klein, 1987) cannot be reconciled with Freeman's and Howell's view of the sites as places where herds of elephants were killed and butchered.

In a revision of Freeman's analysis of tool and fauna associations at Torralba [an analysis based on conventional views of occupation surfaces without consideration of sedimentary processes and containing mistaken faunal identification (Klein, 1987, p. 31)], Binford has argued that tools and elephant bones were usually deposited independently. He finds two major kinds of association: one is defined primarily by notches and denticulates and consistently related to nonelephant species (heads and limbs/feet of cervids, equids and bovids); the second group is characterized by scrapers, choppers, and bifaces and related to carcass remnants, including elephants. However, it is clear that part of the material has been rolled and water-worn (Shipman and Rose, 1983; Klein, 1987), that accumulation processes at Torralba were complex, that the spatial distributions at least partly reflect natural processes of sedimentation, and that the view of Torralba as a kill and butchery site is unwarranted.

Villa (1983, pp. 258–259) noted the variability of tools in the Lower Occupation at Ambrona, which is similar to that at Torralba and unlike known butchering sites in Africa. She suggested that the assemblage reflects a wide range of activities and may represent many different episodes of occupation, not all related to butchery.

To understand Torralba and Ambrona, we must consider their geographic location, which provides easy passage in several directions. At the

same time, the surrounding area appears to have been unpopulated: essentially no cultural remains have been found in the Jalón valley, none in the Ebro basin, the Jiloca or the headwaters of the Henares and Jarama, and very few in the headwaters of the Duero. The very low number of artifacts at Torralba and Ambrona may thus reflect the rarity of humans in this area, which is 200–500 m higher and has a more rigorous climate than most of the Meseta. Occasional and discontinuous visits may also be reflected in characteristics of the industry, such as the heterogeneity in shape and size of the bifacial implements, the paucity of cortical flakes, and the occurrence of multiple edges on flint implements, which suggests repeated episodes of utilization (Villa, 1983; Carbonell *et al.*, 1987; Binford, 1987).

The idiosyncrasy of the Torralba and Ambrona artifacts prevents direct comparison with other Mesetan assemblages. We note, however, that Pinedo, one of the oldest Spanish Acheulean sites, has very different bifaces and cleavers [more irregular and asymmetrical (Querol and Santonja, 1978)] and lacks small tools comparable to those of Torralba and Ambrona.

Torralba and Ambrona are not Early Acheulean; their bifaces and cleavers resemble Middle Acheulean examples from the middle and low-middle terraces of the Meseta rivers (La Maya II and La Azucarera in the Tormes valley, Sartalejo in the Alagón, San Isidro in the Manzanares, and Aridos/Las Acacia in the Jarama river basin). Curiously, the Aridos 1 assemblage, which was clearly associated with elephant butchery, is strikingly different: unlike Torralba and Ambrona, knapping, retouching, and resharpening are very well documented; the flake tools are less retouched and are essentially cutting tools with simple retouch.

The brief descriptions of the Upper Occupation assemblage at Ambrona (Howell and Freeman, 1982) show that it is not Middle Acheulean. This is clearly a Late Acheulean assemblage, comparable to Oxígeno in the Manzanares valley or to Porzuna in the Guadiana basin.

Torralba and the Lower Occupation at Ambrona have been dated to a "Mindel" interstadial (Howell *et al.*, 1962; Butzer, 1971), based on the occurrence of two warm periods, corresponding to "classic interglacials," within the general stratigraphic sequence of the area. There are no absolute dates and the fauna lacks high temporal resolution (Klein, 1987). The first warm period, represented by the Ambrona soil, is correlated with the "Mindel-Riss" interglacial; the second is indicated by pollen of warm-climate species in younger, pre-Holocene deposits (Howell, 1966; Butzer, 1971, 1975, p. 64; Freeman, 1975).

The isolation of Torralba and Ambrona prevents correlation with the morphostratigraphic systems of the Meseta or the Ebro valley. The main argument used to assign the lower stratigraphic units at both sites to "Mindel" (long-distance correlation of the red paleosol above them with other red

paleosols in the Mediterranean) is unwarranted. Processes of red-soil genesis cannot be linked to a specific period; several such processes have been documented in the valleys of Iberia throughout the Pleistocene, and red soils are forming now on the Guadalquivir lower terrace. The properties of such soils, which require micromorphologic study, are dependent on local factors such as parent materials, slope, humidity, and microclimate and cannot be used for long-distance correlation (Pérez González, 1982; Monturiol and Alcalá del Olmo, 1986). Also, comparisons worked out by Butzer with the Jalón and Henares valley must be reexamined; the morphostratigraphic sequences in those areas are much more complex than those described by Gladfelter and used by Butzer. For instance, 22 alluvial platforms are now recognized in the Henares valley, in a stepped sequence between + 210 m and the valley bottom (Gallardo *et al.*, 1987), and sequences with 11 levels are known in the Jalón valley, near Calatayud, downstream from Medinaceli (Hoyos *et al.*, 1977). A geomorphologic study of the Torralba and Ambrona region and adjacent valleys is essential if we are to correlate them with sites in the Meseta.

The Southern Meseta

The Southern Meseta consists essentially of two large tectonic depressions, the Tagus and the Guadiana (known as La Mancha). The Tagus and Guadiana rivers connect the region with the Extremadura and Portuguese plateaus.

The Tagus Trough

This depression, with the Sistema Central and Sistema Iberico to the north and the east and the Toledo mountains to the south, is traversed by the Tagus and its tributaries, among which the Jarama and Manzanares have yielded many sites, while others occur on the terraces of the Tagus itself (Fig. 5).

The Tertiary deposits in the depression have strongly influenced the Quarternary terraces. As the Jarama and Manzanares leave the detritic lithofacies and enter the area of evaporitic rocks, their middle and low terraces change from a stepped to a cut-and-fill pattern with thicknesses of tens of meters. On the Manzanares, this change occurs near the site of San Isidro, and downstream, the cut-and-fill pattern continues after the confluence with the Jarama in the Arganda plain: upstream, inside the detritic lithofacies north of Madrid in the area of Cerro Garabitas, is a sequence of eight stepped terraces (Pérez González, 1980a, b). The same phenomenon is found on the

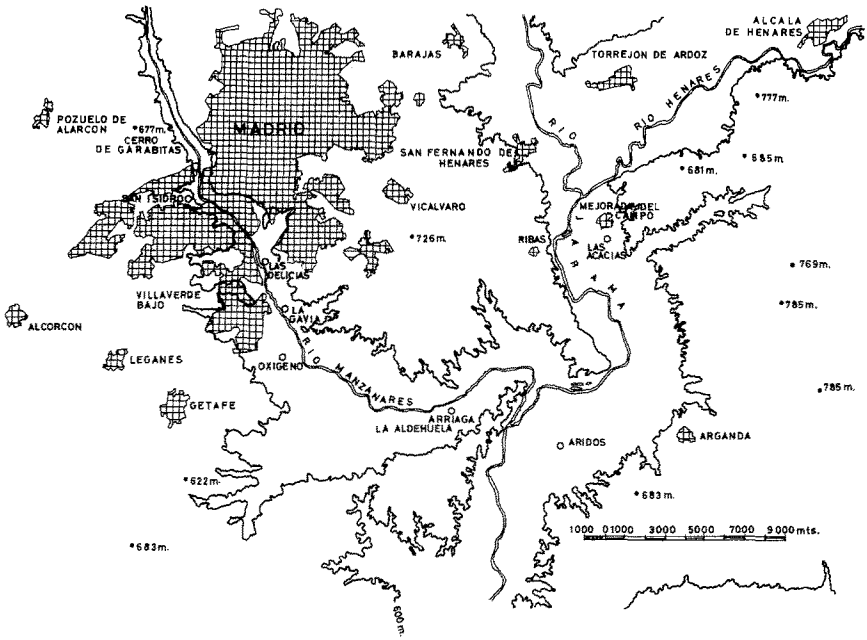

Fig. 5. Map of the Madrid area showing location of Aridos and other sites in the Jarama, Manzanares, and Henares valley.

Jarama: from the area of Mejorada del Campo and downstream is a complex cut-and-fill terrace with a surface at +15–20 m and a depositional sequence that has been divided into three units (Arganda I, II, and III; see below); these units are equivalent to the middle terrace deposits upstream, which occur in steps at and above the 40-m level.

South of the Arganda plain, the middle and low terraces of the Tagus show the same cut-and-fill morphology. The 22-m terrace immediately above the cut-and-fill deposits upstream of Toledo contains the site of Pinedo, which clearly antedates the cut-and-fill terraces of the Arganda plain, where Aridos 1 and 2 occur.

Pinedo. Except for a few artifacts on the 70-m terrace of the Tagus at El Espinar and other equally uninformative occurrences on the high and middle terraces of the Tagus and Jarama, Pinedo (Martín Aguado, 1963) is the oldest site between Madrid and Toledo.

The excavations (Querol and Santonja, 1979) uncovered an area of 25 m^2 and a total thickness of 4.5 m. The deposits consist of gravels in a sandy matrix (channel bars) and cross-bedded coarse sands alternating with pebble beds deposited in shallow channels. There are no erosional episodes and deposition was continuous, although the upper part of the sequence shows a

90° change in the direction of the paleocurrent; even the present Tagus occasionally shows a braided stream pattern with secondary channels perpendicular to the main one.

The few rolled faunal remains [*Lepus* cf. *europaeus*, *Oryctolagus cuniculus*, *Equus* sp., *Cervus elaphus*, *Bos* sp., *Palaeoloxodon antiquus*, *Hippopotamus amphibius*, *Praedama* cf. *süssenbornensis* (Soto, 1979; Kahlke, 1975)] are indicative only of Middle Pleistocene age, although the hippo suggests rather mild temperatures.

The stone industry occurred in secondary context throughout the depth of the deposits. Nonetheless, it was a well-defined concentration (with artifact density decreasing upstream and downstream) with abundant unretouched flakes, suggesting that the original occupation areas were nearby. The material has been divided into three series, according to physical condition: fresh (306 pieces), rolled (5142 pieces, including 3643 unretouched flakes, 426 flake tools, 225 cores, 677 choppers, and 171 bifaces, cleavers, and trihedrals), and very rolled (494 pieces).

The raw material was mainly quartzite (68%), followed by flint (25%) and quartz (7%). Artifacts are simple but quite variable; retouch is irregular, simple, and steep. Elaborate typological classifications are not applicable. Flake-platforms are rarely dihedral or faceted and there is no evidence of the Levallois technique; most core exploitation was limited, with unpatterned removals. The few discoidal cores are not elaborate and lack preparation. The soft-hammer technique was not used.

The large tools are varied. In the rolled assemblage, the 60 bifaces fall into 17 morphological types. Most are asymmetrical or irregular and there are no flat bifaces: the thickness index is 2.35 or higher. Twenty-seven of the 30 cleavers were made on cortical flakes and are varied in size and shape; the marginal retouch did not affect the shape of the blank. One biface was made on flint; all others are of quartzite, as are the cleavers. Trihedral picks are the most common large tool (81) and are even less homogeneous. Only a few are classic examples; most are simple pebble tools and would be more appropriately called trihedral choppers. Regular choppers are abundant; their simplicity and problematic nature (cores? tools?) increase the general impression of primitiveness.

Aridos 1 and 2. The Aridos stone quarry is in the Arganda plain, in the 15 to 20-m terrace on the left bank of the Jarama, 2.5 km southeast of its confluence with the Manzanares and 18 km southeast of Madrid. This terrace has a very thick and complex depositional sequence with three main units, Arganda I, II, and III.

Arganda I, the oldest, is about 30 m thick but only 8 m are now above the water table. This visible portion is made up of well-sorted, cross-bedded sands with bands of small pebbles (quartzite, quartz, and some flint), and

Table I. Aridos 1: The Elephant Butchery Level

	Flint	Quartzite
Shaped tools (including Levallois flakes)	29	5
Flakes with utilization damage	5	–
Biface tips	2	–
Hammerstones	–	3
Cores	7	1
Core tablets	1	–
Bladelike flakes (broken)	3	–
Flakes	31	7
Small flakes and fragments	225	12
Total	331	

finer-grained, floodplain deposits at the top. The Aridos 1 and 2 sites are in the upper part of this unit, 200 m apart, in a silt-clay-sand layer, deposited under conditions of very low energy. The unit is affected by faulting and its upper boundary is an erosional surface. Arganda II is equally affected by faulting and tectonic deformation; it consists of cross-bedded gravels with a maximum thickness of 10 m. Arganda III is a massive pebble unit resting unconformably over the previous unit.

Aridos 1. The elephant butchery level: Two occupation surfaces have been identified at Aridos 1. The first, in an area of ca. 40–50 m^2, yielded the disarticulated remains of a subadult elephant (*Palaeoloxodon antiquus*), consisting of a fragmentary cranium with jaws and tusks, 12 vertebrae, 9 or 10 ribs, both scapulae, and the left pelvis. Limb bones are absent (except for one metacarpal), but the southwestern portion of the site had probably already been destroyed by quarrying. Altogether, 112 m^2 was excavated, but the material is concentrated only in the western portion. The elephant was probably a female, approximately 3.5 m tall, and weighed about 4000 kg (Soto, 1980).

The bones were closely associated with 331 artifacts (Table I), many of them intermingled with the skull fragments and around or inside the pelvis and other bones. All the artifacts are very fresh: 18.3% (60 of 328, excluding three hammerstones) can be refitted, another 146 do not conjoin but were obviously struck from the same nodules, and the remaining 122 pieces can be assigned to one group or another but with less confidence. Twenty-one flint cores or tools and three quartzite choppers were flaked or retouched at the site (Fig. 6).

Flint was used for all flake tools and was intensively exploited: of the total weight of flint (about 2 kg), 41% is debitage and 59% flake tools and cores. In contrast, only 1.1% of the quartzite is debitage (of a total of ca. 7 kg) and 98.9% is choppers, hammerstones, and cores. Quartzite was available at

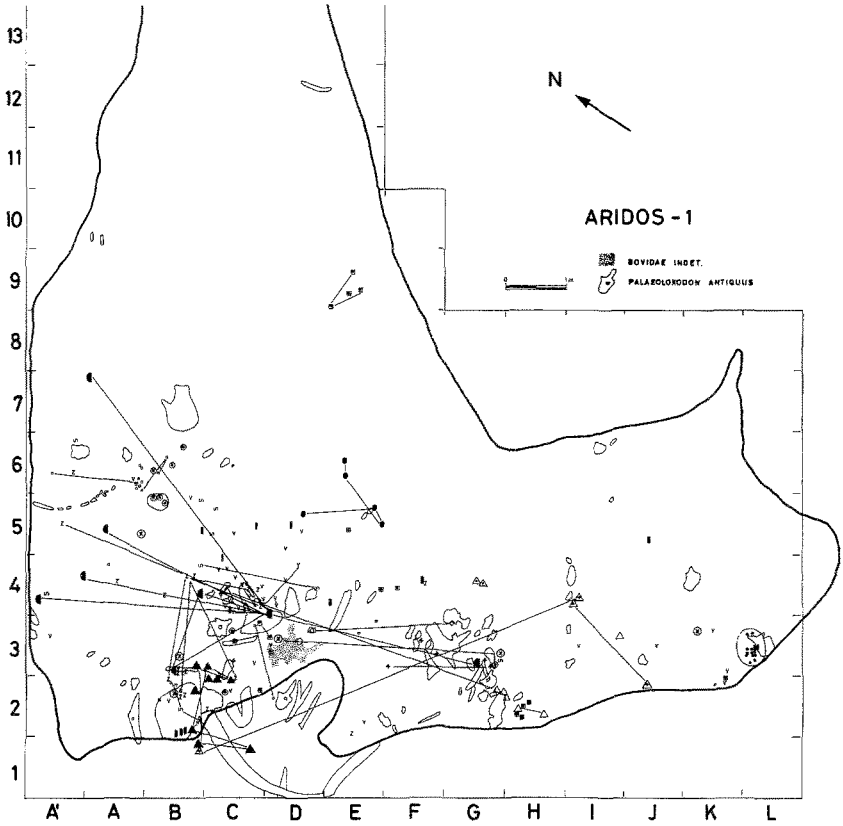

Fig. 6. Aridos 1: the elephant butchery level. Map showing faunal remains, conjoined pieces, and refitting links. Pieces that do not refit but were knapped from the same nodule are indicated by a common symbol; refitting groups are described in the monograph.

the site and flint occurs < 3 km away on the bank of the Manzanares; that only 2 kg was brought in suggests a small group of people.

Use of the Levallois technique was limited (in terms of frequency and of distinctive features) and confined to flint; only 1 of 10 Levallois flakes has a faceted platform. The two Levallois cores were almost completely prepared, but only one shows evidence of individual platform preparation. Three other Levallois cores were also worked at the site (one must have been a blade core, since there is a core tablet from a Levallois blade core) but the cores themselves have not been found.

Most of the artifacts are small flakes and flake fragments and only 10% are shaped tools (Table I; there was also a hammerstone and one chip of quartz). The assemblage is characterized by a near-absence of side scrapers

(only one, on the ventral face) and by a relative abundance of Levallois pieces (eight), burins (seven), and notches (six). The heavy equipment includes four quartzite choppers. The flake tools have only limited retouch but were resharpened at the site, as is indicated by burin spalls and retouch flakes that can be refitted to four tools.

Several points emerge from the study of the conjoined pieces.

(1) Approximately 16 flint cores were fully or partially flaked at the site; the cores found are exhausted except for a large quartzite core. At least two cores were preformed and decortified at the site.

(2) Several tools can be refitted to their cores or shown to belong to a nodule flaked at the site. Eight tools can be rejoined to flakes knapped from the same core.

(3) The locations of conjoining burin spalls and other resharpening flakes indicate that some tools were abandoned at the place where they had been retouched, closely associated with elephant bones.

(4) Several biface trimmers and two biface tips (one is a resharpening flake by a transverse tranchet blow) suggest that two or three flint bifaces were partially shaped, used, and resharpened at the site. The bifaces have not been found and may have been carried away.

(5) Two quartzite choppers were flaked at the site and have not been found. A third chopper made at the site was abandoned, together with its five flakes, near the elephant skull.

The site plan shows three main, contemporaneous (indicated by the refittings) areas of artifact and bone concentration: one associated with the elephant skull (square B2), another with the pelvis (square C4), and the third with a scapula (square G3). There are one or more cores, Levallois flakes, burins, notches, utilized flakes, and biface trimmers in each area, indicating the importance of cutting equipment. Heavy equipment (two choppers) occurs only with the skull; the other two choppers were at the periphery of the excavated area (A3 and E8).

Cut marks were not looked for and have not been reported. Nevertheless, the distributions of lithic and bone materials are clearly meaningful. The remains were restricted to a single horizon, a few centimeters thick, with no vertical displacement. The very fresh artifact edges and the numerous refittings, covering all the area where bones occurred, confirm the absence of postdepositional disturbance. This is undoubtedly an elephant butchering site (Santonja and Querol, 1980b). It was occupied briefly, probably by a small group of people who brought flint to where an elephant carcass was to be butchered. It is not known how the elephant died.

The only other macromammalian remains in this level are the lower jaw and upper milk molars of a 6 to 7-month-old bovid (*Bos* or *Bison* sp.) and a badly preserved jaw fragment of another older bovid, found near the

elephant bones (square D3). Two shed red deer antlers were found at the edge of the concentration (squares B9 and C14) and may belong to the upper level; they are clearly part of the natural background.

The sediments, the amphibian, fish, and molluscan fauna, and the microfauna all indicate that the site was in the floodplain of the Jarama river, some distance from the channel, in humid grassland and probably close to a forest. The climate was not colder than at present; some fish species suggest a larger and deeper river than the modern Jarama, so rainfall may have been higher (it is now 422 mm per annum in nearby Madrid).

Aridos 1. The upper level with small-sized fauna: Above the first occupation surface and separated from it by 8–10 cm or less of sterile sediments, probably representing one flood, were numerous remains of fish, amphibians, lizards, birds, rodents, and lagomorphs, occurring in clusters separated by less dense or empty areas. There were also a few scattered bones of larger mammals: a juvenile canid (two teeth and a jaw fragment), two or three cervids (12 teeth and some bone fragments) and a wild pig (one incisor).

The separation between the two surfaces was evident in squares B6 and B7, where the left elephant scapula was overlain by 5–20 cm (average, 8–10 cm) of sterile sediment, on top of which were concentrated the remains of three terrapins, 10 rabbits, two beavers, five birds, two fish, one snake, one lizard, two rodents, and isolated bones of a canid and a deer; elsewhere, separation of the levels was problematic. There were other dense clusters in and around square E8 (at least three lagomorphs and various rodents, fish, and amphibians) and in square A3. Only two flint flakes, found in squares C6 and A9, were associated with this level (Santonja *et al.*, 1980, p. 328).

Some of the animals may have died *in situ* (such as a colubrid represented by a long articulated vertebral segment); others, such as the few medium and large mammal bones, may be part of the natural "background," that is, bones from animals that died naturally, dispersed by natural agencies. However, the clusters of small animal remains are very distinctive and require explanation.

The clustering of the remains and the absence of preferred orientation argue against water transport and deposition by receding floods; the presence of articulated or loosely connected rodent, bird, and lagomorph bones and the high frequencies of bird limb bones versus limb extremities are incompatible with pellet regurgitation by predatory birds (Mourer-Chauviré, 1980; *contra* Freeman, 1981).

Human predation is possible and was originally suggested (Santonja *et al.*, 1980), but it may be more prudent to suspend judgment. The concentrations could represent disaggregated carnivore scats (which are known to contain articulated bones of smaller prey) and the partly consumed remains of carnivore meals (in the case of rabbits). It is also possible that

remains floating in low water could have been clustered by obstacles on the surface: this may be the case for the cluster above the elephant scapula, whose acromion projected into the upper level (Santonja *et al.*, 1980, Fig. 1, p. 335). Carnivore tooth marks, types of bone breakage, possible corrosion of the bone surfaces, skeletal part representation, and spatial patterns of articulated bones may help to identify the causes of accumulation.

At least some of the material in both levels was deposited in autumn, as indicated by the abundance of *Cepaea nemoralis* eggs (laid during summer or autumn), the growth rings of several fish vertebrae, a molar of a juvenile deer in the upper level, and a bovid juvenile mandible found close to the elephant bones. This would be the time of the lowest river flow and the best time for human movement in the floodplain.

Aridos 2. The old elephant: Aridos 2 was 200 m northeast of Aridos 1 and in the same stratigraphic position. The 12 m^2 excavated was what remained after quarrying and ancient erosion of the northern and eastern sides by channel waters. On a consolidated surface (Santonja *et al.*, 1980, p. 300) were the articulated remains of an old, probably male, elephant, consisting of 24 cervical, dorsal, and lumbar vertebrae, almost all the right ribs, the right scapula, and the right humerus; only three left ribs remained, most of the others had been truncated by a back-hoe. Six cervical (the atlas and skull were missing) and the first two dorsal vertebrae were perpendicular to the dorsal and lumbar segment. A small cranial fragment lay on the northern side of the area, in the opposite to the anatomically correct position. The backward torsion of the spinal column indicates contraction of the dorsal ligaments after death, not a slow death as was previously suggested (Santonja *et al.*, 1980, p. 221). This postmortem torsion occurs during the drying out of the carcass but did not necessarily precede human intervention, since removal of flesh and muscle fibers favors the process (Weigelt, 1927, pp. 127–131). It was a large elephant, ca. 4.6 m tall and weighing > 5000 kg (Soto, 1980). As at Aridos 1, most of the artifacts were made of flint (Fig. 7; Table II).

Table II. Aridos 2: Assemblage Composition

	Flint	Chert	Quartzite
Small tools	1	1	–
Bifaces	–	–	1
Cleavers	–	–	1
Cores	2	2	–
Large retouched flakes	–	–	1
Flakes	6	1	2
Small flakes and fragments	16	–	–
Total		34	

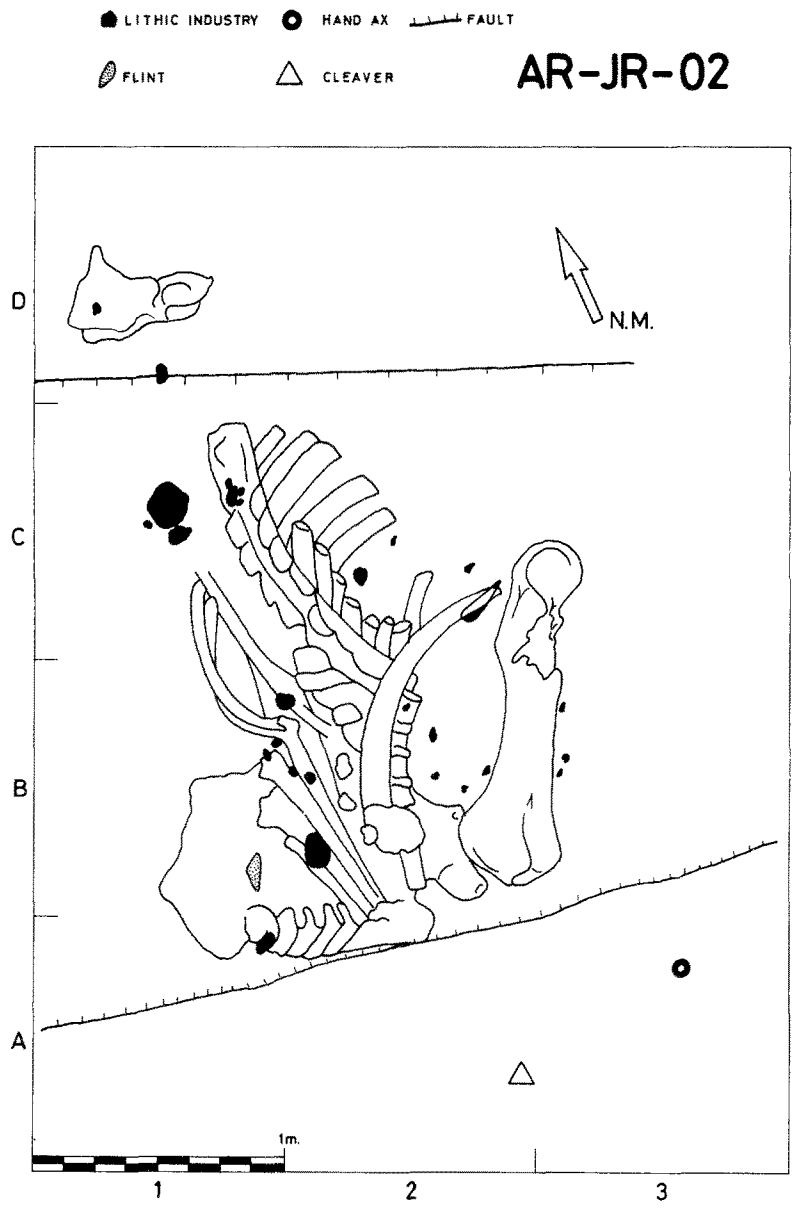

Fig. 7. Aridos 2: plan of the elephant bones and artifacts. The area is bounded by two fault lines. The flint piece is an unworked block with traces of thermal alteration.

There are no refits, but on the basis of physical characteristics, the flint seems to derive from nine different nodules. The debitage indicates that, as at Aridos 1, flint, but not quartzite, was knapped at the site; the total weight of flint is 2.6 kg.

All the finds are in very fresh condition, confirming the association of bifaces with butchering activities. We also note the presence of a simple burin, a backed knife, and a retouched flake, types well represented at Aridos 1. There are no Levallois flakes or Levallois cores, but the assemblage is very small.

Chronology of the Aridos sites: The microfauna (López Martínez, 1980a) and the limited presence of Levallois suggest the middle of the Middle Pleistocene. Typological assessment is made difficult by the scarcity of bifaces and cleavers and the absence of a variety of small tools, but artifacts in a secondary context in the same stratigraphic unit (Arganda I) and in the unit above (Arganda II) do allow comparisons with other industries in the region, especially Pinedo.

Arganda I and II: From Arganda I are 140 artifacts, which show the same preference in the use of quartzite for heavy-duty and large tools and flint for flake tools and cores, as seen at Aridos and other Lower Paleolithic localities (Table III). The artifacts are from several find-spots in Bed A, which is made of cross-bedded sands with some small pebbles; this 1-m-thick layer (base not exposed) is directly below the floodplain deposits of Bed B, which contains Aridos 1 (Santonja *et al.*, 1980, p. 58).

The fairly thick bifaces, partial bifaces, and cleavers on cortical quartzite flakes would be normally classified as Early or Middle Acheulean, like Pinedo, Torralba, or Ambrona. However, the limited presence of Levallois, the regularity and thinness of some bifaces, and the regular retouch on side-scrapers are typologically more advanced than Pinedo, where similar raw materials were used; as noted above, the morphostratigraphic position of Pinedo shows that it is older than Aridos and Arganda I.

Table III. The Arganda I Assemblage

	Flint	Quartzite
Flakes and flake fragments	57	21
Cores	13	2
Choppers	1	3
Flake-tools	10	8
Bifaces	4	10
Cleavers	2	5
Trihedral choppers and picks	–	4
Total	140	

Fragments of *Palaeoloxodon antiquus* bones and stone artifacts have been found in several places in the Arganda II unit. The largest sample is from a gravel layer in Las Acacias quarry, 14 km north of Aridos (Santonja and Querol, 1980a, pp. 40–42). The 100 artifacts (including 67 formal tools) are mostly quartzite; only 17% are flint. The flake tools (points, scrapers, and denticulates) are well made, with regular and invasive retouch, sometimes of Quina type. Two of the 12 bifaces are flat cordiforms. The nine quartzite cleavers are symmetrical and one is made on a Levallois flake; there are also four trihedrals. The sample is small but definitely more refined in typology and technology than Arganda I and, especially, Pinedo.

The Manzanares Valley. Many sites with abundant stone artifacts and fauna are known in the Manzanares terraces between Madrid and the confluence with the Jarama but have never been studied in detail. Important occurrences still exist in the lower part of the valley just before the confluence, but classic sites in the Madrid area, such as San Isidro, Las Delicias, and Usera, have been completely destroyed, making study of the old collections very difficult. However, we may still squeeze some archaeological blood from them.

The San Isidro quarry was in the heart of Madrid. Many stratigraphic sections have been described (Pérez de Barradas, 1941; Riba, 1957) so some aspects are quite well known. The fluvial deposits accumulated on a bench cut into Tertiary marls at + 30 m and had a total thickness of > 10 m. There were two sedimentary cycles, but it is not clear whether these cycles were immediately successive or separated by a disconformity.

Most of the artifacts are flint: the available sample is large (> 4000 pieces in the Museo Arqueologico Nacional in Madrid) but was selectively collected. Assessment of it by the senior author is based on a detailed analysis of 191 bifaces, only 47 of which have a recorded stratigraphic provenience, and visual inspection of the whole series.

The Levallois technique and relatively well-made and regular bifaces (mostly amygdaloid and thick ovates) are already present in the lowest levels; however, very regular cordiforms and typical lanceolates retouched by the soft-hammer technique occur in the upper levels, which may correspond to the second sedimentary cycle (Santonja, 1977).

The collections from other quarries (Vaquerias del Torero, Parador del Sol, Puerta, San Antonio, etc.) just downstream of San Isidro are also extremely large and selectively collected (Pérez de Barradas, 1924, 1926). Technically and typologically the artifacts, mostly of flint, are similar to those of San Isidro, particularly its upper levels; early descriptions also indicate similar sedimentary sequences. However, there is a problematical difference in elevation: the San Isidro deposits rested on a bench cut at + 30 m but the

sand quarries, only 1600 m downstream and also above Tertiary deposits, were at +14 m. This cannot be explained by fluvial erosional cycles; it is more likely that the difference is due to a general sinking of the area because of the change in substratum from detritic facies to evaporitic rocks, which occurs downstream of San Isidro (see above; Pérez González, 1980a). This sinking also explains why progressively younger industries occur along the Manzanares leaving Madrid: the sand quarries exploited only the uppermost deposits, and the lower levels, which might contain industries similar to the lower levels at San Isidro, are now below the watertable. It is thus clear that seriation of the Manzanares/Jarama terraces based on altitude can lead to errors; available evidence suggests that the 15–25-m terrace downstream of San Isidro is Middle Pleistocene, not Upper Pleistocene as has been suggested (Freeman, 1975, p. 698).

Quantities of artifacts and bones, usually lacking contextual data, have also been collected in the lower Manzanares valley, just before the Jarama confluence. The most impressive series is from the sand quarry of Oxígeno, with 5000 artifacts, including 219 bifaces, 38 trihedrals, and 21 cleavers (Rus and Querol, 1981).

Most bifaces were retouched with a soft hammer; some 24% are thin (mainly subtriangular, cordiforms and ovates) and 23% are lanceolates. The trihedrals are elongated and elaborately flaked. The cleavers are made on noncortical, sometimes Levallois, flakes, trimmed by invasive retouch; similar cleavers occur at nearby sites (Santonja, 1976). The Levallois index and the index of faceted platforms are higher than at San Isidro, although we must remember the biased nature of these collections.

Sites such as Las Delicias, Transfesa, La Aldehuela, and Arriaga (Rus and Vega, 1981) yielded macrofauna, particularly *Mammuthus* sp. and *M. trogontheri*, suggesting an age younger than Aridos and the lower levels of San Isidro, which had *Palaeoloxodon antiquus*.

The estate of Salmedina, where the sand quarries of Arriaga are, yielded a large fauna including *Eliomys quercinus*, *Microtus brecciensis*, *Microtus* sp., *Arvicola* sp., *Apodemus sylvaticus*, *Crocidura* cf. *russula*, *Talpa* sp., *Oryctolagus* cf. *lacosti*, *Pitymys duodecimcostatus*, and *Arvicola sapidus*. The last two species are larger than the forms present in Arganda I and suggest an age younger than Aridos (N. Lopéz Martínez, personal communication).

In summary, the enormous quantities of material from the Manzanares and Jarama terraces have yielded little information, the only well-documented occurrences being those of Aridos. It appears that the lower levels of San Isidro are contemporaneous or slightly younger than the Arganda I beds and that, in the Manzanares valley south of Madrid, levels equivalent to San Isidro are below the present floodplain. The sand quarries south of Madrid have yielded Late Acheulean industries with bifaces even more refined than

those in the upper levels of San Isidro. Upper Pleistocene deposits with Mousterian of Acheulean Tradition occur at La Gavia (7 km south of San Isidro) and may have been present at the top of the San Isidro sequence.

The Alagón Valley: El Sartalejo. Few Paleolithic localities are known in the Tagus basin between Toledo and the Extremadura region, 250 km west, where fluvial deposits of the Alagón and Jerte have yielded large quartzite assemblages with good stratigraphic provenience (Santonja, 1986a).

At Galisteo, just upstream from the confluence of the Alagón and the Jerte, is a sequence of eight terraces. The upper and middle ones (at 125, 100, 80, 49, and 28 m) are separated by strong escarpments, while the lower ones (13, 9, and 3 m) are cut-and-fill terraces partly nested into each other. The artifacts from El Sartalejo were on the 28-m terrace, lowest in the stepped series and separated by a major scarp from the 13-m terrace. This position is analogous to La Maya II in the Tormes valley.

The artifacts come from a single layer of gravels in a sandy matrix with silt lenses; sediment accumulation was continuous, without important erosional intervals, although there are lateral facies variations due to migrating channels. The terrace is capped by a red soil. A systematic collection of 606 pieces includes 165 flakes and fragments, 129 flake tools, 54 bifaces, 138 cleavers, 13 trihedral picks, 19 pebble tools, and 88 cores (Santonja, 1986a). The abundance of cleavers partly reflects the local abundance of large cobbles. Several cores show negative scars as large as the blanks used for cleavers (Fig. 8). Among the pebble tools, there are a few cleaverlike forms made by the cleaver-blow technique described for Terra Amata (Fournier, 1974, pp. 131–136; Villa, 1983, p. 122).

This is a non-Levallois industry: there are only two Levallois flakes, no faceted platforms, and 11% dihedral platforms. However, one-third of the cores are discoidal and show systematic flake removal. The flake tools have regular, intensive retouch and there is no gradation between denticulates and scrapers. There are elaborate forms such as end scrapers, points and convergent scrapers, thinned-back scrapers, and backed knives. Compared with Pinedo, this assemblage is characterized by (1) more refined small tools in more elaborate types; (2) many fewer pebble tools (despite the abundance of quartzite pebbles) and rare trihedrals; (3) mostly regular, classic bifaces (typical lanceolates, amygdaloids, thick ovates, two flat cordiforms, and one thin ovate), although less well-made types occur (13 "abbevillian-like" pieces); and (4) only half the cleavers being made on cortical flakes (90% at Pinedo). Cleavers occur made on Janus flakes (flakes struck from other flakes and thus having two "ventral" faces), Levallois flakes, and other prepared flakes resembling the Tabelbala-Tachengit technique (Tixier, 1956). Five have bifacial, invasive, secondary trimming, a feature unknown at Pinedo. These differences are probably dependent on time. However, without

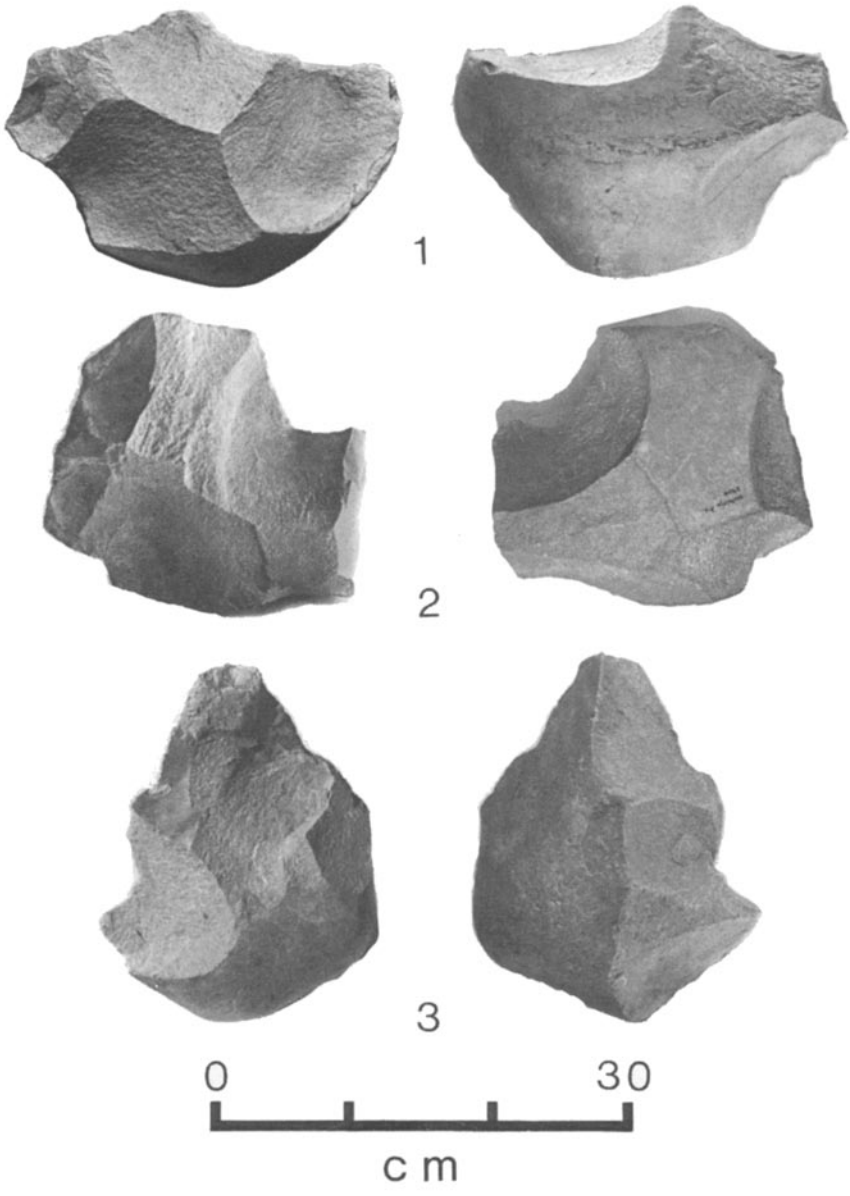

Fig. 8. Cores for the production of cleaver blanks, from El Sartalejo (Alagón valley, Tagus Basin).

correlation studies of the Alagón and Tagus terrace sequences, there is no independent way to establish the relative chronology of the two.

Some morphostratigraphic features suggest an age similar to La Maya II: a similar relative elevation; the presence of a steep, > 10-m-high scarp separating an upper sequence from a lower series of partly nested terraces; and a similar terrace sequence. La Maya II yielded a small assemblage, but the two share some features: (1) a rarity of faceted platforms and of the Levallois technique; (2) flake tools with regular shapes and large flakes with wide retouch scars; (3) very few choppers and picks but many cleavers and bifaces; (4) few or no flat bifaces; (5) no evidence for the soft-hammer technique; (6) many chisel-ended forms among the bifacial tools; and (7) two-thirds of the bifaces being made on flakes.

Portugal: Monte Famaco. There are no significant Pleistocene occurrences in the Tagus valley between the Alagón and Vila Velha in the Rodão region, where there is a terrace sequence of five stepped levels (at 15 m, 32, 52, 95, and 135 m). The Monte Famaco is on the 32-m level. We have no precise information on the stratigraphy (GEPP, 1977) but the surface collection (533 artifacts) was derived from fluvial deposits and was concentrated in a small area. The main features of the assemblage are the absence of the Levallois technique, the exclusive use of the hard hammer even for scraper retouch, fewer cleavers than bifaces, and a high frequency of cleaverlike forms on pebbles, like those at El Sartalejo. Monte Famaco is the only nonevolved Acheulean assemblage between El Sartalejo and the lower Tagus; typologically, it is similar to El Sartalejo and more advanced than Pinedo.

Portugal: The Lower Tagus Drainage and the Region of Lisbon. Earlier work on sites between Torre Vedras and Lisbon (Breuil and Zbyszewski, 1942; Zbyszewski, 1974) is not useful since the local geomorphological history of the river is unknown. The only significant recent study is of Milharós in the Vale do Forno near Alpiarça (Raposo *et al.*, 1985; Raposo, 1989).

The Milharós assemblage was in fine-grained colluvial sediments overlying a fluvial deposit of a low-middle terrace of the Tagus, separated by a scarp from the complex deposits of the valley bottom. It might date to the end of the Middle or the beginning of the Upper Pleistocene; unfortunately there are no faunal remains. The assemblage (338 pieces, almost all quartzite) includes 55% unretouched flakes and cores, 18% flake tools, 15% pebble tools, and 12% bifaces and cleavers. Characteristic features include classic Late Acheulean types (such as lanceolate and micoquian bifaces), the use of the soft hammer, cleavers on cortical flakes but with invasive regularizing retouch on sides and bases, and a predominance of scrapers with continuous and regular retouch among the small tools (Raposo *et al.*, 1985). It is clearly Late Acheulean.

The Guadiana Basin

This area, enclosed by the quartzitic mountains of Toledo, the Tagus trough, the Iberian mountains (Sistema Ibérico), and the Sierra Morena, consists of three major landforms: the flat undissected tableland of La Mancha, the volcanic region of Campo de Calatrava to the south, and the peneplain of Extramadura, formed over the Paleozoic rocks of the Hesperic Massif.

The Pleistocene history of La Mancha and Campo de Calatrava is well known (Pérez González, 1974; Molina, 1975). There was very little river erosion and the deepest valleys are < 20 m deep, except for the Júcar (now a Mediterranean river but flowing to the Atlantic in the Lower Pleistocene). In the Campo de Calatrava, maximum entrenchment is 40 m.

No Lower Paleolithic is known in La Mancha. In the Segura valley to the south (an area related to the Guadalquivir basin), bifaces and cleavers found in a spring deposit near Hellín (Montes and Rodriguez, 1985) are similar to those on the middle terraces of the Meseta rivers. However, this isolated site has no precise morphostratigraphic context.

Around Campo de Calatrava, the Guadiana river has five terrace levels (2–3, 6–8, 11–13, 16–18, and 22–28 m) and the Jabalón, its left-bank tributary, has eight terrace levels (2–3, 7, 10–12, 19–21, 25–27, 31–33, 40–43, and 45–50 m). Biface assemblages occur on the middle terraces (6–8 and 11–13 m for the Guadiana and equivalent levels for the Jabalón) and on pediments formed on the interfluves. The latter lack stratigraphic context and are almost always mixed surface occurrences. Most of the numerous find-spots (Ciudad, 1984) pose interpretative problems or are post-Lower Paleolithic, so we consider only the major occurrences in fluvial deposits (El Martinete, Albalá) and some others in different context (Porzuna).

Albalá and El Martinete. These two sites are about 15 km apart, south of Ciudad Real. The quartzite artifacts occur in deposits of the 6 to 8 and 11 to 13-m Guadiana terraces, respectively. Typologically, both would be defined as Middle Acheulean but Albalá is more refined (that is, more like Late Acheulean) than El Martinete (Table IV).

Porzuna. Northeast of the Guadiana valley, the Bullaque, a right-bank tributary, flows through four small depressions at the contact between the Campo de Calatrava volcanics and the Hesperic Massif. The depressions are filled by pre-Pleistocene alluvial fans (Redondo and Molina, 1980), which have been only slightly dissected by Quaternary drainage. Only in the last two depressions (El Robledo and Piedrabuena) is there a sequence of three terraces, the highest at 18 m. Near Porzuna, where the valley narrows between the two depressions, the surface of the lower terrace has a series of artifact concentrations.

Table IV. Comparison of Albalá and El Martinete

Albalá (6/8-m terrace)	El Martinete (11/13-m terrace)
Levallois technique present (10% of flakes are Levallois; Levallois cores occur)	Levallois technique not clearly documented (discoidal cores only)
Dihedral platforms, 28% Faceted platforms, 15%	Dihedral platforms, 17% Faceted platforms, 7%
Use of soft hammer	No use of soft hammer
Scrapers predominate among small tools	Denticulates predominate among small tools
End scrapers, burins present	End scrapers, burins absent
Large retouched flakes common	Large retouched flakes common
Bifaces & cleavers both common	Bifaces & cleavers both common
Lanceolate, micoquian bifaces	Most bifaces thick amygdaloid & ovates, secondary trimming limited
Trihedrals rare	Trihedrals slightly more common
Pebble tools rare	Pebble tools rare

Artifacts from different find-spots have been lumped together and the series of > 5000 pieces, of which half are shaped tools, is clearly selective (Vallespí *et al.*, 1979, 1985). The sample from Solana de los Monteros appears to be less biased; it is characterized by numerous small amygdaloid bifaces (8–10 cm long) and differs from other collections (Las Tiñosillas, Las Casas del Río, Arroyo Tejar), which are dominated by large lanceolate and micoquian bifaces retouched by soft hammer and carefully made, symmetrical, chisel-edged cleavers. The small tools at Solana include a variety of types (scrapers predominate) and have multiple rows of continuous, intensive retouch. The Levallois technique is well documented (11% of the cores) and discoidal cores are numerous.

In spite of mixing, lumping, and selection, the Porzuna occurrences represent the final phases of the local Acheulean and are analogous to Northern Meseta occurrences like El Basalito and Burganes III, which are also of quartzite but much less abundant. El Martinete and Albalá are older: they are much more variable in biface types and show the beginning of the Levallois technique and of the soft hammer. They have analogues among the Duero assemblages. The Manzanares assemblages appear different from both the Duero and the Guadiana "Middle Acheulean" but raw material (flint, not quartzite) plays a role in this difference (Villa, 1981, 1983).

The Guadalquivir Depression

Acheulean assemblages occur all along the Guadalquivir valley, from Cádiz to Jaén; those on the middle terraces are analogous to those of the Northern and Southern Mesetas, except that the Guadalquivir localities have faunas. Unfortunately, collecting has not been systematic, few artifacts have been studied and there are no geological studies (Vallespí *et al.*, 1982).

The archaic-looking artifacts from the high terrace of the Guadalquivir, near Carmona (Bordes and Viguier, 1969), are not as old as was thought. The artifacts were on the surface, unpatinated and unrolled, and include many typical Levallois and discoidal cores. Open-air workshop sites exist in both Mesetas in analogous contexts; some of them have been shown to be Upper Pleistocene and younger than the deposits of the lower terraces (Santonja, 1986a).

The Guadix-Baza Depression

East of the Guadalquivir is a line of depressions: Granada, Guadix-Baza, Huercal-Overa, and Vera. The eastern ones have marine deposits, while the western ones had internal drainage and continental deposits predominate.

The Guadix-Baza depression (Fig. 9) is an irregular oval, ca. 100 × 60 km. Its fill includes the Serón-Caniles marine formation, the Baza lagoon formation, the Gorafe-Huélago lacustrine formation, and the Guadix fluviatile formation (Vera, 1970). The site of Solana del Zamborino occurs near the top of the sequence, indicating that sedimentation ended near the end of the Middle Pleistocene or the beginning of the Upper Pleistocene. The sedimentary record is continuous from Upper Miocene to Upper Pleistocene.

The age of the topmost deposits has implications for the geomorphological history of the area (Casas and Colbs, in Botella *et al.*, 1975). The surface of the depression is at > 1000 m asl, but all the formations were contemporaneous and represent lateral facies; thus, sedimentation must have taken place at or just above sea level. Uplift occurred in the Upper Pleistocene, and the previously internally drained area was now drained by rivers flowing to the sea. Vigorous erosion and valley cutting of ca. 100 m exposed stratigraphic sections along the walls of the canyons, and recent tectonic movement has produced faults with > 50 m of vertical displacement. Faunal remains believed to be Lower Pleistocene occur in several localities, but without trace of human presence.

Venta Micena: This site in the Orce region (Baza formation) is reported to have yielded a hominid fragment and bone artifacts (Gibert, 1985). The faunal assemblage resembles French Villafranchian assemblages dated between 1.6 and 0.9 mya (*Castillomys crusafonti*, *Allophaiomys pliocaenicus*,

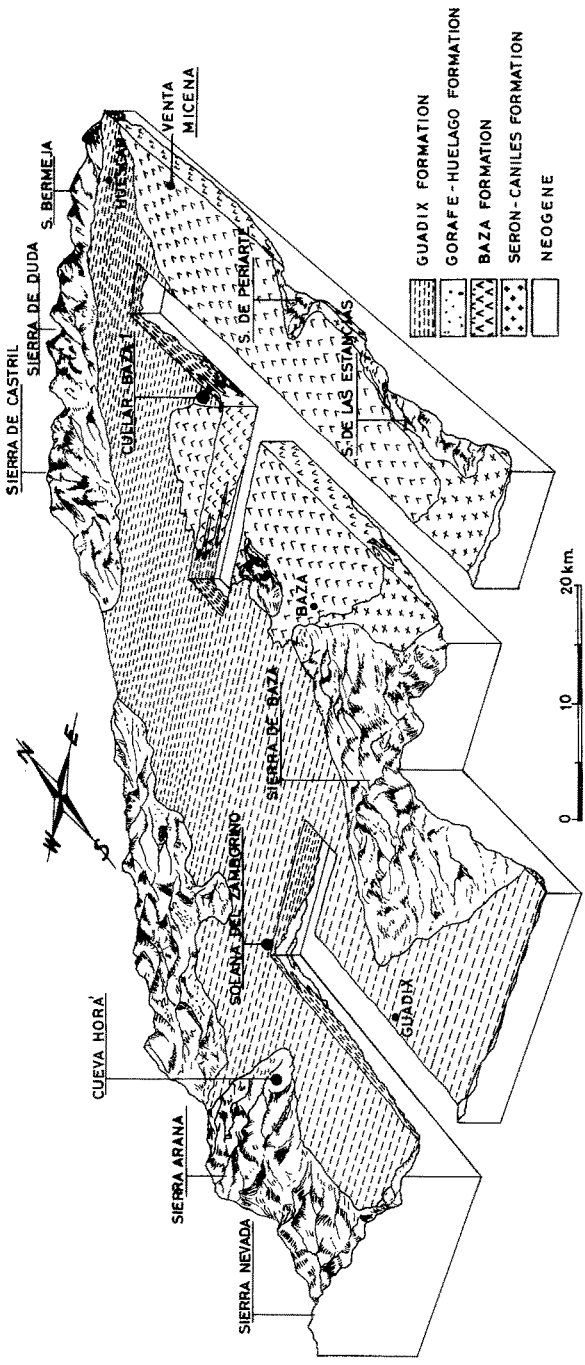

Fig. 9. Block diagram of the Guadix-Baza depression, showing Quaternary formations and location of sites.

Canis aff. *etruscus*, *Mammuthus meridionalis*, *Pachycrocuta brevirostris*, *Homotherium crenatidens*, etc.). If the reported hominid fossil is true, it is the oldest evidence of human presence in Iberia. The absence of stone artifacts at the site is surprising and cause for scepticism, especially since several hundred square meters have been excavated.

Cúllar-Baza I: This is 20 km to the southwest and appears to have the oldest stone artifacts of this area: six flakes and two choppers, found with a large faunal assemblage accumulated by animal predators and other nonhuman agencies (Ruiz Bustos and Michaux, 1986; Ruiz Bustos, 1976; Ruiz Bustos *et al.*, 1986). The fauna includes *Equus stenonis senezensis* var. *granatensis*, *Equus* aff. *süssenbornensis*, *Dicerorhinus etruscus*, *Cervus acoronatus*, *Praemegaceros verticornis*, *Bison* sp., *Sus* cf. *scrofa*, *Mammuthus meridionalis*, *Canis etruscus*, *Vulpes praeglacialis*, *Crocuta* sp., *Microtus brecciensis mediterraneaus*, *Arvicola mosbachensis*, *Apodemus* aff. *sylvaticus*, *Allocricetus bursae balaruciensis*, *Lepus* sp., *Sorex* sp., *Neomys* sp., *Crocidura* sp., *Testudo* sp., *Lacerta* sp., and *Teleosteos* sp. This assemblage indicates mild and humid Mediterranean conditions, with only slight seasonal variation. Comparable French faunas date to about the middle Middle Pleistocene; the microfauna shows affinities to that of St. Estève-Janson and is older than Aridos I (López Martínez, 1980b). Correlation with sites in fluvial deposits of the Meseta is difficult, but the presence of *Mammuthus meridionalis*, in particular, indicates that Cúllar-Baza is older than Pinedo.

Solana del Zamborino: The site is at the contact between the Guadix fluviatile formation and the Gorafe lacustrine formation at 992 m asl and only 8–10 m below the top of the sedimentary sequence in the depression (Botella, 1975; Botella *et al.*, 1975). The deposits with cultural materials are in three lithostratigraphic units, A, B, and C, composed of clay, silt, and sands. The clay and sandy silts of the middle unit (B), the richest in archaeological and faunal material, correspond to floodplain sediments.

The fauna (Ruiz Bustos *et al.*, 1986) includes *Equus caballus* aff. *germanicus*, *Dicerorhinus kirchbergensis*, *Cervus elaphus*, *Megaceros* sp., *Bos primigenius*, *Bison* sp., *Sus scrofa*, *Palaeoloxodon antiquus*, Carnivora indet., *Microtus brecciensis*, *Elyomys lusitanicus*, *Arvicola sapidus*, *Apodemus* cf. *flavicollis*, *Allocricetus bursae colombariensis*, *Oryctolagus* cf. *cuniculus*, *Lepus* sp., *Sorex* sp., *Crocidura* sp., *Testudo* sp., and Cercopithecidae. According to Garcia and Rosino (1983), this assemblage, especially the microvertebrates, dates toward the end of the Middle Pleistocene or the beginning of the Upper Pleistocene and is later than Cúllar-Baza I. Ruiz Bustos and others (1986) think that it is only slightly younger than Cúllar-Baza I and emphasize the presence of *Apodemus* cf. *flavicollis*, which, unlike *A. sylvaticus*, suggests a cold climate or conditions just prior to a cold period. Stressing morphological

and metrical continuity with the microfauna of Cúllar-Baza, they suggest an age well within the Middle Pleistocene.

Preliminary reports of the site concern only the 1972–1973 seasons, when only 97 m^2 were excavated; later excavation has reached 400 m^2, without exhausting the site. The excavation is > 10 m deep, with cultural levels at the base and possibly even deeper. This complex site has an undetermined number of superimposed occupations in different sedimentary contexts and in various states of preservation. Habitation structures are reported, including a 22-cm-wide fireplace circled by quartzite pebbles, and an apparently manmade ditch, 5 m long, 1 m wide, and 75 cm deep, containing bones and stone artifacts.

The fauna is dominated by horse bones but their association with the artifacts has not been analyzed. The artifacts are made of flint, quartz, and quartzite. The flint was carried from an outcrop on the opposite side of the lake; quartz and quartzite pebbles were brought into the depression by rivers flowing from the Sierra Nevada.

Preliminary analyses by Botella and others (1975) show that small tools predominate. Scrapers and denticulates are the most common; they are well made and regularly retouched. Large tools (bifaces and cleavers) are less abundant and include classic types, such as cordiforms. The Levallois technique is present and the occurrence of cores and chips shows that knapping was done at the site. The assemblage is considered to be Late Acheulean; more detailed analyses are needed to understand how it relates to others nearby, particularly the Mousterian from Cueva Horá and Cariguela (Vega Toscano, 1983).

Cueva Horá: This cave is in the Sierra Harana at the western margin of the depression. The lower levels are above the top levels of the Guadix-Baza depression, indicating a younger age. More than 15 m of cave deposits has been excavated and yielded numerous levels of monotonous, non-Levallois, Typical Mousterian (Botella *et al.*, 1983). The lower levels (XLVIII–L) have been described as Upper Acheulean of Meridional facies (Bordes, 1971), based on a comparison between Level XLVIII with Level 48 at Combe Grenal. Compared with the levels above, Level XLVIII is characterized by small bifaces (three lanceolates and one amygdaloid), a slightly higher frequency of burins and end scrapers, and an abundance of denticulates. The excavators, however, emphasize continuity in technology and small-tool types throughout the sequence. Variations in the relative frequencies of tool types do not seem significant, given the small size of the sample (about 100 pieces per level). There is, therefore, no definite evidence for a cultural change between the lower and upper parts of the sequence.

The microfauna contains species (*Microtus arvalis, Pitymys duodecimcostatus, Clethrionomys* sp.) absent from Solana, suggesting a younger age

and a definitely colder climate (García and Rosino, 1983). We do not know whether these species also occur in the "Meridional Acheulean" levels of the site.

In summary, the relative ages of Cúllar-Baza, Solana del Zamborino, and Cueva Horá are well established, with Cúllar as the oldest and Horá the youngest. The Guadix-Baza depression may preserve a continuous, stratigraphic sequence of behaviorally significant localities and is thus a crucial area.

The Mediterranean Region

This is one of the best-studied areas of Iberia, but Lower Paleolithic sites are practically unknown in the coastal region between Cádiz and Catalonia and there is insufficient information to propose a sequence or a regional synthesis.

The Ter river basin near Girona in northern Catalonia is the only area to yield significant assemblages from several sites: the caves of Cau del Duc de Torroella and Cau del Duc de Ullá, the rockshelter of Piedra Dreta, and two open-air sites, Puig d'En Roca and La Selva (Carbonell *et al.*, 1978; Carbonell and Canal, 1979).

The caves of Ullá and Torroella have only recently been studied systematically (de Lumley, 1971). At Torroella, the archaeological deposits had been redeposited near the cave entrance. The assemblage, made mainly on limestone, contains some abbevillian-like and amygdaloid bifaces and a variety of pebble tools; the proportion of Levallois flakes (308 of 1537) is high but the sample may not be homogeneous. Ullá had almost no core-tools but a high frequency of pseudo-Levallois flakes struck from discoidal cores; again, the sample is difficult to diagnose.

The fauna (Estevez, 1979) includes *Equus caballus*, *Elephas antiquus*, and *Bos primigenius* at Torroella and *Ursus deningeri*, *Equus hydruntinus*, *Capra ibex*, *Rupicapra rupicapra*, and *Bos primigenius* at Ullá. Some species (*Ursus deningeri*, *Elephas antiquus*) and the biface morphology at Torroella suggest that at least some of the material is Middle Pleistocene.

The surface occurrences of Puig d'En Roca have been discussed above. The abundance of discoidal cores and pseudo-Levallois points suggests Middle Paleolithic workshops, although the industry could be older or could be mixed.

The rockshelter of Pedra Dreta was destroyed before detailed study. A sample of > 300 pieces, mostly quartz, was recovered, including very few shaped tools, so the series is difficult to diagnose. As at other sites, there were many discoidal cores and pseudo-Levallois points. The fauna is very poor and the site might be Middle, rather than Lower, Paleolithic.

Several surface occurrences are known from La Selva, in the upper basin of the Ter. The largest is from Puig d'Esclats (Carbonell *et al.*, 1978), with about 200 shaped tools and 100 cores. There are some bifaces (abbevillian-like, amygdaloid, and chisel-ended), as well as various side scrapers, but we have no basis for assigning the material to a specific part of the Pleistocene.

SUMMARY AND CONCLUSIONS

Methodological Considerations

Two phenomena, the location of sites on river banks and the use of quartzite and quartz cobbles as raw material, profoundly influenced the typological and morphological characteristics of early Iberian assemblages. This influence requires some brief discussion.

Most workers (including the senior author) use Bordes' typology to analyze and categorize this material. His type list was developed for Middle or final Lower Paleolithic artifacts made on good-quality raw materials and is too elaborate to reflect faithfully the characteristics of more archaic, simpler artifacts made on blanks and raw materials that yielded usable edges with only a few removals and were at times (as at La Maya) of poor flaking quality. Early assemblages, with high frequencies of thick, irregular core-tools and flakes with limited retouch, do not fit easily into Bordes' types, which are better suited to more elaborate forms. Core-tools are particularly problematic with Bordes' types, so scholars in Spain and elsewhere (Tavoso, 1986) have developed complementary descriptive procedures. A rigid application of Bordes' list of flake tools may cause an unwarranted multiplication of tool forms, although not surprisingly, it fits the Manzanares flint assemblages quite well. In short, before assigning significance to technotypological differences between assemblages, we must factor out the raw materials and the distortion introduced by an inappropriate system of classification (see also Villa, 1981, 1983).

Almost all sites are open-air and in river deposits, which has several consequences. First, we cannot establish the size and extent of the occupation area, sometimes not even for primary context finds.

Second, we cannot assume the integrity of an assemblage but must consider its sedimentary context and formational processes. To this end, the senior author has estimated the degree of integrity, using traits such as the relative proportions of cores and core-tools to flakes, the presence or absence of particular products of knapping sequences, and the comparison of flakes and flake scars (cf. Villa, 1983).

Third, the time involved in the formation of an assemblage is not known. Most assemblages are aggregates of material discarded at different times over an unknown period. An indication of the episodic nature and restricted temporal scope of any individual event is provided only by exceptional sites such as Aridos.

Fourth, it is clear that direct comparisons based on typology or even technology are misleading, if the many variables involved in formational processes are not considered. For instance, the absence of bifaces at Aridos 1 has no cultural implications since bifaces are found in the laterally equivalent river deposits of the Arganda I beds.

The definition of industrial facies in the Lower Paleolithic is not easy and many factors must be eliminated first. Thus, the typological and technological differences between the Manzanares and other Mesetan assemblages made on quartzite are at least partly linked to different raw materials, differences in site activities, and differences in the geological processes of archaeological site formation.

Chronology and Temporal Variation

Our present knowledge of lithic assemblages does not allow us to define periods with distinct characteristics. However, temporal trends in technology and typology are beginning to emerge, although the pattern is fragmented. The evidence we have refers to moments in time and is discontinuous; even local sequences represent intervals that are probably very brief compared with the time span of the Middle Pleistocene as a whole.

Iberia is not homogeneous and site density varies from one area to the next. In the interior (essentially the Duero, Tagus, and Guadiana basins), we have a framework, since sites occur in morphostratigraphic contexts that can be correlated and are relatively well known. In this area, there are no well-documented archaic industries in Lower Pleistocene deposits. The high river terraces have yielded isolated pieces, whose human manufacture or precise age is open to doubt; they are too rare and undiagnostic to prove human settlement of Iberia in the Lower Pleistocene.

El Aculadero on the Atlantic littoral of Andalusia could be older than any of the biface industries, but the site is an isolated occurrence without absolute dates or fauna. No other find-spots in the area can be correlated with it, so no sequence can be worked out. Some characteristics of the assemblage (the absence of bifaces, the very high proportion of pebble tools, and the rudimentary flake tools) suggest an early date, but the numerous discoidal cores (one-third of all cores) imply a certain degree of technical development. We cannot therefore assign a precise age to the site.

Biface industries first appear in the upper middle terraces of several rivers in the interior. In the Southern Meseta, Pinedo is the oldest known site to yield a large assemblage with well-defined characteristics. Morphostratigraphic criteria show that Pinedo is older than the Arganda I deposits of the Jarama river and older than the Manzanares sites. In the Northern Meseta, a few bifaces have been found in the 62 to 64-m terrace of the Tormes, but the earliest large samples are in the 50 to 54-m terrace and below (Fig. 3). If the suggested correlation between La Maya II in the Tormes valley and El Sartalejo in the Alagón valley is correct, and if El Sartalejo is indeed younger than Pinedo, then La Maya III would be of an age comparable to Pinedo.

Many biface assemblages occur on the lower middle terraces of the Tormes, Duero, Pisuerga, Tera, and other rivers of the Northern Meseta. Broadly comparable are occurrences in the Manzanares and Jarama valleys (San Isidro, Arriaga, Arganda I and II, Aridos), Monte Famaco in the Tagus valley, the region of Galisteo in the Alagón valley, and those in the Guadiana region (Albalá, Martinete). All these are clearly different from (a) finds *on the surface* of the high and middle terraces of the Northern Meseta (Basalito in the Yeltes valley, Burganes III in the Tera valley, (b) sites in valley bottoms and dissected pediments of the Southern Meseta (Porzuna, El Sotillo), and (c) occurrences in the upper layers of the Manzanares valley fill just before the Jarama confluence.

Pinedo, and perhaps La Maya III, represent an early phase of biface industries, which is characterized by (a) thick, irregular bifaces; (b) simple cleavers made on cortical flakes; (c) numerous pebble tools; (d) small tools of simple types with limited retouch; (e) no Levallois technique *sensu stricto*, but frequent use of simple centripetal flaking, creating discoidal cores (which may make up a third of all cores); and (f) no "soft-hammer" technique.

A later phase, represented by the middle terrace of the Northern Meseta (La Maya II and I), the Manzanares and Jarama sites described above (San Isidro, Aridos, etc.), and sites in the Tagus basin (Monte Famaco, El Sartalejo) and in the Guadiana area (Albalá, Martinete), shows the following characteristics: (a) regular bifaces and cleavers, (b) use of the Levallois technique, (c) small tools of elaborate types, and (d) sporadic use of the soft hammer. Although there are occurrences on more than one terrace level (e.g., four in the Tormes valley), this phase cannot be further subdivided.

The third and last phase is defined on the basis of Burganes III, El Basalito, and similar finds in the Northern Meseta, and sand quarry of Oxígeno in the Manzanares valley, Milharós in the lower Tagus valley, and Porzuna and El Sotillo in the Southern Meseta. These industries are not well known because the assemblages are small, or have not been studied, or are surface finds and possibly mixed. Their main features are (a) bifaces made by the soft hammer, with symmetrical and classical shapes such as lanceolates

and micoquians, and straight edges; (b) cleavers with invasive bifacial retouch, made on Levallois or Janus flakes; and (c) well-made trihedral picks with intensive trimming.

This threefold subdivision of Iberian biface industries does not formally correspond to the classic, tripartite, Acheulean chronology (Early, Middle, and Upper). We are not sure that the phases represent real patterns in the evolution of technical behavior, because too few assemblages are known to be considered as representing a whole epoch. It would seem, however, that significant changes did occur through time and throughout Iberia.

The End of the Lower Paleolithic

The data and circumstances of the replacement of biface industries by the Middle Paleolithic are little known. Transitional industries in the interior occur outside stratigraphic sequences but appear to be younger than the lower middle terraces and older than the present floodplain (generally dating to the end of the Upper Pleistocene): some transitional assemblages (La Maya I and Valgrande near Salamanca and Cerro Arzollar near Ciudad Real) occur in colluvial deposits covering the low terrace levels (Santonja, 1986b). Some assemblages (Cerro Arzollar) have small bifaces, of micoquian, lanceolate, and cordiform forms, while others have no bifaces. The 14-m terrace of La Maya I yielded an assemblage with very few bifaces (see above). At present, assemblages with large bifaces seem to have disappeared toward the end of the Middle Pleistocene and were replaced by industries with greater patterned variability (Santonja and Pérez González, 1984).

The same pattern may occur in the Manzanares area, although little is known of sites such as Arriaga and La Gavia. Some of the distinctive features of these assemblages are tied to the use of flint. Solana del Zamborino and Cueva Horá in the Guadix-Baza depression are expected to provide significant data concerning the Lower-Middle Paleolithic transition.

No sequences comparable to those of the Meseta are known from the coastal regions. Stratified sites occur only in Cantabria and in Galicia and are generally late (e.g., Bañugues, Budiño). El Castillo has yielded a distinctive assemblage, thought to be similar to those found in the Dordogne caves of Pech de l'Azé and Combe Grenal.

Problems and Perspectives

Our knowledge of the Iberian Lower Paleolithic is still at the elementary stage of exploring questions of the first appearance, temporal sequences, and

geographical distribution of human occupation. Our knowledge of the environment, climate, vegetation, and fauna is restricted to a few specific sites that cannot be integrated into a general framework. A fundamental problem is that of tying together evidence from open-air sites with few or no organic remains and the very different kind of evidence provided by caves.

This survey has outlined gaps in knowledge and defined guidelines for future research. We must intensify the exploration of the eastern valleys of the North Meseta to provide a firmer basis of comparison with the better known western sector. The Mediterranean littoral and the high river terraces must also be better surveyed for early Pleistocene deposits.

Occurrences in terraces can provide useful information if the stratigraphic sequence is well documented and mapped over a wide area. Nevertheless, only sites in primary context and rich in organic remains can provide the kind of information we seek on the economic and social behavior of human groups and their environment. In this respect, the most promising areas seem to be the Manzanares-Jarama valleys and the lacustrine facies of the Guadix-Baza depression.

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