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Abstract

This paper focuses on an overview of the sites featuring lithic industries ascribed to Middle Palaeolithic based upon a raw materials, technological organization and toolkit management. This is a synthetic analysis of the Western Mediterranean area where sites featuring broad stratigraphic sequences are abundant and enable an adequate assessment of the available record. Presenting all the data organized according to geographical regions contributed to the homogeneity of the results and allowed us to contextualize a regional synthesis, from a broad territorial and chronological point of view. This perspective was compared to other distant European spheres which in turn enabled establishing a framework that consolidates the study area as a different cluster, independent from the remainder of the territories. This paper shows how the various Neanderthal populations had diverse cultural traditions throughout Europe; these are reflected by the archaeological record with the existence of diverse regional clusters that show a significant variability during the Middle Palaeolithic. Therefore it seems reasonable to conclude that even though the previously referred technical traditions persisted throughout the entire Middle Palaeolithic, arguably even more so than during more recent time periods, it seems pretty obvious that the idea of the Middle Palaeolithic being an homogenous period is wrong and should be disregarded as far as Europe and the Western Mediterranean in particular are concerned.

Keywords	Keywords: Techno-typology; Raw materials; Middle Paleolithic; Chronology; Western Mediterranean.

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Highlights

- An overview of the sites featuring lithic industries ascribed to Middle Palaeolithic has been done.
- This paper shows how the Neanderthal populations had diverse cultural traditions throughout Europe. These are reflected by the archaeological record with the existence of diverse regional clusters that show a significant variability during the Middle Palaeolithic.
- The idea of the Middle Palaeolithic being an homogenous period is wrong and should be disregarded as far as Europe and the Western Mediterranean in particular are concerned.

MIDDLE PALEOLITHIC LITHIC ASSEMBLAGES IN WESTERN MEDITERRANEAN EUROPE FROM MIS 5 TO 3

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Abstract: This paper focuses on an overview of the sites featuring lithic industries ascribed to Middle Palaeolithic based upon a raw materials, technological organization and toolkit management. This is a synthetic analysis of the Western Mediterranean area where sites featuring broad stratigraphic sequences are abundant and enable an adequate assessment of the available record. Presenting all the data organized according to geographical regions contributed to the homogeneity of the results and allowed us to contextualize a regional synthesis, from a broad territorial and chronological point of view. This perspective was compared to other distant European spheres which in turn enabled establishing a framework that consolidates the study area as a different cluster, independent from the remainder of the territories. This paper shows how the various Neanderthal populations had diverse cultural traditions throughout Europe; these are reflected by the archaeological record with the existence of diverse regional clusters that show a significant variability during the Middle Palaeolithic. Therefore it seems reasonable to conclude that even though the previously referred technical traditions persisted throughout the entire Middle Palaeolithic, arguably even more so than during more recent time periods, it seems pretty obvious that the idea of the Middle Palaeolithic being an homogenous period is wrong and should be disregarded as far as Europe and the Western Mediterranean in particular are concerned.

Keywords: Techno-typology; Raw materials; Middle Paleolithic; Chronology; Western Mediterranean.

1. Introduction

During the Middle Palaeolithic human behaviour was affected by a series of factors that originated a wide array of answers resulting from the cultural variability of Neanderthal populations. The new data indicate technical and social changes as a result of increased cultural diversity among the human groups (Jöris, 2004; Delagnes and Meignen, 2006; de la Torre et al., 2013; Villa and Roebroeks, 2014), as opposed to other views of this period as a homogenous, static phase with hardly any signs of internal innovation (Gamble, 1986; Klein, 1999; Kuhn and Hovers, 2006).

The spatio-temporal entities that can be identified on the basis of different factors like blade production, the advent of Levallois technology or the presence of a certain type of handaxe or cleaver are spatially limited and include a series of shared features which grant them originality and exceptionality within each region (Richter, 2000; Jöris, 2004). Such artefacts provide keys to the reconstruction of the technical procedures that define versatile behaviours and originate a significant variability of the debitage methods (Boëda, 1991; Boëda et al., 1990; Pigeot, 1991). The management of lithic resources enables the production of blanks with variable dimensions and morphologies, which can be used in tasks that are critical for the viability of the human groups. The coexistence of expeditive and structured schemes, as described in various sites and chronologies, indicates the coexistence of different technical choices that may be used according to particular circumstances. The dual technical systems, grouped under the structured/expeditive concepts, can be seen as discrete schemes that result from different ways of managing the lithic resources and define a variegated cultural scenery. Nevertheless, the intense research efforts carried out since the mid-twentieth century are still unable to pinpoint the origins of this variability, such as raw material uses and management, site functionality, the different uses of the toolkits, tool recycling and rejuvenation or the skills and abilities of the individual knappers (Rolland, 1981; Dibble, 1984, 1987; Geneste, 1985; Dibble and Rolland, 1992; Turq, 2000; Vaquero, 2011; Vaquero et al., 2014).

The studies on Western Mediterranean archaeological assemblages and sequences add a new perspective to this discussion on the variability of the lithic records. The high density of sites makes it one of the richest regions within the overall European panorama. Furthermore, this area has some specific features that are significantly different from the more northern areas (see Roebroeks, 1988, Conard and Adler, 1997; Conard and Fischer, 2000; Jöris, 2006; Roebroeks et al., 2011, Ruebens, 2013). However, we are aware of the difficult task that is to homogenize all the data coming from raw materials, lithic technology and tools to be able compared them adequately. In addition to the differences in the depth of the detail in each selected site, we have tried to take the data as objectively and carefully as possible.

2. Material and methods

The time frame of this paper encompasses the Middle Palaeolithic sites dating from interglacial or MIS 5 (128000-118000 BP) until MIS 3 (57000-28000 BP). In order to establish a framework for the studied sites, it is imperative to consider the Mid- and Late Pleistocene industries as well, i.e. dating from MIS 7 and 6, around 242000-185000 BP, which are known in Iberia at such sites as Lezetxiki (VII-VIII) up north, Cueva del Ángel (XVIII), Bajondillo (20), Cueva de las Grajas (C to F) and Solana del Zamborino (A to C) down south, Mollet I (4-5) to the east, Vale do Forno 8, Almonda and Galerias Pesadas (B to E) to the west and, in Southeastern France, Payre (C to G), Moula (XVIII-XIX), Baume des Peyrards (23 to 26), Bau de l'Aubesier (I to N), Baume Bonne (IV) and Lazaret (B to D), among others; the scope of the present study also includes, as shall be seen further on, a significant part of the Cova Negra and Bolomor sequences. Still, and despite the fact that one must look further back into the final stage of the MIS 6, in order to characterize the classic Middle Palaeolithic sites, this paper shall not consider the final stages of the above described time span and no sites postdating 30,000 BP shall be considered. The current debate on the Middle-to-Upper Palaeolithic transition and the early Upper Palaeolithic of the study area is left out of this paper, as its purpose is characterizing the Middle-Palaeolithic industries in a strict sense, to examine their degree of homogeneity or heterogeneity and their evolution, thus the need to consider the immediately preceding assemblages. But this study does not aim at contributing to the debate on the more recent stages, a subject that has already been extensively addressed in previous studies (Villaverde and Fumanal, 1990; Utrilla and Montes, 1993; Iturbe et al., 1993; Vega, 1993; Carbonell and Vaquero, 1996; Cabrera et al., 2001; Maíllo, 2003; Slimak, 2004; Jöris et al., 2004; Menéndez et al., 2005; Arbizu et al., 2005; Arrizabalaga, 2005; Zilhão, 2006; Finlayson et al., 2006; Rios, 2006; Cortés, 2007; Martínez-Moreno et al., 2010; Baena et al., 2012; Maroto et al., 2012; Santamaría, 2012; Zilhão et al., 2017). The text is organized according to the following study areas (Fig. 1 and Table 1):

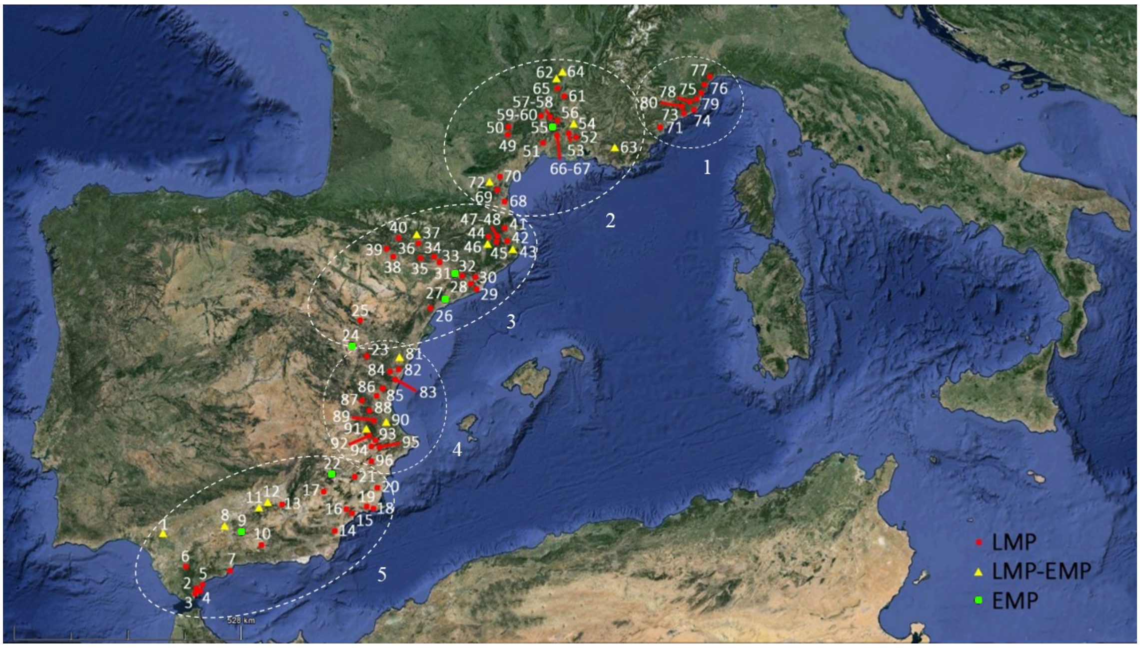

Fig. 1. Areas and main sites cited in the text: 1- Italian Liguria, 2- Southeastern France, 3- Northeastern Iberia, 4- Central Mediterranean Iberia and 5- Southeastern Iberia. Sites: 1-Tarazona, 2-Devil's Tower, 3-Ibex's Cave, 4-Gorham's Cave, 5-Vanguard's Cave, 6-Higueral la Valleja, 7-Bajondillo, 8-Cueva del Ángel, 9-Cueva de las Grajas, 10-Boquete de Zafarraya, 11-Solana de Zamborino, 12-Carigüela, 13-Cueva Horá, 14-Zájara I, 15-Palomarico, 16-Perneras, 17-Abrigo Grande del Cerro Negro, 18-Aviones, 19-Vermeja, 20-Sima de las Palomas, 21-Cueva Antón, 22-Cueva Negra del Estrecho del Río Quípar, 23-Cueva de los toros de Cantavieja , 24-Cuesta de la Bajada, 25-Eudoviges, 26-Bòbila de Sugranyes, 27-Vinyets, 28-Can Albareda, 29-Cova del Rinoceront, 30-Abric Romaní, 31-La Noguera, 32-Cova Teixoneres, 33-Roca dels Bous, 34-Cova Gran, 35-Estret de Tragó, 36-Cova dels Muricecs, 37-Nerets, 38-Gabasa, 39-Fuente del Trucho, 40-Fuentes de San Cristóbal, 41-Els Ermitons, 42-Arbreda, 43-Mollet I, 44-Cova 120, 45-Can Garriga, 46-Puig d'Esclats, 47-Can Rubau, 48-Pedra Dreta, 49-Les Canalettes, 50-Le Rescoundudou, 51-Hortus, 52-La Combette, 53-Baume des Peyrards, 54-Bau de l'Aubesier, 55-Orgnac 3, 56-Maras, 57-Ranc Pointu

2, 58-Le Figuier, 59-Saint-Marcel, 60-Abri des Pecheurs, 61-Grotte Mandrin, 62-Payre, 63-Baume Bonne, 64-Moula, 65-Baume Neron, 66-Esquicho Grapaou, 67-Ioton, 68-Crouzade, 69-Tournal, 70-Ramandils, 71-Grotte du Lazaret, 72-Grotte d'Aldène, 73-San Francesco, 74-Grotta del Principe, 75-Madonna dell'Arma, 76-Grotte de Santa Lucia superiore, 77-Grotte d'Arma delle Manie, 78-Grotta del Colombo, 79-Fate, 80-Barma Grande, 81-Tossal de la Font, 82- Forcall Rambla-Millars (FRM), 83- Terrassa Pont Nou (TPN), 84- Terrassa Pont Vell (TPV), 85- El Pinar, 86- Hoya Albaida-Titonares and Árguinas-Majadal, 87- Abrigo de la Quebrada, 88- San Luís, 89- Las Fuentes, 90- Bolomor, 91- Cova Negra, 92- Petxina, 93- Bancals Pere Jordi, 94-Beneito, El Salt and Pastor, 95- Coves d'Estroig, Penella and Alt de la Capella and 96-La Coca. Red dot: LMP (Late Middle Paleolithic), yellow triangle: LMP-EMP (Late Middle Paleolithic- Early Middle Paleolithic) and green dot: EMP (Early Middle Paleolithic).

- Italian Liguria: located in Northwestern Italy, between the mountain ranges of the Alps and the Apennines to the north and the Mediterranean to the south; its boundaries are France to the west, the Piedmont to the north and Emilia-Romagna and Toscana to the east.

- Southeastern France: the entire territory of the French regions of Languedoc-Roussillon and Provence-Alpes-Côte d'Azur, all located on the eastern end of France; their boundaries are the Iberian Peninsula to the southwest, the regions of Midi-Pyrénées (Ariège, Haute Garonne, Tarn and Aveyron), Auvergne (Cantal and Haute-Loire) and Rhône-Alpes (Ardèche, Drôme, Isère and Savoie) to the north, Italy to the northeast and the Mediterranean to the east.

- Northeastern Iberia: including the present-day territories of Aragon and Catalonia; their boundaries are the Pyrenees to the north, the Catalonian coastal range and the Mediterranean to the east and the foothills of the Iberian range and the Meseta Central. The whole area is crossed by the Ebro River.

- Central Mediterranean Iberia: its boundaries are Catalonia to the north, the Iberian range and the Maestrazgo sierras, which border on the territory of Aragon) to the west. The Baetic System is located to the south and the northwest of the central area, starting at the fault south of Valencia and reaching the interior of the Iberian Peninsula. And, to the east, the wide coastal plain of Valencia, which reaches the Mediterranean.

- Southeastern Iberia: its boundaries are the foothills of the Meseta Central to the north, close to the Prebaetic range and the Sierra Morena. To the far south, most of this area reaches the Mediterranean, while a small part (Gibraltar) reaches the Atlantic.

	Main raw material	Secondary raw material	Allochthonous raw material	Main lithic production	Secondary lithic production	Tools	Macro-tools	Reference
Italian Liguria								
Madonna dell'Arma (IV-VII)	Quartzite	Limestone, flint and jasper	Yes (-)	Levallois	Discoid	Sidescrapers	Yes	Cauche, 2007
Arma delle Manie (I-VIII)	Quartzite	Jasper and flint	-	Discoid	Not standardized and orthogonal	Sidescrapers	No	Cauche, 2007
Santa Lucie superiore (B-F)	Limestone	Quartzite and flint	-	Discoid	Not standardized	Sidescrapers	Yes (D-E)	Cauche, 2007
San Francesco	Flint	-	-	Levallois	-	Denticulates	No	Tavoso, 1988
Grotta del Prince (B-E)	Gres	Flint and quartzite	-	Levallois	Laminar (D-E)	Sidescrapers	No	Yamada, 1993
Grotta del Colombo (1-12)	Quartz and quartzite (1-7) and quartz (8-12)	Flint (1-7) and quartzite and flint (8-12)	-	Discoid (1-12)	Levallois (1-7)	Sidescrapers	No	Arobba et al., 2008

Fate (4)	Quartzite	-	Yes (90 km)	Unipolar and bipolar	-	Sidescrapers	No	Échassoux et al., 1989
Barma Grande (A-E)	Quartzite	-	-	Discoid	Laminar	Sidescrapers	Yes	Onoratini et al., 2012
Southeastern France								
Payre (D-F)	Flint	Basalt and quartz	Yes (60 km)	Discoid	Unipolar	Sidescrapers	Yes	Moncel, 1999
Moula (IV-XIX)	Flint	-	No	Discoid	Levallois (rec. uni/bipolar)	Sidescrapers	No	Defleur et al., 2001
Le Figuier (1-1')	Flint	Quartz and quartzite	Yes (50 km)	Discoid	Levallois?	Sidescrapers	No	Moncel, 2001
Ranc Pointu (C)	Flint	Quartz and limestone	No	Levallois (rec. uni/bipolar)	-	Sidescrapers	Yes	Moncel, 1996
Abri du Maras (1-8)	Flint	Limestone, quart, quartzite and basalt	No	Levallois (rec. uni/bipolar)	Discoid	Sidescrapers	No	Moncel, 1996
Pecheurs (1-3)	Quartz	Flint	-	Discoid	-	-	-	Moncel et al., 2008
Saint-Marcel (g-	Flint	Quartz and	No	Discoid	Unipolar	Sidescrapers	No	Moncel,

j)		limestone						1998
Mandrin (3-7)	Flint	-	No (5); Yes (70 km) (6)	Levallois (rec. unipolar) (3-4); Kombewa (5); Lame/pointe and Levallois (6)	-	Sidescrapers (3-5) and points (6)	Yes (1-4); No	Yvorra and Slimak, 2001; Slimak, 2007
Ioton (Cj, Ag, A)	Flint	Quartzite and quartz	Yes (30 km)	Discoid	Levallois	Sidescrapers	No	Bourguignon and Meignen, 2010
Hortus (III-V)	Flint	Quartz and limestone	Yes (>20 km)	Discoid	Levallois	Sidescrapers	No	Lebegue, 2010
Grotte d'Aldène (VII)	Flint	-	Yes (-)	Discoid and Levallois (rec. uni/bipolar/centripetal)	-	Sidescrapers and points	No	Rossoni-Notter et al., 2016
Tournal (A-D)	Quartzite	Flint and quartz	No	Levallois	Discoid	Denticulates	No	Tavoso, 1987
Ramandils (I-V)	Flint	Quartzite and chaille	No	Levallois	Globular	Sidescrapers	No	Moles, 1996
Bau de l'Aubesier (IV)	Flint	-	Yes (45 km)	Levallois	-	Sidescrapers	No	Lebel et al., 2001

La Combette (A-G)	Flint	-	Yes (40 km)	Levallois	Quina and kombewa	Sidescrapers	No	Texier et al., 2003
Baume Bonne (M)	Flint	Chaille	Yes (-)	Levallois (rec. uni/centripetal and points)	-	Sidescrapers	No	Gagnepain y Gaillard, 2009
Northeastern Iberia								
Cova 120 (IV-V)	Quartz	Flint and limestone	-	Poliedrical	Levallois	Sidescrapers	No	Agustí et al., 1991
Ermitons (IV-VI)	Flint, hornfels and quartz	-	No	Discoid	Levallois	Sidescrapers	No	Ortega and Maroto, 2001
Arbreda (I-N)	Quartz	Quartzite	Yes (-)	Discoid	Levallois	Sidescrapers and denticulates	No	Soler et al., 2014
Mollet I (3-5)	Quartz	Quartzite	-	Discoid	Levallois	Sidescrapers	Yes	Maroto et al., 1987
Can Garriga (1-3)	Quartz	Quartzite, porphyry and hornfels	No	Centripetal and orthogonal	Levallois	Denticulates	Yes	Rodríguez and Lozano, 1999
Puig d'Esclats	Quartz	Quartzite and	No	Centripetal	Levallois	Sidescrapers	Yes	Canal and Carbonell,

		porphyry						1989
Nerets	Quartzite	Hornfels and sandstone	No	Levallois	Centripetal, trifacial and multifacial	Sidescrapers	Yes	Rodríguez and Lozano, 1999
Fuentes San Cristobal (E-G)	Flint	Limestone	No	Discoid	Multifacial multipolar	Sidescrapers and denticulates	Yes	Menéndez et al., 2009
Gabasa (a-h)	Flint	Quartzite	No	Discoid	Poliedrical	Sidescrapers	No	Utrilla and Motes, 1993
Estret de Tragó (S5/7-UA1/3)	Flint	-	-	Discoid	Levallois (rec. uni and preferential)	-	No	Casanova et al., 2009
Roca dels Bous (N10/12)	Flint (N10) and quartzite (N12)	Quartzite (N10) and flint (N12)	-	Unifacial (N10) and bifacial hierarchical (N12)	Bifacial hierarchical (N10) and Levallois (preferential) (N12)	Denticulates	No	Mora et al., 2008
Cova Gran (S1B-S1C)	Flint	Quartzite	-	Bifacial hierarchical	Unifacial (S1B) and Levallois (preferential) (S1C)	Denticulates	No	Martínez-Moreno et al., 2010
Abric Romaní (B-O)	Flint	Quartz and limestone	No	Discoid (sensu lato)	Levallois	Denticulates	No	Vaquero, 1997; Chacón, 2009; Vaquero et

								al., 2012
Cueva de los Toros (c-e)	Flint	Quartz	-	Discoid	Levallois	Sidescrapers	No	Montes et al., 2006
Teixoneres (II-IV)	Quartz	Chert	Yes (30 km)	Discoid	Levallois	Sidescrapers	No	Talamo et al., 2016
Vinyets	Flint	Quartz and quartzite	No	Lineal bifacial	Orthogonal	Denticulates	Yes	Rodríguez and Lozano, 1999
Central Mediterranean Iberia								
Tossal de la Font (Nivel sup.-Nivel inf.)	Flint	-	-	Discoid	Levallois	Sidescrapers	No	Gusi et al., 2013
El Pinar (1-2)	Flint	Quartzite and sandstone	Yes (-)	Discoid	Levallois	Sidescrapers	No	Casabó and Rovira, 1992
Abrigo de la Quebrada (II-IX)	Flint	Quartzite and limestone	Yes (120 km)	Discoid	Levallois (rec. centripetal)	Sidescrapers	No	Eixea, 2015
San Luís	Flint	Quartzite	No	Discoid	Levallois	Sidescrapers	No	Fernández-Peris and Martínez

								Valle, 1989
Las Fuentes (II)	Flint	Quartzite	No	Discoid	Levallois	Sidescrapers	No	Villaverde, 1984
Bolomor (I-XVII)	Flint (all levels) and limestone (VI and XII)	Quartzite and limestone (all levels) and flint (VI and XII)	Yes (-)	Trifacial (IV) and Discoid	Levallois (rec. centripetal)	Sidescrapers	Yes	Fernández-Peris 2007
Cova Negra (I-XIV)	Flint	Quartzite and limestone	Yes (40 km)	Discoid	Levallois (rec. centripetal)	Sidescrapers	Yes	Villaverde, 1984; Eixea, 2015
Petxina (2-9)	Flint	Quartzite	-	Discoid	Levallois (rec. centripetal)	Sidescrapers	No	Villaverde, 1984
Beneito (X-XII)	Flint	Quartzite	Yes (30 km)	Discoid	-	Sidescrapers and Upper Pal. Group	No	Iturbe et al., 1993
Abric del Pastor (IV)	Flint	-	No	Levallois (rec. centripetal)	Discoid and kombewa	Sidescrapers	No	Machado et al., 2013
El Salt (X)	Flint	Limestone	No	Levallois (rec. centripetal)	Multipolar and polyhedral	Sidescrapers	No	Galván et al., 2014

Cochino (II-III)	Flint	Quartzite and limestone	No	Discoid	Levallois	Sidescrapers	No	Villaverde, 1984
La Coca	Flint	-	-	Levallois (rec. centripetal)	-	Sidescrapers	No	Fernández Peris, 1998
Penella	Flint	-	-	Discoid	Levallois	Sidescrapers	No	Faus, 1988
Alt de la Capella	Flint	-	-	Levallois	Discoid	Sidescrapers	No	Barciela and Molina, 2016
Southeastern Iberia								
Sima de las Palomas (2c-2l)	Flint	Quartz, rock-crystal, limestone and quartzite	-	-	-	Sidescrapers	No	Walker et al., 2008
Higueral de Valleja (V-X)	Flint	-	-	Discoid	Levallois	Denticulates	No	Jennings et al., 2009
Perneras (Alfa-delta)	Flint	Quartz, quartzite and	Yes (-)	Discoid	Levallois	Denticulates	No	Montes, 1985

		limestone						
Vermeja (nivel inf.)	Quartz	Flint and quartzite	Yes (-)	Discoid	-	Denticulates	No	Vega, 1988
Zájara I (1-3)	Flint	Quartz and quartzite	-	Discoid	Levallois	Sidescrapers	No	Vega, 1988
Aviones (I-IV)	Quartz	Flint	Yes (-)	Discoid	Levallois	Sidescrapers	No	Zilhão and Villaverde, 2008
Cueva Antón (II-I)	Flint	Limestone	-	Centripetal (discoid or Levallois)	-	Sidescrapers	No	Zilhão et al., 2017
La Boja (OH21-OH23)	Flint	Quartzite	-	Discoid?	Kombewa	Sidescrapers and denticulates	No	Zilhão et al., 2017
Finca Doña Martina (9)	Flint	Quartzite	-	Levallois	Kombewa and discoid	Sidescrapers	No	Zilhão et al., 2017
Solana del Zamborino (A-C)	Quartz and quartzite	Flint	-	-	-	Sidescrapers and denticulates	Yes	Botella et al., 1976
Carigüela (IV-XII)	Flint	Quartz and limestone	-	Discoid	Levallois (rec. centripetal/preferential)	Sidescrapers	Yes	Vega, 1988; Vega et al., 1997

Cueva Horá (I-XVII)	Flint	Quartz and chalcedony	-	Discoid	Levallois	Sidescrapers and denticulates	Yes	Botella et al., 1983
Bajondillo (14-19)	Flint	Quartzite and quartz	-	Levallois	Discoid and kombewa	Denticulates	No	Cortés, 2005, 2007
Zafarraya (Sup./Med./Inf.)	Flint	Quartzite and sandstone	No	Levallois (rec. centripetal)	Uni and bipolar	Points/endscrapers and denticulates	No	Baroso et al., 2003
Grajas (C-F)	Flint	Quartzite	Yes (-)	Discoid	-	Sidescrapers	Yes	Benito del Rey, 1982
Cueva del Ángel (I-XVIII)	Flint	Quartzite and limestone	Yes (40 km)	Unipolar	Discoid and kombewa	Sidescrapers	Yes	Barroso et al., 2011
Tarazona (III/1-III/5)	Quartzite	Sandstone, quartz and flint	No	Simple	Discoid	Denticulates	Yes	Caro et al., 2011

Table 1. Techno-typological characteristics of the Western Mediterranean sites between MIS 5 to 3.

This area comprises a wide region that covers most of the western Mediterranean area, from Gibraltar to the easternmost part of Liguria. This region shows a certain homogeneity during the Middle Paleolithic that separates it from the other regions - the peninsular plateau, the Cantabrian, the Atlantic coast or the Paris basin. It is also one of the central regions in the explanation of the settlement process of Neanderthal groups throughout the Middle Paleolithic. It fits into a territory located in a transition zone between different natural areas and includes a great variety of orographies and climatic zones. This region, surrounding the Mediterranean Sea, would be geographically defined by that character of passage zone and way of communication of Paleolithic populations between different areas such as the interior of the Iberian peninsula, the Pyrenees, the Rhone Valley or the Alps and the multiplicity of areas that we find in its interior (coast, closed valleys, mountains, large valleys and plateaus) whose ecological environments have very different characteristics and in which the Neanderthal populations occupied indistinctly (Aura et al., 1993; Fumanal and Villaverde, 1997; Mussi, 2002; Mora et al., 2004; Cortés, 2007; Martínez-Moreno et al., 2006, 2007; Daujeard et al., 2012; Moncel et al., 2012, 2015).

3. Results

3.1. Italian Liguria

This zone features several sites dating from between MIS 5 and 3, known since the mid-twentieth century and excavated during the 1950s and 60s (Fig. 2). The excavation works did not extend over the entire surface of the sites but nevertheless led to the recovery of abundant faunal and lithic remains (Mussi, 2002; Cauche, 2007, 2012). Recently, the multidisciplinary works carried out at Madonna dell'Arma (San Remo), Grotte de Santa Lucia superiore (Toirano) and Grotte d'Arma delle Manie (Finale Ligure) have contributed to increase the available information on the area.

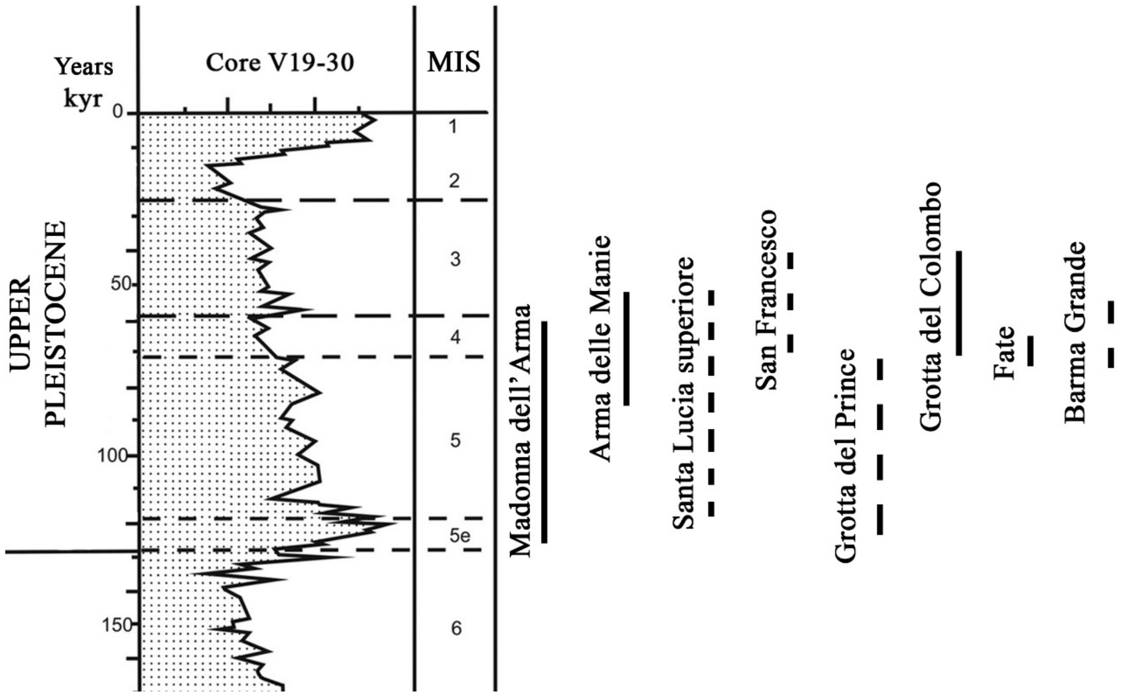

Fig. 2. Time span of Middle Palaeolithic sites from Italian Liguria (isotopic curve adapted from Gamble, 1986). In continuous line absolute dates and in discontinuous line relative dates. Madonna dell'Arma (ESR and U/Th: Stearns et Thurber, 1967; Blanchin, 1999); Arma delle Manie (ESR: Mehidi, 2005); Santa Lucie superiore (Palynology: Kaniewski, 2002); San Francesco (Palynology: Karatsori, 2003); Grotta del Prince (Stratigraphy: Lumley, 1971); Grotta del Colombo ((ESR and U/Th: Pirouelle, 2006); Fate (ESR and U/Th: Giacobini et al., 1984; Falguères et al., 1990); Barma Grande (U/Th: Dubar et al., 2012).

3.1.1. Raw materials

Flint and other quality rocks are rather scarce in this area (Vicino and d'Errico, 1985). The territory can be divided in two zones: on one hand, the eastern region where radiolarite, also known as jasper, is the dominant raw material, being available along the entire coast, as for instance at the Bargone site; flint is also present in the records albeit in small amounts and was procured in territories located further south, close to Toscana. On the other hand, on the western region one finds a predominance of poor-quality rocks like quartz, quartzite and limestone, all obtained in the vicinity of the sites. This was observed, for instance, at Grotte d'Arma delle Manie and Grotte de Santa Lucia superiore, where limestone is the predominant raw material, followed by quartzite, or at Grotta del Colombo, Madonna dell'Arma and Fate, where the predominant rocks are quartzite and quartz, with an insignificant percentage of flint. The availability of the latter is considerably better at the westernmost sites, as Balzi Rossi, where outcrops in primary position exist 1 km away from the site and flint was widely used throughout the entire sequence (Cremaschi et al., 1997). What is observed in raw material procurement is a consistently local provisioning, mostly in a range of 10 km, and a exotic raw material types presents in very low proportions. As Kuhn (1991 and 1995) points out, while small pebbles available in the coastal strip, were generally used, a limited amount of flint was collected at a distance in excess of 50 km and the exotic material was used less and less through time. The changing sea level must have accounted for an access to the pebble deposits, which varied greatly through time If anything, lower marine stands, and the erosion of small gullies by the streams, made it easier to collect suitable raw material along the banks and at the mouth of the rivers (Mussi, 2002).

3.1.2. Lithic technology and tools

From MIS 5 onwards the management of the different lithologic types was predominantly discoid, in cases like de Madonna dell'Arma (VII) or Grotte de Santa Lucia superiore (C-F), followed to a lesser extent by orthogonal and unipolar debitage (Mussi, 2002). Levallois debitage also exists but is poorly represented at these stages; it does increase towards MIS 3-4, as can be seen at Grotte d'Arma delle Manie, where it is present throughout the whole sequence in low percentages but reaches around 30-40% in the final stages (Cauche, 2007), and at San Francesco, where a Levallois debitage does exist, represented by such blanks as Levallois cores, flakes and blades, which account for more than half of the recovered remains (Isetti, 1961; Tavoso, 1988). The presence of this method is also confirmed by the elongated Levallois products made on micro-quartz sandstones at the Abri Mochi (I) site and the superficial level of La Rosa, using both centripetal recurrent and preferential reduction. In Arma delle Manie level VII, Levallois debitage was also used on quartz and limestone, apart from micro-quartz sandstones. And also on quartzite, in levels Q, S and IV of Madonna dell'Arma, where quartzite is the predominant raw material, as at Grotta delle Fate or de Collombo, where quartz was used as well. Furthermore, at Grotte del Principe sandstone is the dominant raw material but quartzite was selected for the Levallois debitage (Cauche, 2012) (Fig. 3).

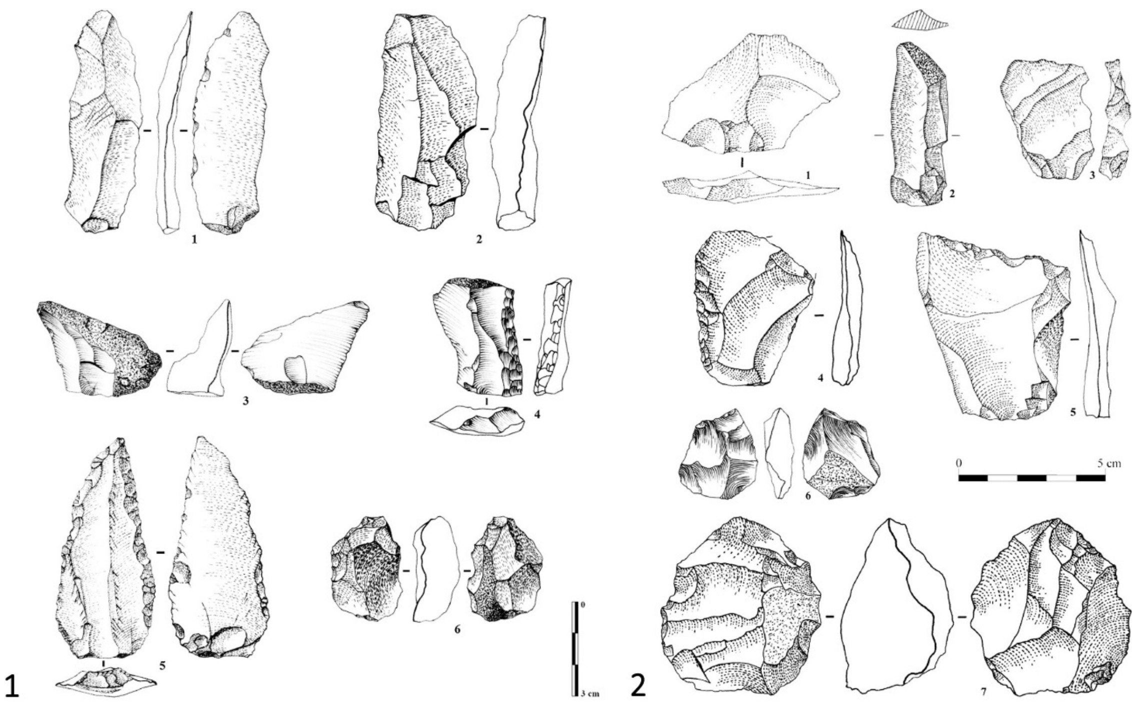

Fig. 3. 1. Mousterian industry of Fate: 1. Microquartzite Levallois blade; 2. Quartzite blade; 3. Jasper half-cortical flake; 4. Sidescraper on jasper flake; 5. Microquartzite mousterian point; 6. Microquartzite Levallois core (Cauche, 2012). 2. Mousterian industry of the external dune in Madonna dell'Arma site: 1. Quartzite Levallois flake; 2. Quartzite Levallois blade; 3. Quartzite Levallois débordant flake; 4. Simple sidescraper

on quartzite Levallois flake; 5. Transversal sidescraper on quartzite Levallois flake; 6. Levallois core on black jasper (Cauche, 2007).

Regarding tools, the evolution of most of the above-referred assemblages shows the progressive disappearance of macro-tools since the final stage of the Middle Pleistocene. The industries that included choppers, chopping-tools, picks, thick handaxes (mostly cordiform, discoid and sub-triangular) and thick sidescrapers, as found at Prince or Santa Lucia superiore, for example, are replaced by assemblages featuring much smaller, elaborate and standardized tools. Among the latter, we can observe a duality between the (slightly predominant) sidescraper and the denticulate groups, as can be seen at Madonna dell'Arma or Arma delle Manie. Interestingly, level IV of the latter site (roughly dating from MIS 4) shows a clear rupture: sidescrapers disappear and there is a considerable increase in the number of backed knives (up to 33%), along with some borers. Parallel to these dynamics of change and particularly between MIS 4 and 3 there is an increase in the presence of Levallois chaines opératoires, as well as a considerable increase of the blade index, which can reach up to 30% of the assemblages, as observed at Balzi Rossi and Barma Grande (Bulgarelli, 1974; Yamada, 1997), the D and E hearths from Prince (Lumley, 1969; Yamada, 1993) or at Madonna dell'Arma (Cauche, 2012) (Fig. 4).

3.2. Southeastern France

As far as the Middle Palaeolithic industries from Southeastern France are concerned, this clearly is one of the more important zones in terms of the amount and the richness of its archaeological sites. A good number of these feature broad stratigraphies that allow approaching the settlement of Neanderthal groups from a multidisciplinary point of view (Fig. 3). In many cases the settlements are located in strategic zones rich in natural resources, such as the Ardèche gorges or the Rhône River valley, among others, which indicates the existence of some micro-territories, managed in a specific manners at a specific places and times (Moncel, 1999; Moncel et al., 2004, 2015).

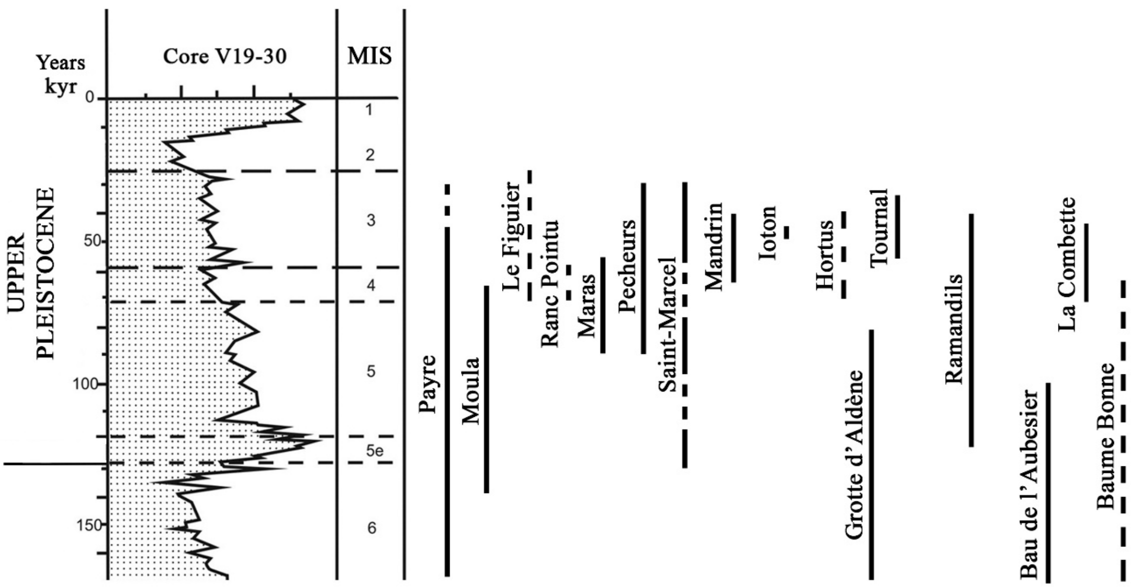

Fig. 4. Time span of Middle Palaeolithic sites from Southeastern France (isotopic curve adapted from Gamble, 1986). In continuous line absolute dates and in discontinuous line relative dates. Payre (ESR, U/Th, TL and TIMS: Valladas et al., 2008); Moula (Radiocarbon: Evin et al., 1985); Le Figuier (Stratigraphy: Combier, 1967); Ranc Pointu (Stratigraphy: Debard, E., 1988); Maras (U-Th: Moncel et al., 1994; Moncel and Michel, 2000. ESR/U-Th: Richard et al., 2015); Pecheurs (Radiocarbon: Evin et al., 1985. U/Th and ESR: Masaoudi et al., 1994); Saint-Marcel (Radiocarbon: Evin et al., 1985; Szmidt et al., 2010); Mandrin (Radiocarbon: Slimak, 2008); Ioton (TL: Valladas et al., 1987); Hortus (Stratigraphy: Lumley, 1972. Biostratigraphy: Crégut-Bonnoure, 2002); Grotte d'Aldène (ESR and U/Th: Falguères et al., 1991); Tournal (ESR: Yokohama et al., 1987a); Ramandils (ESR: Yokoyama et al., 1987b); Bau de l'Aubesier (ESR: Blackwell et al., 2000); La Combette (IRSL and TL: Texier et al., 1999); Baume Bonne (Stratigraphy: Gagnepain and Gaillard, 2005).

3.2.1. Raw materials

Flint is generally the main lithologic type used in this area, indeed almost the only rock ever used for tool-knapping at the various sites, since the oldest stages (MIS 9-6) (Moncel and Daujeard, 2012). From MIS 5 to 3, flint accounts for more than 90% of the remains, which leaves the other lithologic types – like quartzite, quartz, basalt, limestone or sandstone - at insignificant percentages, barely reaching more than 5% of the record. Unlike other regions, this fact mostly results from the large number of good-quality flint outcrops located in the vicinity of the sites, so that other rocks are hardly ever used for tool manufacturing. Some of the few recorded exceptions are l'Abri des Pêcheurs, where quartz is the predominant rock (Moncel and Lhomme, 2007), Saint-Marcel (levels l, m, o, p and q), where quartz and limestone are predominant (Moncel, 1998) and Tournal, where quartzite stands for more than 95% (Tavoso, 1987). These cases can be explained in terms of the high mobility of the human groups and regardless of the settlement system being used (circulating or radiating). The procurement areas are mostly local and semi-local and not very diversified, located at distances of 10-20 km between the sites and the outcrops. The analysis of cortical surfaces and microfossils indicates that raw materials arrive at the sites in various formats, as nodules, cobbles or slabs; there doesn't seem to be any preference for the procurement of a specific morphology. The observable technological criteria are not related to the amount of available rocks. Instead, it is the original dimension of the blocks that seems to explain the choice of the different raw materials (Moncel et al., 2004; Fernandes et al., 2008). On the other hand, there is also a presence but in low proportion of exogenous raw materials obtained from far-away sources, such as flint in the Neronian levels of Neron and Mandrin, sourced 70 km away from the site (Slimak, 2008), Bedoulian flints at Baume Bonne (Gagnepain and Gaillard, 2005) and Le Figuier (Moncel, 2001), sourced 40-60 km away or the Cenomanian flint from Hortus (Lebegue et al., 2010), which indicates the groups' broad mobility ratios within the territory.

3.2.2. Lithic technology and tools

From the final stage of the Middle Pleistocene onwards (MIS 8 to 6) there is a complex technological set, dominated by Levallois, discoid and Quina methods, which in some cases may even be present in the same cores (Payre Ga level) (Baena et al., 2014). Towards the Upper Pleistocene (MIS 5), discoid debitage (unifacial, bifacial and even multifacial in some cases) becomes predominant, mostly using thick cores to produce a few blanks only, a low-productivity scheme. This is combined with Levallois core management, both unipolar recurrent and centripetal, mostly from cores-on-flake, in cases like Ranc Pointu, Baume Flandin, Maras, Pêcheurs or Saint-Marcel (Moncel, 1996). The blanks thus obtained feature increased variety: not only short, thick discoid debitage but also longer, flatter products with a higher degree of laminarity, which is typical of Levallois products. Laminar products are not dominant but nevertheless reach percentages in the range of 5-10% at Maras (Moncel, 1994), 20% at Neron (Slimak, 2004) and even around 30% at Moula (Defleur, 1989). Despite this fact and as referred by M.-H. Moncel (1996), the problem lies in identifying the above referred laminarity, as most of the products are laminar flakes and not real blades obtained by means of a specific blade-oriented management, solely dedicated to the production of this type of blanks, which does happen at such sites as Baume Flandin (Gagnière et al., 1957), Pêcheurs (Lhomme, 1984), Saint-Marcel (Gilles 1986) or Baume d'Oullins (Combier 1976). This laminarity is closely related to the widespread of the Levallois method from isotopic stages 5 and 4 onwards. There is but little change during this stage, other than the widespread of technical concepts like convergent or Kombewa; everything else seems to feature a homogenous continuity throughout the territory under study. Levallois and particularly discoid debitage systems become predominant only from late MIS 4 onwards and during MIS 3. The originality of the latter lies in its strong internal variability, from the thin unifacial exploitation planes (Saint-Marcel, Le Figuier or Les Canalettes) to the globular morphologies with bipyramidal section and considerable thickness (Payre, Pêcheurs or Ioton), both featuring centripetal and "chordal" extractions (Fig. 5). Regarding Levallois, its variants are basically centripetal recurrent and/or unipolar, as can be seen at Maras, La Combette, Ranc Pointu, Moula and also at Tournal, where the raw material to which the above criteria are applied is quartzite (Tavoso, 1987). On top of this enormous variability there is also the production of small flakes or micro-productions as the ones recorded at Ranc de l'Arc, Baume d'Oullins or Ramandils (Clerc, 2001; Moles and Boutié, 2009), which already existed since MIS 5 but grow during the late stages of MIS 3. In the same context, one should not overlook the local development, from MIS 3 onwards, of the Neronian industries recorded at Neron and Mandrin, which constitute a clear case of regional development by the Neanderthal groups that occupied this area. In the latter group of sites the Middle Palaeolithic sequence is divided in two stages: the first stage is ascribed to the Neronian (level 6) and the second stage is post-Neronian (levels 5 to 1). The former is characterized by the production of elongated blanks (blades, bladelets and points) by means of such schemes as blade/point and bladelets/micro-points, using high-quality raw materials. Blank transformation is achieved by means of semi-abrupt convergent retouch; the Soyons points are a remarkable example. As to the latter, most of the raw materials used are local, with a small amount of exotic rocks; the production is aimed at obtaining flakes. Two stages can be defined here: the industry of the first stage (level 5) has a considerable microlithic character, with micro-flakes obtained from large, cortical core-flakes. The Kombewa method is commonly used and sidescrapers account for most of the toolkit. In the second stage (level 4) the debitage systems tend to produce elongated flakes which are used as blanks for the production of sidesrapers with a laminar tendency (Slimak, 2007, 2008). These characteristics show the deep social and cultural complexity of the Neanderthal groups. Thus, the changes that took place during the final stages of MIS 3 cannot be perceived from a linear point of view. The above described broad picture must be understood within this framework of multiple changes, interactions and renovation of technical behaviours.

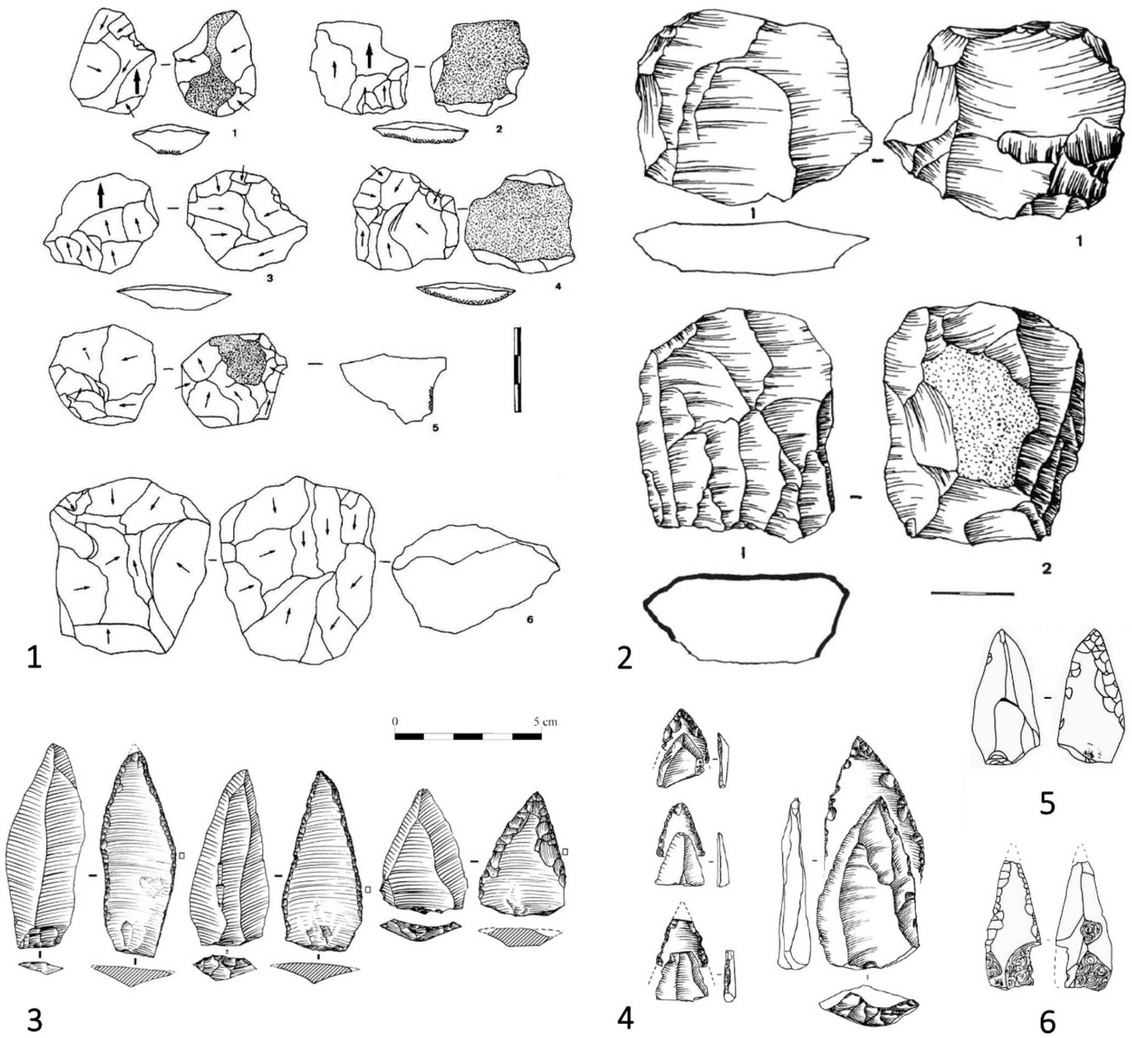

Fig. 5. 1. Saint Marcel lithic industry (level i): 1-4. Core-on-flake; 5, 6. Pyramidal core (Moncel, 1998). 2. Figuier: 1: core with a flat débitage surface; 2. Blade core (Moncel, 2001). 3-5. Neronian points from Abri du Maras (3) (Slimak, 2008), Grotte Mandrin (4) (Slimak, 2008) and Cova Negra (5, 6) (Villaverde, 1984).

Finally, from a typological point of view and since the late Mid- and early Upper Pleistocene (end of MIS 6 and 5), we can see how the dominating toolkit is basically composed of sidescrapers, which amount to 60-80% at Payre, Baumme Bonne or Aldène, for example. Within each assemblage there is a gradual shift towards an increased percentage of sidesrapers, mostly related to the production and the standardization of tools on flake, just like in Italian Liguria or in Mediterranean Iberia. In morphological terms, there is a variety of blank types, either flat or thick and frequently opposed to natural backs, which were transformed by means of simple or in some cases stepped retouch, thus producing Quina sidescrapers (Payre level D). Macro-tools are a minority, hardly reaching more than 5% and composed of handaxes of variegated morphologies and made on large flakes, among which some lanceolate, amygdaloid and naviform ones, and some unifacially or bifacially worked cobbles. This is comparable to what one may find in the Iberian southeast and northeast, where macro-tools may reach higher percentages, unlike the Central Mediterranean area of Iberia or Italian Liguria, where such tools are even scarcer. Sidescrapers and sometimes denticulates are still dominant during MIS 5 and 4, followed, in lesser amounts, by notches and points (Maras or Pêcheurs). This situation hardly changes at later stages, due to the continuity of this dual typology and its widespread throughout the entire Western Mediterranean. Indeed, the only thing that changes is the production of such tools mostly on Levallois blanks, quite often elongated and with a laminar tendency, featuring simple, light retouch. As to the remainder of the toolkit, composed of endscrapers, burins and backed knives, its percentage decreases, not unlike the macro-tools, and becomes virtually insignificant in much the same way as throughout the whole of Iberia. As already mentioned, the only major changes are related to the Neronian industries from Néron I, Moula IV, Figuier 10, Maras 1-10 or Mandrin 6, best represented by the Soyons points, unparalleled in any other territories (Slimak, 2008) except by two documented in the uppers levels of Cova Negra, in the Central Mediterranean Iberia (Villaverde, 1984) (Fig. 5.5-6) and in La Boja, in the Southeastern Iberia (J. Zilhão, pers. comm.).

3.3. Northeastern Iberia

There is a large number of assemblages featuring industries ascribed to the Middle Palaeolithic in the northernmost area of the Iberian Peninsula, including both cave sites and quite a few open-air sites. Even if it falls out of the timespan addressed in this study, the oldest human settlements known so far in the area are the Puig d'En Roca Excavació (Canal and Carbonell, 1989), Domeny (Rodríguez et al., 2004), Cau del Duc de Torroella del Montgrí (Rodríguez et al., 2004) and Cau del Duc D'Ullà (Canal and Carbonell, 1989) assemblages. Despite the fact that the above sites are dated to the Middle Pleistocene (end of MIS 9 and beginning of MIS 8), they are nevertheless interesting due to the presence of handaxes along with Levallois debitage (Fig. 6).

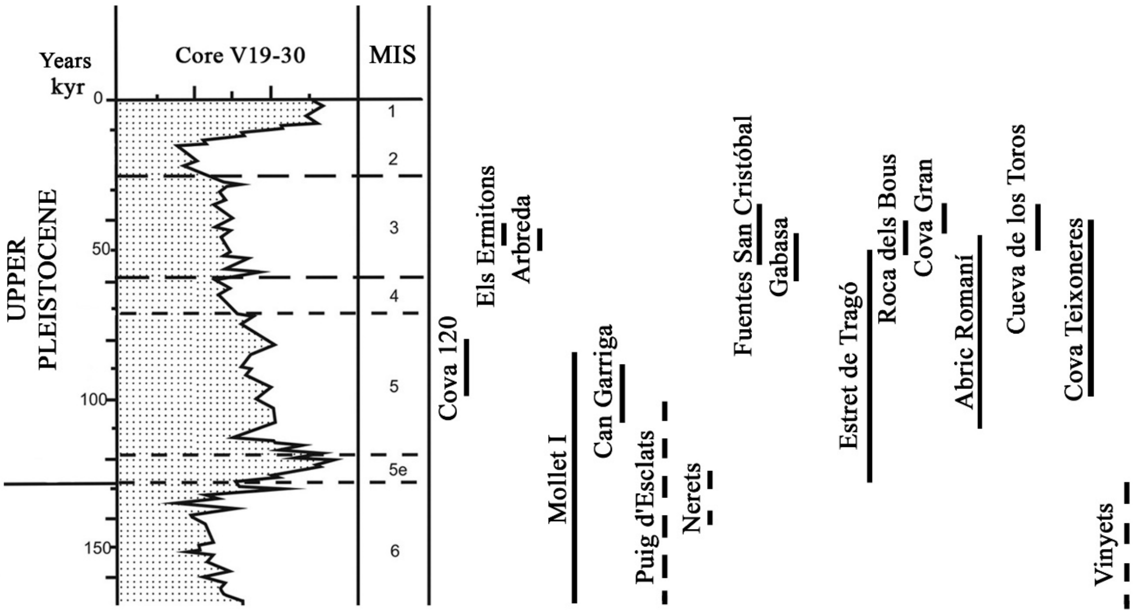

Fig. 6. Time span of Middle Palaeolithic sites from Northeastern Iberia (isotopic curve adapted from Gamble, 1986). In continuous line absolute dates and in discontinuous

line relative dates. Cova 120 (U/Th: Agustí et al., 1991); Els Ermitons (Radiocarbon: Maroto, 1986); Arbreda (Radiocarbon: Maroto et al., 2012a); Mollet I (U/Th: Maroto et al., 2012b); Can Garriga (Stratigraphy: Rodríguez, 1997); Puig d'Esclats (Stratigraphy; Canal and Carbonell, 1989); Nerets (Stratigraphy: Rodríguez, 1997); Fuentes San Cristobal (Radiocarbon: Maroto et al., 2012a); Gabasa (Radiocarbon; Utrilla and Montes, 1987); Estret de Tragó (TL: Martínez-Moreno et al., 2004); Roca dels Bous (Radiocarbon: Martínez-Moreno et al., 2006); Cova Gran (Radiocarbon: Martínez-Moreno et al, 2010); Abric Romaní (U/Th: Bischoff et al., 1988; OSL, TL and radiocarbon: Vaquero et al., 2013; Sharp et al., 2016); Cueva de los Toros (Radiocarbon: Montes et al., 2006); Teixoneres (Radiocarbon: Talamo et al., 2016); Vinyets (Stratigraphy: Rodríguez, 1997).

3.3.1. Raw materials

The use of the different raw materials varies throughout the whole area according to the availability of rocks in the vicinity of each site, not unlike the previously referred cases. For example, at sites located close to the Ter River basins the most widely used raw material is quartz, followed by porphyry or hornfels while, on the other hand, at sites located close to the Segre River and its tributaries quartzite was mostly used, followed by porphyry, sandstone or limestone. There are of course some exceptions: sites located close to natural flint sources where, from MIS 6 onwards, the most widely used rock is flint, like the open-air sites of Vinyets (Rodríguez and Lozano, 1999). But at most of the sites other types of rock, like quartzite, were used: at Nerets, where it was used in shaping and exploitation processes, while porphyry was only used to produce tools on cobbles; or at Can Garriga where quartz is the prime raw material, despite the fact that other lithologic types were used in exploitation processes (Rodríguez and Lozano, 1999). From MIS 5 onwards the pattern remains similar, the difference being that the percentage of flint in the assemblages keeps rising until it becomes the second lithologic type, reaching amounts around 10-20%, as in Cova 120, Estret de Tragó or Teixoneres (Agustí et al., 1991; Castañeda and Mora, 1999; Rosell et al., 2010). Finally, during the more recent stages of MIS 4 and 3, we can already observe a predominance of flint in most of the assemblages, particularly at the westernmost sites of this territory, as at Las Fuentes de San Cristóbal, Moros de Gabasa or Toros de Cantavieja (Montes, 1988; Rosell et al., 2000; Santamaría et al., 2008). In all of these cases flint sources are located just a few kilometres away from the sites. On the other hand, the easternmost zone features a lithologic duality, with flint also being predominant at some sites like Abric Romaní, Els Ermitons or Roca dels Bous (N10), while its percentages are much lower (less than half) at other sites where quartzite and quartz are the dominant rocks, like at l'Arbreda, Roca dels Bous (N12) or Cova Gran. Establishing whether raw material shifts are interrelated phenomena is a suggestive hypothesis and it might be possible that a larger density of remains would provide information about changes in site use or on the duration of the activities carried out therein. Likewise, differences in raw material management might indicate changes in the frequency of the displacements to the procurement areas or in toolkit composition. The records also show a presence of some types of alochtonous flint but in much lesser percentages than at the other studied territories; these flint types were sourced at distances of 20-50 km from the sites, for example at Arbreda, Abric Romaní or Teixoneres.

3.3.2. Lithic technology and tools

Sites dating from the late Middle Pleistocene show us the presence of complex technical concepts such as the ramification of the production sequences, the recycling of flakes by means of the rejuvenation of tools and exhausted cores and the use and widespread of the Levallois method, both centripetal recurrent and preferential, as is the case of Cuesta de la Bajada (Santonja and Pérez-González, 2010; Santonja et al., 2014). During the early Upper Pleistocene (MIS 5) there is a broad variability of debitage systems: unifacial and bifacial exploitations with centripetal extractions, in the final stages of Mollet I (Maroto et al., 1987); unifacial and bifacial cores with lineal, orthogonal or opposed extractions, without a pre-established strategy, at Vinyets or Can Garriga; bifacial debitage, specifically prepared in order to obtain products with preconfigured morphologies, as in the case of Nerets; and trifacial or multifacial strategies with predominantly orthogonal extractions, quite frequent at Can Garriga o Cuesta de la Bajada (Rodríguez and Lozano, 1999; Santonja et al., 2014). All of the above also applies to the Central Mediterranean Iberian area (Fernández-Peris, 2007; Eixea, 2015). From MIS 4 and 3 onwards, this technical diversity is considerably reduced and limited to more elaborate debitage schemes, particularly in terms of production organization and the degree of planning and foresight, the general pattern being dominated by discoid and bifacial centripetal schemes (Fuentes de San Cristóbal, Abric Romaní o Els Ermitons), along with the widespread of the Levallois method, particularly its centripetal recurrent variant (Roca dels Bous, Cova Gran, Arbreda, Teixoneres or Eudoviges) (Ortega and Maroto, 2001; Mora et al., 2008; Vaquero et al., 2012) (Fig. 7).

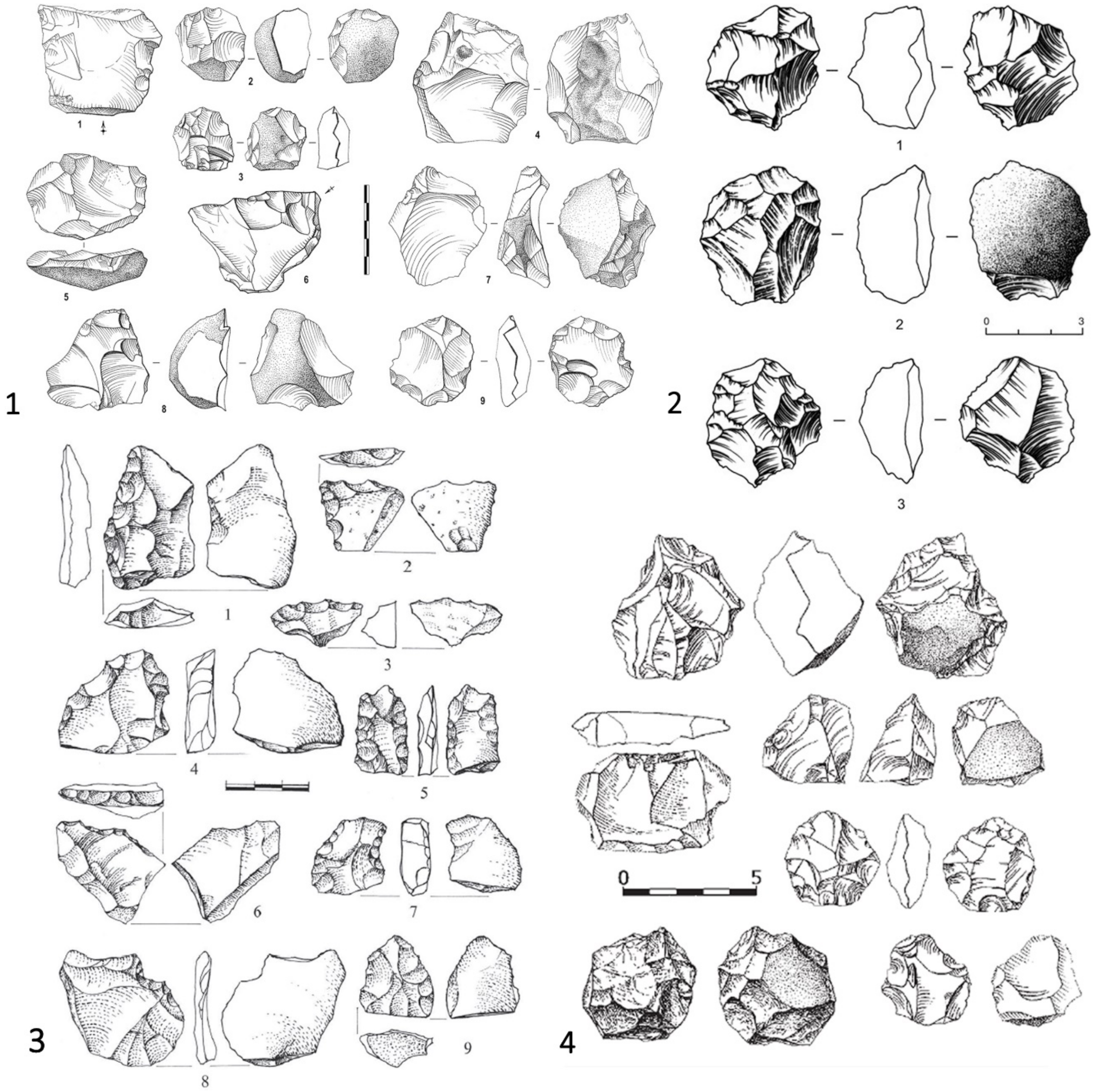

Fig. 7. 1. Cova Gran: technological variability of cores in S1B: 3, 4, 7. Preferential Levallois; 2, 8, 9. Recurrent centripetal Levallois; 5. Expedient core on flake (centripetal unifacial); 1, 6. Expedient core on flake (abrupt unifacial) (Martínez-Moreno et al., 2010). 2. Abric Romaní: cores from sublevel Ja (Vaquero et al., 2012). 3. Arbreda: Mousterian industry from level M (Soler et al., 2014). 4. Roca dels Bous: technological systems representing morphological variability (Mora et al., 2008)

Regarding tools, there is also a significant presence of macro-tools throughout the territory (Cau del Duc de Torroella de Montgrí, Puig d'En Roca or Puis d'Esclats), particularly during MIS 9-7. This broad technical management variability is closely related to the production of flake-based toolkits dominated by sidescrapers and denticulates. For example, Cuesta de la Bajada features a considerable variety of tools, including denticulates, notches, backed knives and sidescrapers, the latter being the predominant type, all of which were made on small blanks, some 3-4 cm long/wide in average, consistent with the size of the last extractions obtained from the cores (Santonja et al., 2014). From MIS 6 and 5 onwards, the number of macro-tools decreases dramatically, not exceeding 10% at Can Garriga and Vinyets, while Nerets features similar amounts of tools on cobbles and retouched flakes. The same can be said, in broad terms, about the remainder of the Iberian territory. During MIS 4 and 3, expedient tool production persists with polyhedral, longitudinal or radial management schemes with hardly any Levallois component (Gabasa, Fuente del Trucho or Toros de Cantavieja) related with macro-tools made on cobbles or large blocks that are decreasing until disappear. It will become increasingly important the production focused at obtaining flake-based tools with varied morphologies dominated by the sidescraper/denticulate dichotomy. The former are predominant at l'Arbreda, Ermitons, Peña Miel, Eudoviges, Toros de Cantavieja or Gabasa, while the latter dominate the assemblages from Abric Romaní, Roca dels Bous, Cova Gran, Fuente del Trucho or Teixoneres. Across the entire Western Mediterranean area and in broad terms, the Upper Palaeolithic tool group (endscrapers, burins and borers) is also represented, albeit in extremely low numbers, along with some points, both Mousterian and Levallois.

3.4. Central Mediterranean Iberia

This region counts more than forty sites featuring Middle Palaeolithic industries. Site distribution is rather uneven: most of the sites are located in the central areas of the province of Valencia, some sites are located in the southern areas and only a few sites are known in the northern zone. A significant share of the available information comes from cave sites featuring recently excavated, broad stratigraphic sequences (Bolomor or Cova Negra). In recent years, a good number of shelters (El Salt, Quebrada or Pastor) and open-air sites also added to the global picture (Fig. 8).

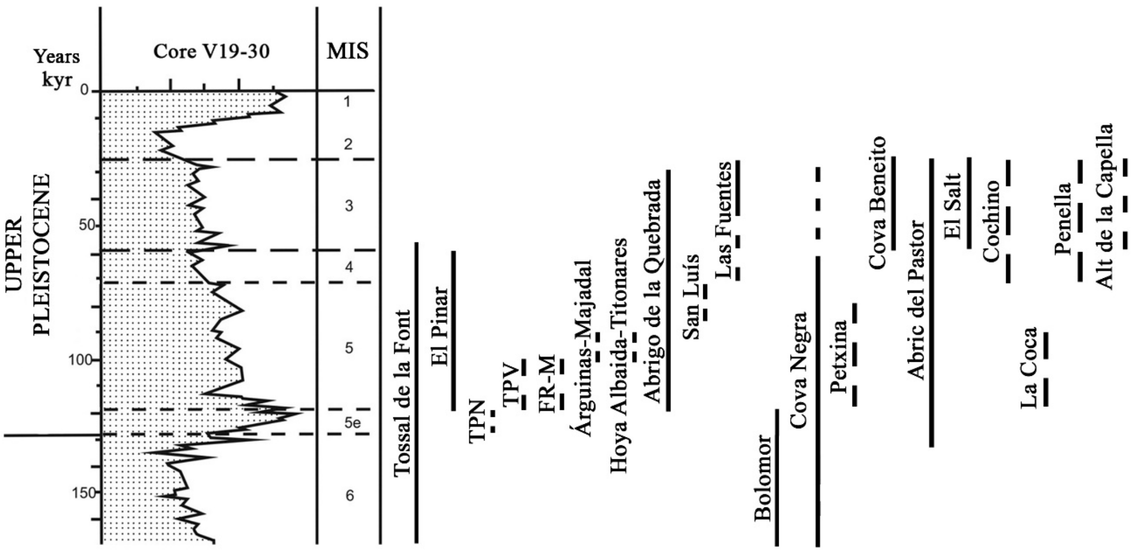

Fig. 8. Time span of Middle Palaeolithic sites from Central Mediterranean Iberia (isotopic curve adapted from Gamble, 1986). In continuous line absolute dates and in discontinuous line relative dates. Tossal de la Font (U/Th: Gusi et al., 2013); El Pinar (TL: Casabó and Rovira, 1992); TPN, TPV and FR-M (Stratigraphy: Casabó et al., 2010); Árguinas-Majadal and Hoya Albaida-Titonares (Stratigraphy: Casabó and Rovira, 2002); Abrigo de la Quebrada (Radiocarbon: Villaverde et al., 2008; Eixea et al., 2011-2012. OSL: Real et al., in press); San Luís (Stratigraphy: Fernández-Peris and Martínez Valle, 1989); Las Fuentes (Radiocarbon: Aparicio, 1981); Bolomor (U/Th, AAR and TL: Fernández-Peris, 2007); Cova Negra (TL: Arsuaga et al., 2007; Villaverde et al., 2014; ESR: Richards et al., 2018); Petxina (Stratigraphy: Villaverde,

1984); Cova Beneito (Radiocarbon: Iturbe et al., 1993); Abric del Pastor (TL: Machado et al., 2013); El Salt (TL and OSL: Galván et al., 2014); Cochino (Stratigraphy: Villaverde, 1984); La Coca (Stratigraphy: Fernández-Peris, 1998); Penella (Stratigraphy: Faus, 1988); Alt de la Capella (Stratigraphy: Barciela and Molina, 2005).

3.4.1. Raw materials

Raw material procurement and use is limited to flint, quartzite, limestone and quartz; percentages vary from site to site, particularly in the case of flint. Not unlike the other study areas, procurement radii are basically local, at distances of 5-8 km from the sites. Nonetheless, there are some examples where larger distances are involved: Abrigo de la Quebrada, where some 5% of the assemblage was made on flint from sources located over 100 km away from the site (Eixea et al., 2011, 2014) or Cova Negra, where some flint types were seemingly procured in zones located some 30-50 km away. In diachronic terms, during the older stages of MIS 6, as recorded at Bolomor and Cova Negra, there is a flint/limestone duality. At the former site, limestone is absolutely dominant (85%), while flint and quartzite are also present but in much lesser amounts. This is an interesting case, possibly resulting from environmental factors, which must be taken into consideration due to the lack of other records of similar age that would enable some generalization. Only Cova Negra levels V-VII might be comparable, pending confirmation of the chronology proposed for the lower levels (Villaverde et al., 2014; Eixea, 2015); still, and despite the short distance between both sites, limestone is not the main rock type here, as flint clearly predominates at values exceeding 95%. As the MIS 5e sets in this situation tends to become more homogenous, with a clear predominance of flint as can be seen at Bolomor I, Tossal de la Font, Terrassa del Pont Nou and the upper levels of Cova Negra. Similar cases can also be found in assemblages dating from the MIS 3, due to the increase in the number of known sites (El Pinar, Terrassa del Pont Vell, Forcall la Rambla and el Millars or La Coca), all following the same pattern of absolute flint predominance. It should be stressed that there are other sites where quartzites are predominant, like the open-air sites Árguinas-Majadal and Hoya Albaida-Titonares, which have to be taken into consideration with due caution due to the lack of direct datings. Finally, between MIS 4 and 3 the predominance of flint becomes overwhelming, exceeding 80% of the lithic remains at Abrigo de la Quebrada, San Luís, Las Fuentes, Petxina, Beneito, Abric del Pastor, El Salt, Cochino and at the open-air sites Coves d'Estroig, Penella, l'Alt de la Capella and Els Bancals de Pere Jordi.

3.4.2. Lithic technology and tools

The MIS 6 chaines opératoires recovered in the upper levels of Bolomor and the middle levels of Cova Negra feature exploitation schemes that use limestone (Bolomor) or flint (Cova Negra) cobbles with two asymmetrical surfaces, one of which is somewhat flatter than the other; the extractions are sub-parallel to the theoretical pane of intersection. The order and direction of the negatives seem to indicate a certain hierarchy in the extraction of blanks, preferentially from the flatter face. The negatives on the convex face are centripetal and secant, as opposed to the chordal or centripetal negatives on the flatter face, which are sub-parallel to the intersection plane and frequently posterior to the ones on the convex face. Therefore, this debitage concept is consistent with two-surface debitage methods like centripetal recurrent Levallois or hierarchical discoid. The products thus obtained are thick, with a triangular section and opposed to natural backs or meplats. Butts are mostly flat and only rarely dihedral or faceted; bulbs are not very prominent (Fernández-Peris et al., 2008; Eixea, 2015). The toolkit is characterized, on the one hand, by the low presence of macro-tools, as in some previously referred cases, excepting some bifaces and bifacial tools in the middle and lower levels of Cova Negra and, on the other hand, non-Acheulian macrolithic tools, predominating flake tools, particularly simple, double and convergent sidescrapers, denticulates and backed knives. In the same way, it is interesting to observe typological coincidences, as is the case of the good proportions of Quinson and Tayac points, between this region and Southeastern Iberia and France (Fig. 9). Later, during MIS 5, there was a significant diversification of the debitage systems with discoid and, to a lesser extent, Levallois, Quina and trifacial debitage. The majority of the products thus obtained are core-edge blanks, featuring broad, flat and déjeté morphologies; the negatives of previous extractions are centripetal, both unipolar and bipolar. Dorsal surfaces showing remains of a ventral surface (Kombewa) are also frequent. The toolkit is dominated by the sidescraper group, including Charentian types and particularly simple and transverse scrapers, followed in lesser amounts by double, convergent and déjeté scrapers. Finally, during MIS 4 and 3, the chaines opératoires are adjusted to the discoid and centripetal recurrent Levallois productions, which increase significantly in most assemblages, as opposed to the former time period. Examples can be found at the sites of Cova Negra, Petxina, Abrigo de la Quebrada, Las Fuentes, San Luis, Cochino, El Salt, Abric del Pastor, and even in open-air sites like La Coca, Penella, l'Alt La Capella or Bancals de Pere Jordi. Concerning the toolkit, there aren't any major changes in relation to the former one: the sidescraper group is still predominant, followed by notches and denticulates; there is a considerable increase in the number of Mousterian points and a low proportion of tools belonging to the Upper Palaeolithic group. Thus, this stage is broadly similar to the previous ones, the only major difference being the last phase recorded at Cova Beneito, which also features Levallois industries but with abundant notches, backed knives and tools belonging to the Upper Palaeolithic group; the most meaningful technological characteristic would be an increase of laminarity and, from a typological point of view, the reduced presence of sidescrapers (Iturbe et al., 1993).

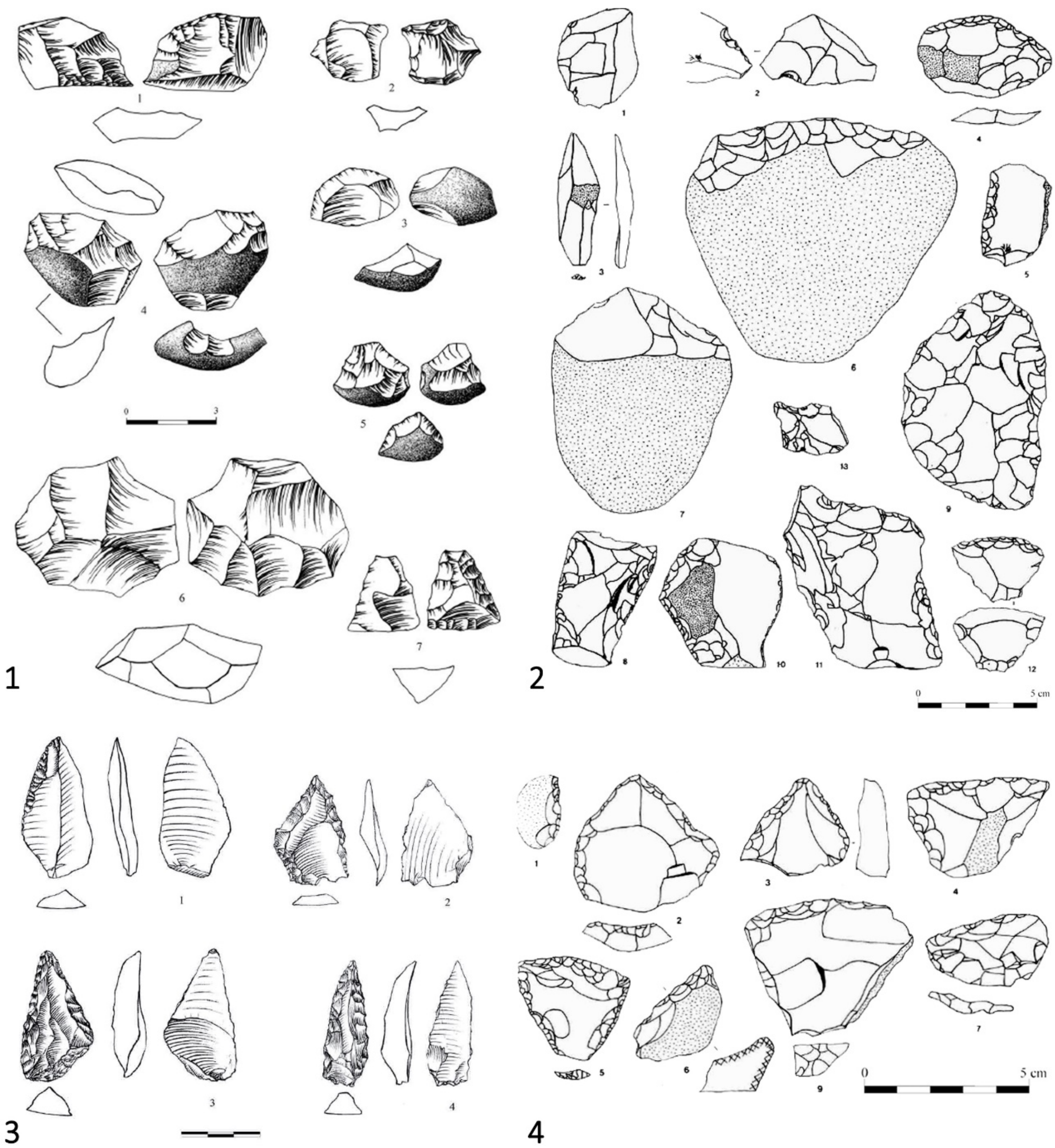

Fig. 9. 1. Cova del Bolomor (level IV): cores (Fernández-Peris, 2007). 2. Cova Negra lithic industry (middle levels) (Villaverde, 1984). 3. Abric del Pastor: pointed tools (Galván et al., 2007-2008). 4. Petxina lithic industry (layer 2) (Villaverde, 1984).

3.5. Southeastern Iberia

In the northernmost part of this area, i.e. the present-day Region of Murcia, a considerable number of sites, such as Vermeja, Palomarico or Perneras, were excavated in the beginning of the 19th century by L. Siret and mostly studied by G. Vega (1980, 1988) and R. Montes (1987, 1989) during the 1980s. This area features some thirty sites ascribed to the timeframe of this study but only a few have precise stratigraphies, reliable studies on the record formation processes and technological analyses consistent with current methodologies (Zilhão and Villaverde, 2008). The situation is similar in the Andalusian region, which counts over one hundred sites featuring industries with Middle Palaeolithic affinities. Yet, a historiographical review of the recorded sites using qualitative and quantitative criteria applied to the available information resulted in a rather different panorama, reliable information being available for a few sites only (Cortés, 2005). In much the same way, when one attempts an approach to the technological analysis of the industries, one comes across similar difficulties, as few assemblages were published according to the criteria followed by this type of analysis in a more or less generalized way over the last decades (mainly Boquete de Zafarraya and Cueva Bajondillo) (Barroso and Lumley, 2006; Cortés, 2007). Apart from these few assemblages there are also the Gibraltarian caves, but the problem is that lithic remains are scarce at a good number of them. For example, there are 319 finds from Vanguard Cave (101 in the Upper Horizon, 181 in the Intermediate Horizon and 37 in the Lower Horizon), 222 from level IV, which is the richest level at Gorham's, 96 from Ibex Cave and as little as 22 pieces were recorded at Beefsteak Cave (6 in level C and 16 in level B) (Giles et al., 2012; Shipton et al., 2013). In this sense and as previously mentioned by some authors, these are extremely poor assemblages with limited diagnostic potential (Barandiarán et al., 1996; Santamaría and de la Rasilla, 2013) (Fig. 10).

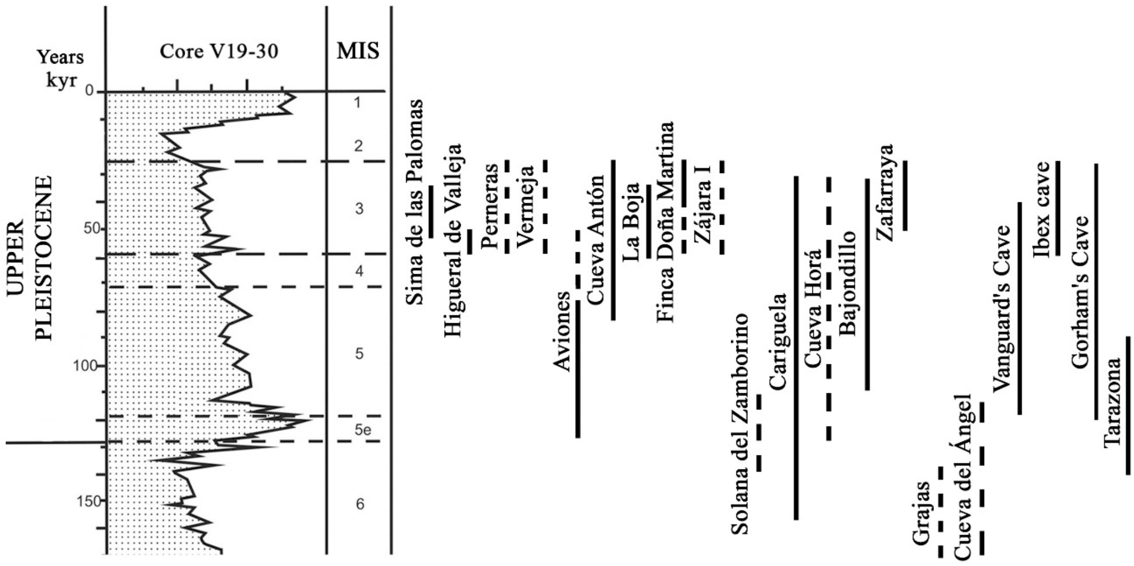

Fig. 10. Time span of Middle Palaeolithic sites from Southeastern Iberia (isotopic curve adapted from Gamble, 1986). In continuous line absolute dates and in discontinuous line relative dates. Sima de las Palomas (U/Th: Walker et al., 2008); Higueral de Valleja (OSL, TL and radiocarbon: Jennings et al., 2009); Perneras, Vermeja and Zájara I (Stratigraphy: Vega, 1988); Aviones (Radiocarbon: Zilhão et al., 2010); Cueva Antón (Radiocarbon: Zilhão et al., 2017); La Boja (Radiocarbon: Zilhão et al., 2017); Finca Doña Martina (Radiocarbon: Zilhão et al., 2017); Solana del Zamborino (Stratigraphy: Botella et al., 1976); Carigüela (U/Th and Radiocarbon: Vega et al., 1997); Cueva Horá (Stratigraphy: Botella et al., 1983); Bajondillo (U/Th and Radiocarbon: Cortés, 2007); Zafarraya (Radiocarbon: Hublin et al., 1995; Wood et al., 2013. U/Th: Barroso et al., 2003); Grajas (Stratigraphy: Benito del Rey, 1982); Cueva del Ángel (U/Th: Barroso et al., 2011); Vanguard's Cave (Radiocarbon: Pettitt and Bailey, 2000. OSL: Doerschner et al., 2018); Ibex Cave (ESR: Rhodes, 2000); Gorham's Cave (Radiocarbon, OSL and U/Th: Finlayson et al., 2006); Tarazona (OSL: Caro et al., 2011).

3.5.1. Raw materials

Concerning the management of the various types of rocks, from the final Middle Pleistocene industries of Cueva del Ángel to the more recent stages of MIS 3, there is a clear predominance of flint as the main raw material, sometimes reaching 80% of the remains (Perneras, Zájara I, Carigüela, Horá, Boquete de Zafarraya, Ibex Cave or Tarazona I) (Botella et al., 1983; Vega, 1988; Cortes, 2007). Notwithstanding, some exceptions can be found, particularly at sites located at longer distances from the flint sources and where other lithologic types are predominant as, for example, the final Acheulean site La Solana del Zamborino, or Tarazona II and III, with assemblages dominated by quartzite and quartz. Further examples can be found on more recent assemblages such as Gorham's and Vanguard's Caves, where sandstone and limestone were used, along with quartzite. Allochtonous lithological types have only been recorded at Cueva de las Grajas and Gorham's, albeit in very small percentages only. The case of Cueva del Ángel is a different issue, this is a flint-dominated assemblage which includes very limited amounts of quartzite, obtained from sources located some 40 km away from the site (Barroso et al., 2011).

3.5.2. Lithic technology and tools

During the older stages, as defined in the upper levels of Cueva del Ángel (MIS 7 and 6), the industry is characterized by the presence of handaxes and non-Levallois debitage. The production methods reflect an exhaustive and standardized use of good-quality raw materials. Most of the early debitage phases are not represented, hence they were not performed at the site. The recorded debitage schemes show the presence of unidirectional and radial recurrent methods; striking platform preparation is similar to the Levallois concepts. Bifacial and unifacial discoid cores were also recorded, in lesser amounts, and the toolkit is characterized by the predominance of the sidescraper group (70%), particularly simple scrapers, and by the notches and denticulates group, to a lesser extent (20%). There are also some handaxes (n=46), particularly of cordiform morphology, as well as some Quinson and Tayac points (Barroso and Lumley, 2006). Since the final stages of the Middle Pleistocene and at the beginning of the Upper Pleistocene (MIS 6 to 5) industries are characterized by simple flake debitage aimed at producing tool blanks, along with some amigdaloid handaxes, for example at the Tarazona, Horá, Grajas or Carigüela sites. One of the more outstanding features of this region, and one that differentiates this area from the previously referred zones, is the fact that from this period onwards and until more recent stages of the MIS 5 the lithic production based on more complex cores such as discoid and Levallois cores shows a steady increase. Furthermore, there is a continuous presence of handaxes of variegated morphologies, choppers, chopping tools, picks and thriedral pieces, along with tools made on thick, dissymmetrical flakes from centripetal and unipolar productions. Examples can be found in the assemblages from Solana del Zamborino, Tarazona or the basal levels of Carigüela. Finally, from MIS 3 and 4 onwards we can observe a clear increase of mixed production-and-consumption management schemes, both Levallois and discoid, within a context of diachronic enrichment of the Levallois models, as can be seen at Bajondillo (16 and 17) (Cortés, 2007, 2008). During the final stages most of the assemblages share similar characteristics, namely a predominance of discoid and centripetal recurrent Levallois debitage and an absence of evolved technological features of Aurignacian type (Zafarraya, Gorham's, Ibex, Bajondillo 14 y 15, Carigüela, Sima de las Palomas, Perneras or Vermeja), except at La Boja where discoid method underlies prismatic for the extraction of blades and bladelets cores and a carinated/nosed "scraper" reduction (Zilhão et al., 2017) (Fig. 11).

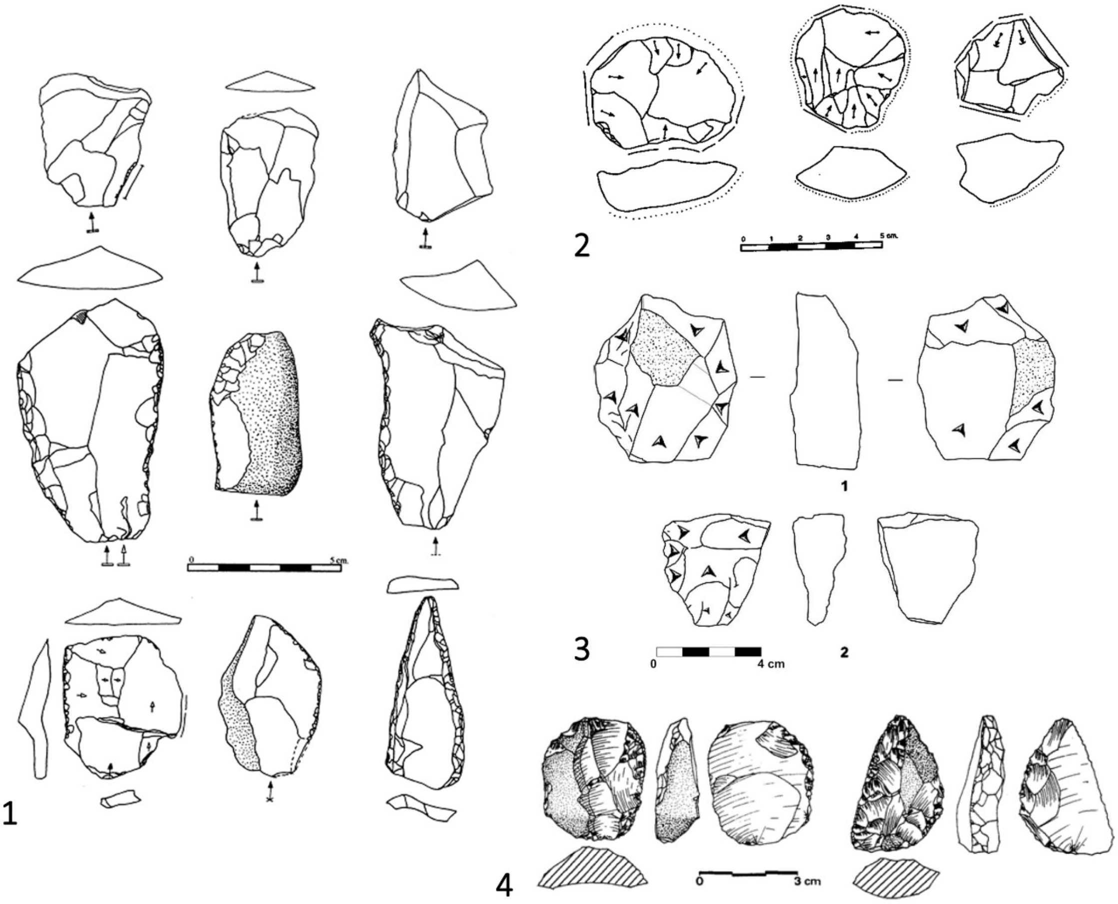

Fig. 11. 1, 2. Bajondillo: tools and cores from layer 14 (Cortes, 2007). 3. Gorham's Cave: cores (Giles et al., 2011). 4. Cueva Antón: flint sidescrapers from level III-f Cueva Antón. (Martínez, 1997).

As to the toolkit, its main characteristic is its homogeneity and small size, particularly in the case of Levallois and discoid management, with some dominating morphotypes (sidescrapers or denticulates) that may vary from level to level within each site (Carigüela, Horá, Higueral de Valleja, Bajondillo or Aviones). Macro-tools are also part of the set, as previously mentioned. Finally, during the more recent stages (MIS 4 and 3) the scraper/denticulate duality was subdued by an abundant group of notches and denticulations, depending upon scraper-poor (Bajondillo, Carigüela or Perneras) or scraper-rich contexts (Gorham's, Zafarraya, Vermeja, La Boja, Finca Doña Martina or Cueva Antón). In much the same way, large format tools decrease dramatically and almost disappear in all of these assemblages (Montes, 1985; Vega, 1988; Cortés, 2007; Zilhão and Villaverde, 2008; Giles et al., 2012).

4. Discussion

4.1. General remarks

From the point of view of the analysed lithic industries, the Middle Palaeolithic cultural mosaic appears to be a changing world where the various human groups perpetuate the know-how inherited from their predecessors and, at the same time, develop technical novelties and new ways of producing their toolkits. Profound variations in terms of raw materials, debitage systems, tool functionality, etc. were taking place and shaping regional specificities in most of the European territory throughout the studied time period. But this spatial differentiation does not constitute a disjointed and fragmented world. Instead, the transmission of knowledge, concepts and ideas denotes a certain homogeneity at a macro-spatial level and in terms of cultural dynamics.

In this regard and after reviewing the lithic assemblages that feature industries ascribed to the Middle Palaeolithic, a number of ideas ought to be highlighted, as a synthesis (Table 2).

	Raw materials
Italian Liguria	Flint shortage. Eastern zone (jasper domain) and western zone (quartz, quartzite and limestone). Local procurement.
Southeastern France	Flint domain (>90%). Local procurement, good quality and abundant raw materials.
Northeastern Iberia	Representation of raw materials based on the availability of rocks in the immediate environment. Flint domain in the most advanced phases.
Central Mediterranean Iberia	Flint domain (> 80%), followed by quartzites and limestones that are usually smaller (20%).
Southeastern Iberia	Flint domain (> 80%) with some exceptions, especially in deposits where the catchment areas are further away.
	Technology
Italian Liguria	Discoid dominates followed by orthogonal and unipolar systems. Increase of Levallois in the final phases.
Southeastern France	Unifacial / bifacial discoid technology and multifacial explotations. Recurrent centripetal and/or unipolar Levallois debitage made on core-on-flakes.
Northeastern Iberia	Unifacial, bifacial and centripetal methods, in some cases, with predetermined type. From MIS 4, the technical diversity is considerably reduced towards more complex management.
Central Mediterranean Iberia	Flake technocomplexes obtained through unidirectional and centripetal exploitations. From MIS 6, increase of Discoid and Levallois productions, mainly recurrent centripetals.
Southeastern Iberia	Unidirectional and radial schemes with prepared platforms similar to Levallois method. In advanced moments, most of the sites share similar characteristics with a dominance of the discoid with the recurrent centripetal Levallois.
	Tools
Italian Liguria	Duality between sidescrapers and denticulates groups always with a slight predominance of the first versus the second. Macrotools few represented.
Southeastern France	Sidescrapers domain. Macrotools focused on bifaces of varied morphologies and choppers / chopping-tools.
Northeastern Iberia	Important presence of macrotools in the oldest moments. From MIS 5, there is an abundance of tools on flakes (sidescrapers and denticulates).
Central Mediterranean Iberia	Marginal macrotools, prevailing over the time sidescrapers and denticulates. Points well represented (Mousterian and Levallois).
Southeastern Iberia	Continuity of bifacial phenomenon with sidescrapers and denticulates that will be dominant tools.

Table 2. Summary table with the main lithic characteristics of the areas treated.

4.1.1. Raw materials and catchment areas in western Mediterranean context

Concerning raw material management, the procurement radii are mostly local, encompassing various niches (coast, coastal valleys, interior or highlands) usually within distances not exceeding 10 km, and accounting for 60-80% of the lithic record.

This pattern results from the fair amount of lithologic types available in the vicinity of the sites (Tuffreau, 1987; Turq, 1989; Boëda, 1994; Ruebens, 2013) and was recognized among some modern hunter-gatherers (Binford, 1982) and in other areas, such as Aquitaine or Northern Europe. Flint is the predominant lithologic type in most of the assemblages. There is a wide array of flint types, ranging from high-quality ones (from the Rhône valleys, Ardèche or the southern areas of Valencia) to the rather mediocre, lower-quality variants (from western Liguria or the Central Mediterranean Iberian area). The presence of cortical surfaces and microfossils indicates that flint mainly arrived at the sites in formats such as nodules, cobbles or slabs. In quantitative terms, there is not much evidence for long-distance (80-100 km) transportation (a maximum of 3-5% of the total number of remains) but, in qualitative terms, such evidence indicates the use of extensive territories and the practice of deferred strategies, both spatially and temporally, in order to ensure the availability of toolkits during the occupation of the sites. It is interesting to highlight that data on the long-distance management of raw materials are rather scarce within the study area and particularly in Northeastern Iberia. At sites featuring recurrent occupations over time and high population mobility, like Abric Romaní or Roca dels Bous, there is hardly any record of types sourced at long distances, which might link these territories with Southwestern France, the region of Valencia or inland Iberia, i.e. the closest areas. Actually, such a connection arguably existed during the Upper Palaeolithic, given the possibility that the Ebro River would have functioned like a structuring element and a corridor into more interior areas (Utrilla, 1992). Another example is the case of flints from Montgaillard and Montsaunès (French Pyrenees) recorded at sites from Catalonia and indicating frequent contacts between both sides of the Pyrenees during the Last Glacial Maximum. This means that despite the strict cold conditions the whole area was a homogenous territory where human contact was continuous (Sanchez de la Torre et al., 2017). Therefore, and based upon raw material data, either there is no evidence for contacts between human groups in the study area during the Middle Palaeolithic or this is a line of work that should be taken into account in order to be developed in the future. Anyway, it does seem odd to see that it does happen in some other cases, for example, in the case of the wide circulation radii of various lithologic types during the Neronian of Southeast France, where high-quality raw materials were used and generally brought from long distances. Or, for another example, the Abrigo de la Quebrada where the lithic assemblages of each level include a 3-8% proportion of flint types obtained at sources located more than 100 km away from the site. This indicates a pattern of connections with the coastal plain over the natural corridors, as a structuring element of the central area of Mediterranean Iberia on the basis of a North-South and coast-inland mobility (Eixea et al., 2011, 2014). Thus, and despite a certain degree of regionalization that may have existed within the study area, the available data suggest the occupation of extended territories by the human groups, the existence of long-range networks and a strong influence of resources and environment, which define the high mobility of the human populations. Concerning the other gathered rocks, they are obtained within the same spaces where flint is found, generally just a short distance away from the sites and mainly on nearby ravines, slopes or terraces. The more frequent ones are quartzite, quartz and limestone, always obtained as cobbles larger than the flint ones. These rocks reach higher proportions in areas devoid of flint or where flint sources are more distant (>30 km) and are generally worked by means of simple exploitation schemes, normally discoid, and in situ. The blanks thus obtained are irregular, large sized and seldom retouched; the larger ones were transformed using bifacial retouch to shape massive tools. Excepting a few cases where complex technical systems were used, for example in Central Mediterranean Iberia, Italian Liguria or Cantabria (Eixea et al., 2016), such massive tools were used as hammers or blanks for manufacturing macro-tools by façonnage.

4.1.2. Lithic technology in western Mediterranean context

At technological level, we can observe a certain rupture between MIS 6, 5 and particularly 4: most of the elements related to macro-tools and façonnage disappear and the dominant productions are those related to discoid-type systems and, to a lesser extent, Levallois. Both are present throughout the Lower Pleistocene but only reach significant proportions from the Middle Pleistocene onwards and particularly during the Upper Pleistocene. The obtained products are mainly flakes, with the exception of the French territories where, from MIS 4 onwards, there is a fair proportion of elongated objects and pieces with a laminar tendency, always related to Levallois debitage. On the other hand, stricto sensu laminar debitage, i.e. when the entire peripheral surface of the block is exploited, is practically non-existent. The broad picture is dominated by an either discoid or Levallois technical system associated, to a lesser extent, to a secondary system that generally stands for 20-40% of the record. The latter are mainly Kombewa, cores-on-flake, Quina, orthogonal, trifacial or marginal extractions, often related to ramified productions and aimed at obtaining small-sized formats (< 2cm on both axes). As mentioned above, this specificity is present throughout the whole Western Mediterranean and particularly in Iberia. It provides advantages regarding mobility and the nature of the occupations, facilitates more precise uses, increases the range of artefact diversity, including hafted tools, and definitely considerably increases the functional potential of each raw material unit, which improves raw material economy. Besides, its integration in more complex systems, by means of ramified productions, has some advantages in terms of tool procurement planning and in structuring the activities according to the variability of toolkit sizes (Kuhn, 1995; Kuhn and Elston, 2002; Niewoehner et al., 2003; Bourguignon et al., 2004; Dibble and McPherron, 2006; Mazza, 2006; Villaverde et al., 2012; Rios et al., 2015). The proportions may vary from place to place; this seems to be a complementary form of management, carried out through short production sequences, generally using local or semi-local raw materials. To be specific, in Mediterranean Iberia Levallois debitage is mainly centripetal recurrent while in Southeastern France the predominant modality is uni-and bipolar recurrent, particularly from MIS 4 and 3 onwards. When local flint types are used, the chaines opératoires are usually complete (cortical, semi-cortical and non-cortical elements, cores, etc.), whereas products made on exogenous flint types, sourced further away, show more fragmented chaines opératoires. In terms of variability, the size of blanks ranges between 2 and 6 cm; the majority of the pieces is small-sized, larger ones being nearly absent. On the other hand, discoid management features a much broader blank diversity: flakes opposed to natural backs and/or core trimming elements, triangular or quadrangular morphologies, elongated, short, etc. Core management is either uni- or bifacial, with parallel or secant exploitation and orthogonal, uni- or bipolar centripetal directions. The exploitation of some cores starts by using a certain type of technical management and ends with a different one, showing considerably versatile production choices.

4.1.3. Tools in western Mediterranean context

There is stronger regional diversity in Southeastern France, much more than in Mediterranean Iberia. In the former case, there is more diversity within the scraper group (mainly composed of simple, double and mostly convergent scrapers) while in the latter the backed knives and the points (either Levallois or Mousterian) reach higher proportions. Furthermore, the Northeastern and Southeastern Iberian areas feature higher proportions of macro-tools, thus originating a slight decrease of the dominant denticulate group, denticulates being more abundant than scrapers in both areas. This particular idiosyncrasy seems to be somewhat parallel to the situation in Cantabria, not unlike the cleaver issue (de la Torre et al., 2013). The fact that denticulates prevail, particularly in Northeastern Iberia, has been known for years (Ripoll and de Lumley, 1965; Mora, 1988) and recently defined as a feature shared with the assemblages from the French Pyrenees (Thiébaut, 2005). Concerning the proportion of toolkits within the industries as a whole, the former generally amount to 5-30% and are mostly composed of sidescrapers made on short, thick blanks or, to a lesser extent, on thin, elongated ones. Apart from some previously referred cases of large, uni- or bifacial tools, differences between the various assemblages are based on the proportion of points and convergent elements, along with a greater or smaller presence of sidescrapers, burins and/or borers. It is also interesting to point out how toolkits may vary, depending on the chosen technical management. On one hand, in the case of the Levallois method, most of the tools are sidescrapers; retouch is mostly marginal and does not cause much edge retreat. Abrupt or stepped retouch is scarce, which also indicates a low index of scrapers or borers made on this type of blanks. A considerable amount of blanks obtained by means of preferential Levallois management are not retouched, while there is a slight increase in the proportion of retouched pieces in the case of recurrent modalities. As far as elongated Levallois products are concerned, most pieces are not transformed by means of retouch but do feature use-wear traces, which indicates that the quality of the raw edge is sufficient for performing the required tasks. On the other hand and regarding discoid management, there is a higher proportion of retouched pieces, mainly larger ones like points and thick scrapers with bifacial retouch that could be ascribed to the Quina type.

4.2. Western Mediterranean lithic assemblages in European context

4.2.1. Aquitaine region

A quick review of other assemblages from nearby European areas would allow for some comparisons. In Aquitaine, the use of local raw materials reaches percentages of up to 90-100% of the assemblages, mainly due to the high concentration of good-quality flint outcrops in this region (flysch, the Chalosse anticline or Bergeracois). In any case, the presence or absence of good raw materials in the vicinity of the sites is not a critical factor in terms of human settlement. Not unlike the Western Mediterranean area, in places where raw materials are scarce or not too good, flint is replaced by other lithologic types. Moreover, another common feature is the use of the same operational systems, in some cases with minor technical variants. On the other hand, Levallois debitage seems to almost exclusively employ flint in Aquitaine, whereas in the study area the system is much more permissive and lesser-quality raw materials like quartzite, limestone or quartz are used in Levallois debitage as well. Concerning exogenous raw materials, and as Turq et al., (2013) point out, long distance movements of various types of flint, over distances of more than 100 km, indicate the large size of the areas visited by Neanderthal populations and their high-mobility pattern. Nonetheless, the same authors also point out that this could also be partly due to the recycling of previously transported lithic objects.

Another particular feature of the Aquitaine area and one that is totally different from the Western Mediterranean space concerns the technological diversity and the subsistence and mobility strategies of the Neanderthal groups. It has been possible to identify activities carried out at the site and their corresponding reflexes in the lithic assemblages. Thus, Levallois and laminar systems are related to unselective hunting strategies but also to ambitious raw material procurement in order to support long, complex chaines opératoires resulting in the production of short-lived elements. On the other hand, discoid and Quina productions reflect selective and seasonally programmed hunting strategies focusing on migrating prey like bison and reindeer and correlated with flexible and easily fragmented technologies designed to produce blanks that can be alternatively used as cores or tools (Delagnes and Rendu, 2011). Conversely, and in our opinion, the image that emerges shows a complex panorama and a multitude of factors, some of which may have more importance than we can infer, but does not seem to have a single cultural, functional, temporal or environmental explanation. Explanations that respond to a wide variability in the observed technical behaviours are explained based on the needs of the populations in each specific region. As we have seen, an example of this is the predominance of a knapping system that exists at one level and that is associated with different types of settlement patterns and a different chronology. Similarly, tools also do not seem to be linked to specific activities, because sidescrapers dominate by a high percentage in most of the assemblages, apart from those assemblages that are dominated by denticulates; there is no economical or functional variation. Also regarding the fauna no clear temporal differences are identified; it is more the topography, the variety of biotopes, the accessibility of resources and the location of places that exerted a greater influence on the types of activity carried out at the various sites (Szmidt, 2003; Daujeard et al., 2012; Eixea, submitted).

Finally, in the Aquitaine area and unlike the Western Mediterranean region, the diachronic evolution of the different debitage methods can be seen as a specific one. Recent studies indicate a succession in the dominance of the Levallois and laminar debitage systems between MIS 7 and 5, followed by Quina and discoid/denticulate types of management from MIS 4 until the transitional industries leading to Upper Palaeolithic (Delagnes and Rendu 2011). Such changes of the MTA are chronologically meaningful: type A is older than type B (Soressi, 2004). From 50 kyr onwards assemblages show a significant process of microlithization and typological specialization (Slimak, 2008). Moreover, there are also important changes in the Levallois debitage system prior to MIS 5, whereby uni- and bipolar recurrent modalities give way to centripetal recurrent types of management (Turq, 2000). And, from the same stage onwards, centripetal methods become dominant, along with Kombewa and Quina debitage. This evolution does not seem to find any parallels neither in this paper's study area nor in the rest of Europe.

4.2.2. Cantabrian region

When compared to the Cantabrian region, there seems to be a certain differentiation between the western and the eastern areas from MIS 6 and 5 onwards. Regarding the former, most of the assemblages are composed of a considerable number of elements made on large quartzite flakes rather than on bifacial elements or macro-tools, cleavers being the best example. There are also some thick handaxes on flakes and the so-called "tool-handaxes" (Álvarez-Alonso, 2012). Cobble-based industries are also important throughout this whole phase, both as cores and as tools. All of the above are combined with the production of flake blanks by means of Levallois, discoid and Quina debitage. When compared to studied area, this type of assemblages is not dissimilar to the ones from Southeastern France, or Northeastern and Southern Iberia. In all of these areas, the proportion of macro-tools is larger than in other areas, like Central Mediterranean Iberia, which feature much smaller amounts of macro-tools. Besides, the combination of macro-tools and Levallois and discoid productions is widely documented (Botella et al., 1983; Moncel, 1999; Barroso and Lumley, 2006; Rodríguez, 2004). Regarding raw materials, quartzite still is the dominant lithologic type, even if there is an increase of other rocks, such as flint. Toolkits are mostly composed of denticulates and small-sized scrapers. Both factors fit the similarities to the previously referred regions. And, concerning the latter zone, i.e. the eastern Cantabrian area, during the same period one finds industries similar to the ones from Central Mediterranean Iberia, showing a prevalence of productions on flake, sometimes of allochtonous origin, and an absence of bifacial elements (worked cobbles, handaxes and/or cleavers). Levallois and discoid debitage are present in the record and ramified productions are rather scarce in both zones (Fernández-Peris, 2007; Rios, 2016). At a later phase there are some large-sized elements with bifacial retouch, combined with discoid and Levallois flake productions not dissimilar to the ones from Northeastern and Central Mediterranean Iberia and Southeastern France (Rodríguez, 1999; Moncel, 1999). From MIS 5 and 4 onwards the available data are rather scarce but there is a presence of both Quina and Levallois debitage and a fair proportion of Mousterian points. The only available parallel within the studied area is the Payre site, in Southeastern France, where the same type of management and the pointed elements are also documented, in a context of settlements featuring considerable hunting-related activity (Moncel et al., 2009; Baena et al., 2014). The same context of the problematic Vasconian phase, characterized by the presence of cleavers and discoid debitage (Fortea, 1999; Deschamps, 2010; Colonge et al., 2015), and featuring a unique regional specificity, being totally different from the rest. Besides, there are serious issues not only concerning its precise chronology but also when trying to find a common link between these industries and how they relate to Quina, discoid and Levallois debitage (Rios, 2016). Finally, there are two separate phases during MIS 3. The first one features Levallois debitage, greater occupation stability and length and subsistence strategies based on selective hunting, unlike the previously mentioned case of Aquitaine where this type of management was not focused on any particular prey. Moreover, both zones show differences in raw material use as well: in Cantabria the primary rock types are local (sandstone and quartzite) and the flint scrapers and Mousterian points are imported whereas Aquitaine shows an intensive selection of good-quality raw materials. And, on the other hand, there was a change into a Quina phase that replaced the previous one, which featured a predominance of flint as the prime raw material, the presence of bone retouchers, intensive recycling activities and flake productions, as well as large flakes with transverse edges, not dissimilar to cleavers (Rios, 2016). These components are not recorded in the Mediterranean region and constitute a regional difference in relation to the remainder of Iberia and Europe. Finally, during the last time period there is a very low number of assemblages dated to around 40 kya. Such assemblages feature industries made on good-quality raw materials, mostly flint, and toolkits composed of sidescrapers, denticulates, points and some Upper Palaeolithic types (Sáenz de Buruaga, 2014). These characteristics are very similar to the Eastern Mediterranean ones, both at typological level and in terms of the different modalities of discoid and Levallois productions (mainly centripetal recurrent) and also in the use of flint as the dominant lithologic type of the main chaine opératoire.

4.2.3. Northern France

Extending the comparison further away from the closer areas, the human occupation of Northern France during MIS 6 is rather scarce, due to the harsh climatic conditions (Locht et al., 2016), unlike the Western Mediterranean, where climatic conditions were milder and therefore there is a much larger number of sites. Levallois debitage systems are well represented in the documented assemblages and bifacial production seemingly tends to be located towards the western zones. Likewise, few population changes can be documented during MIS 5 due to the low presence of archaeological assemblages; still, there are some industries associated to Levallois and discoid debitage and some production of points as well (Monnier et al., 2002). In many cases, such debitage schemes are combined with laminar schemes obtained from prismatic cores; due to the presence of laminar productions and Levallois blanks, the industries from this time period are marked by elongated and rather thin components (Goval, 2012; Goval et al., 2015). When compared to the Western Mediterranean, and as already mentioned throughout this study, the differences are remarkable due to the near absence of sensu stricto laminar chaines opératoires and laminar or elongated elements; these cases are better described as industries featuring quadrangular morphologies and a certain thickness. The only outstanding exception is Southeastern France, where uni- and bipolar recurrent Levallois debitage does originate more elongated formats. By the end of MIS 5, debitage is oriented towards obtaining flakes, points and blades, combined with a bifacial toolkit characterized by a marked morphological homogeneity (Depaepe and Deschodt, 2001; Locht, 2005; Depaepe, 2007). During this last stage there is a possible techno-typological similarity between the industries, which show some shared technical features during nearly forty thousand years. It is possible that human groups might have passed their knowledge on to the next generations on the same territory, as in the case of the Bettencourt-Saint-Ouen site (Locht, 2002; Locht et al., 2013). From MIS 4 and 3 onwards the number of sites increases, which contributes to a clearer situation and highlights the presence of diverse cultural groups in the northern half of the territory. On one hand, there are some assemblages that exclusively feature discoid debitage and denticulates and are comparable to the Southeastern area of France and to Northeastern Iberia. This type of assemblages remains in use during a certain timespan and might indicate repeated incursions into the North by human groups bearing this cultural tradition. And, on the other hand, there are other assemblages, characterized by Levallois management, mostly preferential and, to a lesser extent, centripetal recurrent, uni- and bipolar, similar to the Western Mediterranean assemblages except for the fact that the latter are dominated by centripetal recurrent modalities with few examples of uni- and bipolar recurrent debitage, when compared to the classic preferential modalities. It should also be stressed that besides these two major groups there are also sites featuring the presence of MTA elements and showing some similarities to assemblages from Western Europe and Aquitaine, which is the northernmost area of France reached by this type of toolkit during MIS 3 (Soressi, 2002; Cliquet et al., 2009).

4.2.4. Central Europe

As to the most distant part of Western Europe, the panorama is completely different from the Western Mediterranean, there being a series of specific characteristics that lend it a marked regional component, different from the rest of Europe, due to its outstanding bifacial technologies and particularly the intense handaxe production, which started to decrease during the widespread of Levalois debitage (Monnier, 2006; Scott, 2011). During MIS 9 and 6 the bifacial technologies became a marginal phenomenon, even if their use never ceased completely. Conversely, from MIS 5 onwards the assemblages with a greater proportion of bifacial tools extend over large portions of Central and Oriental Europe and include various types of handaxes, foliates and bifacially retouched sidescrapers and/or Keilmesser (Cliquet, 2001; Soressi, 2002; Cliquet et al., 2009; Deschodt et al., 2006; Ruebens, 2013, 2014). Finally, from MIS 3 onwards this bifacial toolkit can be found in some of the transitional complexes (very local as well), particularly the Szeletian and the Lincombian-Ranisian-Jerzmaniwichian, until they disappear with the arrival of early Upper Paleolithic (Flas, 2008, 2011).

5. Conclusion

To conclude, in this study we carry out an updated review of data pertaining to the lithic industries ascribed to the Middle Palaeolithic in the Western Mediterranean, taking into account a number of factors, such as raw materials, technological organization and toolkit management. Firstly, presenting all the data organized according to geographical regions within the same study area contributed to the homogeneity of the results and enabled us to contextualize a regional synthesis, from a broad territorial and chronological point of view. This perspective was than compared to other, more distant European spheres, which in turn enabled establishing a framework that consolidates the study area as a different cluster, independent from the remainder of the territories. In the light of the results thus obtained, several elements that deserve some consideration emerge from this study.

Firstly, the existence of a high degree of technical variation among the Western Mediterranean industries. For example, while it is true that most of the assemblages are generally composed of a prime raw material used on the main chaine opératoire, nevertheless there are several lithologic types that can play this main role, particularly during the older stages. Environmental constraints play a major part in the use of one rock or another, as they limit the choices and therefore the development of the various chaines opératoires. From a technical point of view, the fundamental characteristic is the presence of a significant industrial variability during the last stages of the Middle Pleistocene (MIS 6) and the beginning of the Upper Pleistocene (MIS 5), which is every bit as relevant as the variability documented at more advanced stages of the MIS 4-3. All the changes that took place in this study area highlight the wide variety of subsistence strategies adopted by the various human groups. The adoption and widespread of those technical innovations are closely related to climate and environmental changes in the broadest sense (changes in the fauna, in the landscape or in the vegetation). Besides, the fact that there was a significant diversity in the productive strategies, adapted and used in different manners, might reflect the onset of new cognitive abilities among the human groups as early as the end of the Middle Pleistocene.

And secondly, this paper shows how the various Neanderthal populations had diverse cultural traditions, both in the study area analysed throughout the paper and in the rest of Europe; these cultural traditions are reflected by the archaeological record through the existence of diverse regional clusters that show a significant variability during the Middle Palaeolithic. Among many other examples, the Neronian, Pontinian, Vasconian or the Keilmessergruppen, to name but a few, are the reflex of several cultures that predate the arrival of the Anatomically Modern Humans and the manifestation of the broad cultural mosaic that existed all over Europe, and namely in the Western Mediterranean. The identification of all these geographically specific cultural traditions also shows the interaction and relation between the human groups that inhabited this region and among which there probably was a significant knowledge exchange and transfer throughout the generations until that know-how became stable for a long time period. In this sense, it would lead to the admission of the existence of a certain continuity of the human settlement in this region during the end of the Middle Pleistocene and the Upper Pleistocene. Likewise, it is interesting to point out that the large number of assemblages known in this region is the result of the frequent presence of human groups in the territory, due to its natural resources (areas rich in quality raw materials, a variety of biotopes and orographic features that facilitate population movements), which played an important part in the formation dynamics of those cultural traditions. This region's specificities and characteristics have contributed to the settlement of diverse Neanderthal groups and to the development of a strong regional identity.

Therefore, in the light of the data presented herein, it seems reasonable to conclude that even though the previously referred technical traditions persisted throughout the entire Middle Palaeolithic, arguably even more so than during more recent time periods, it seems pretty obvious that the idea of the Middle Palaeolithic being an homogenous period is wrong and should be disregarded as far as Europe and the Western Mediterranean in particular are concerned.

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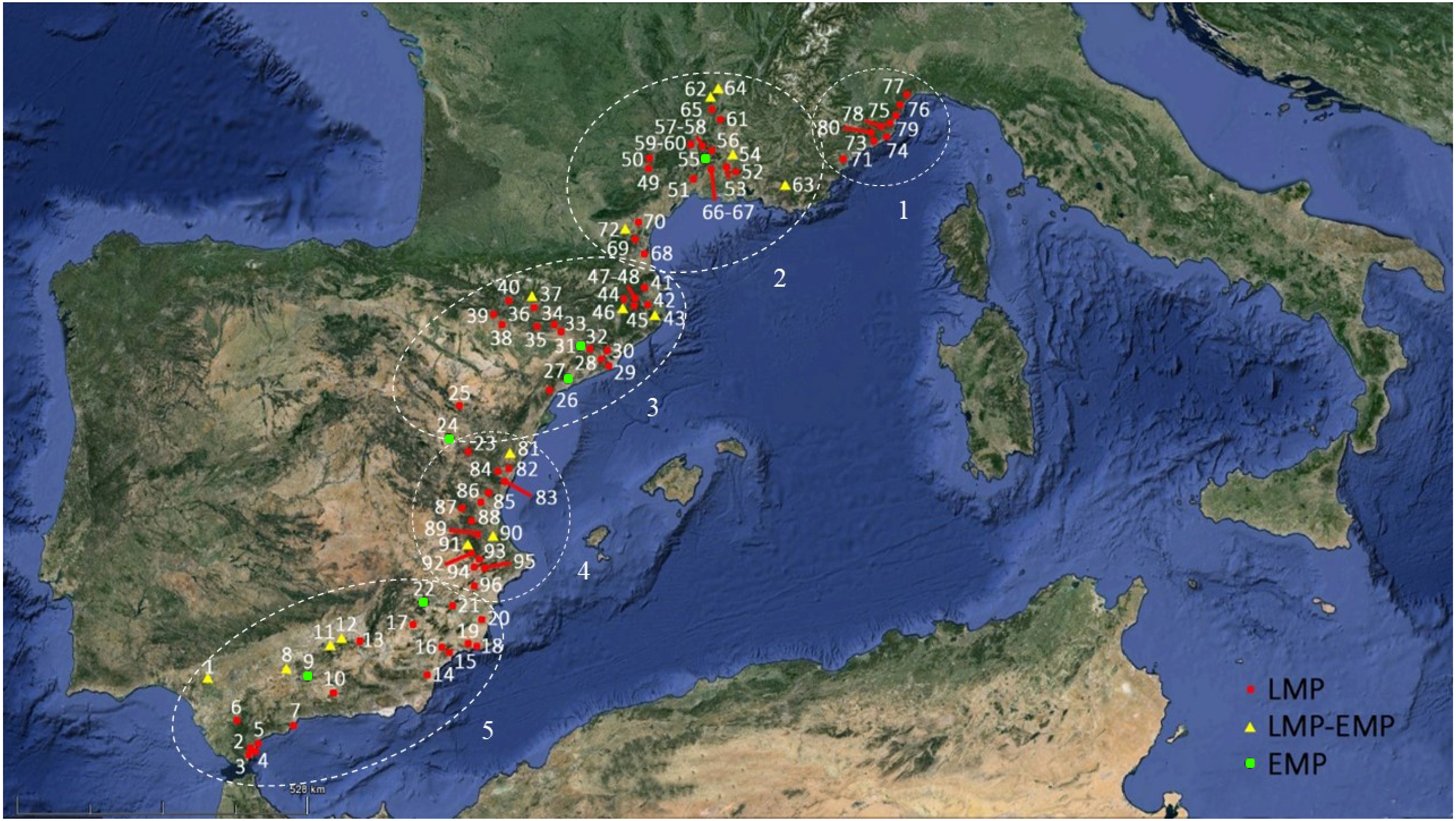
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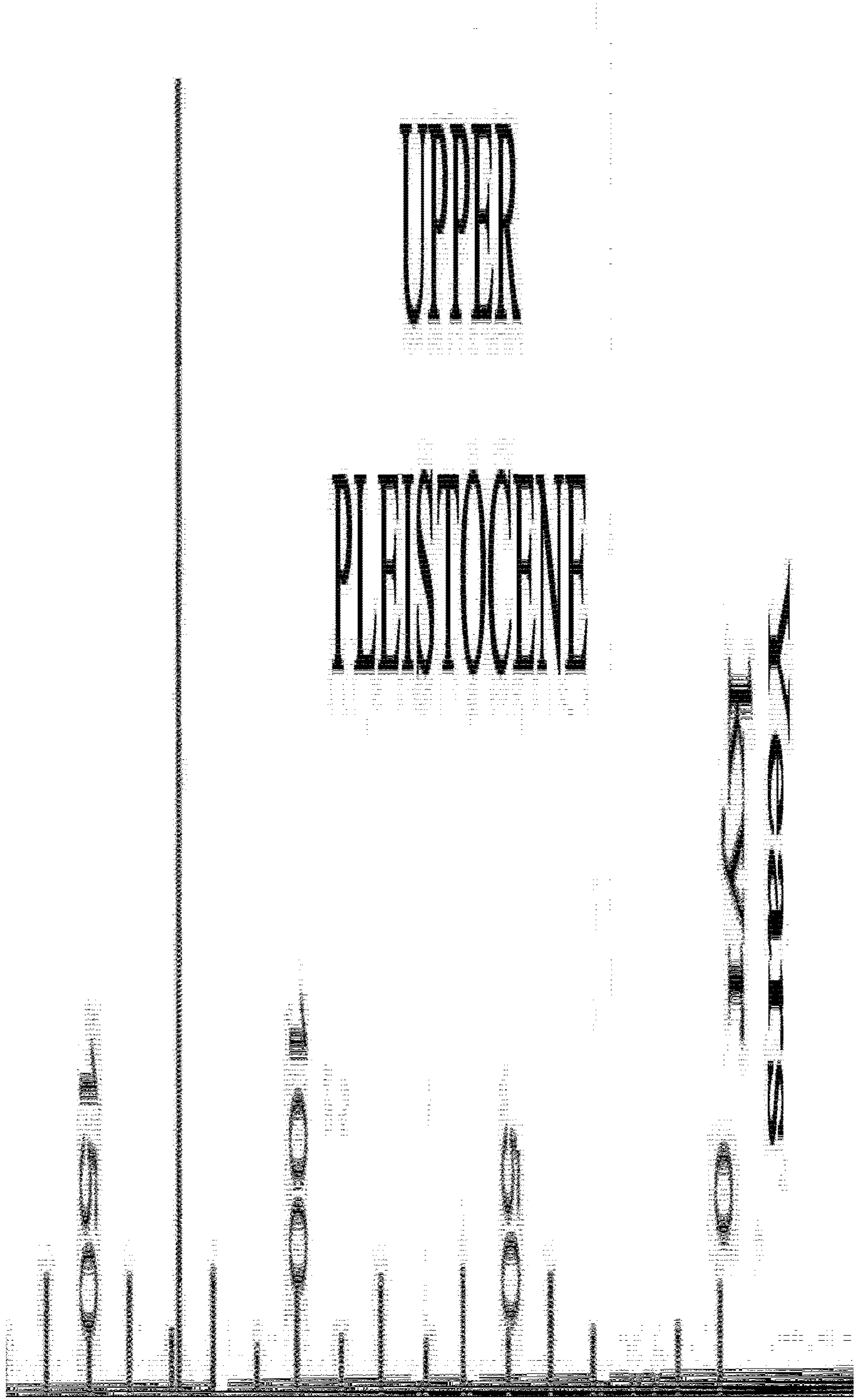
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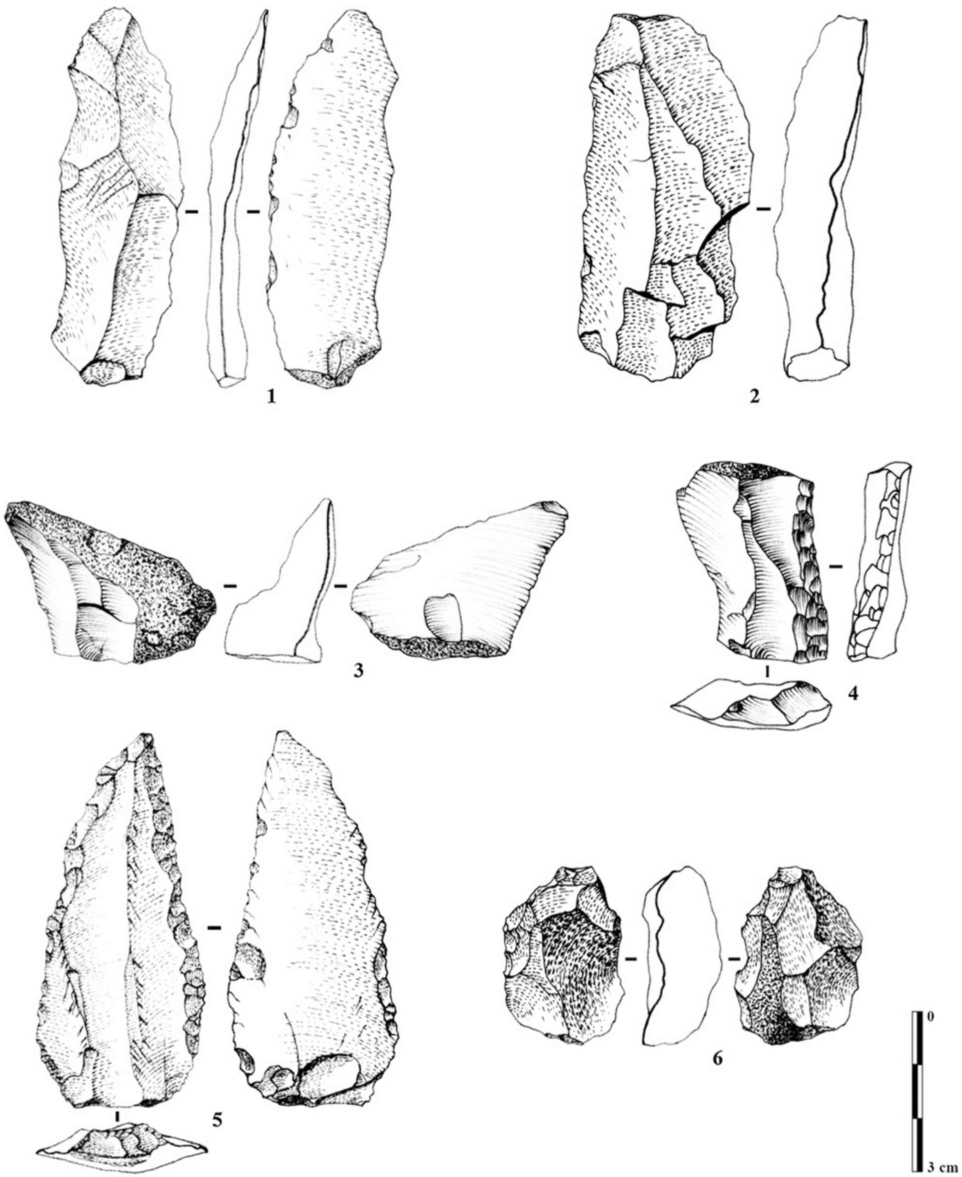

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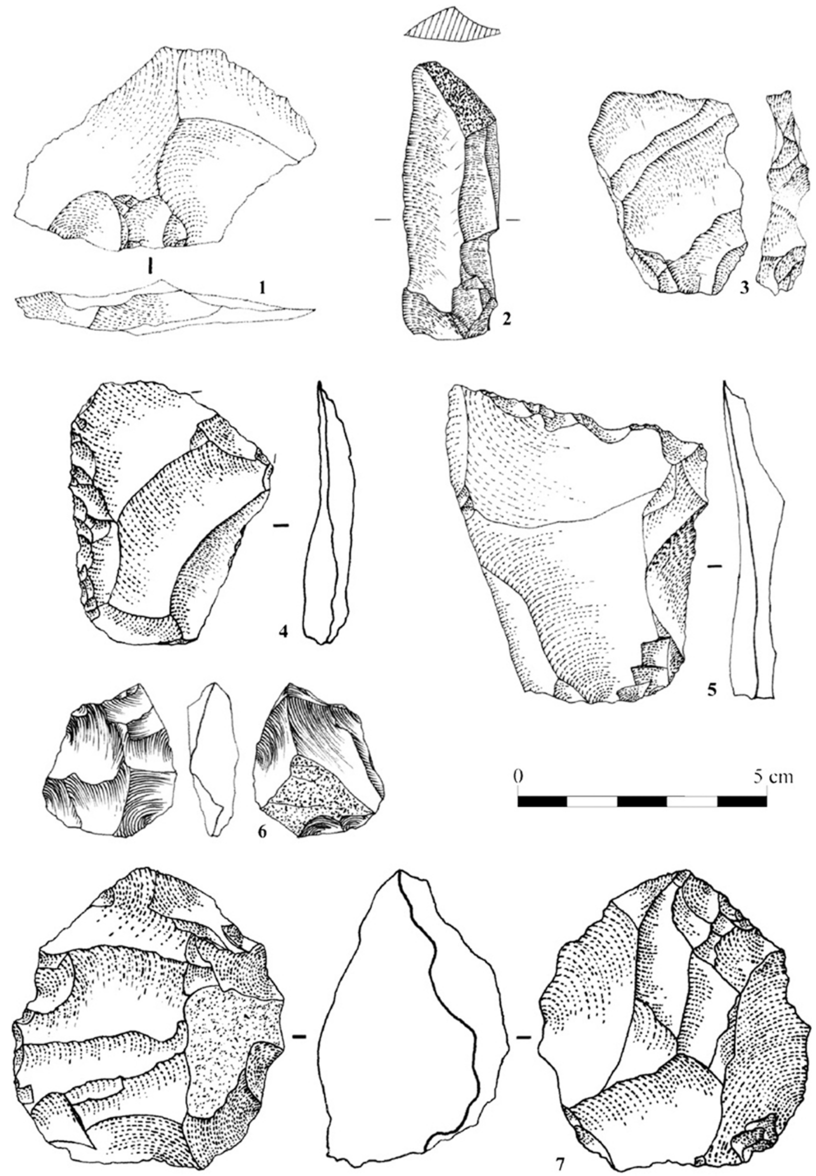

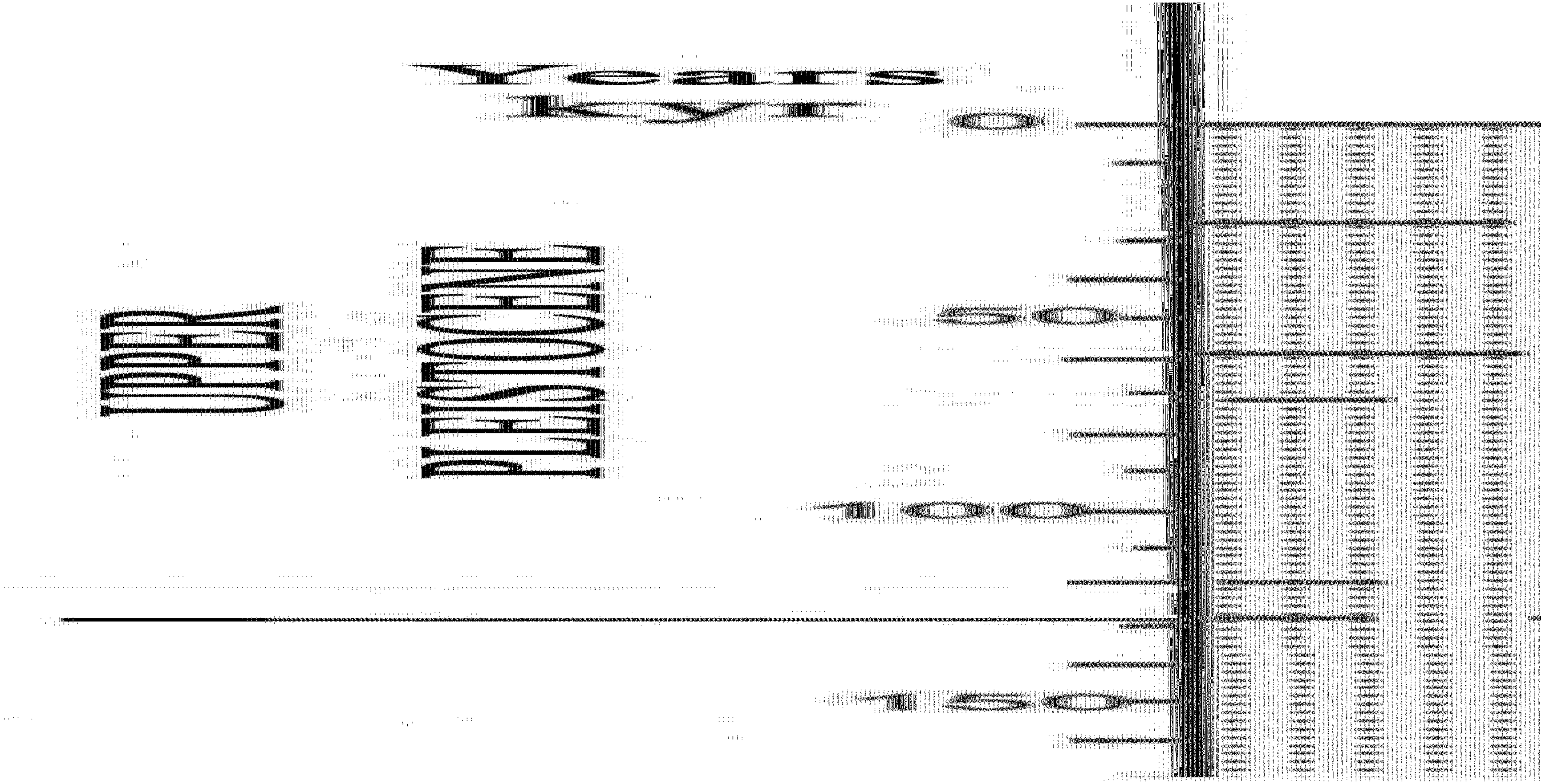
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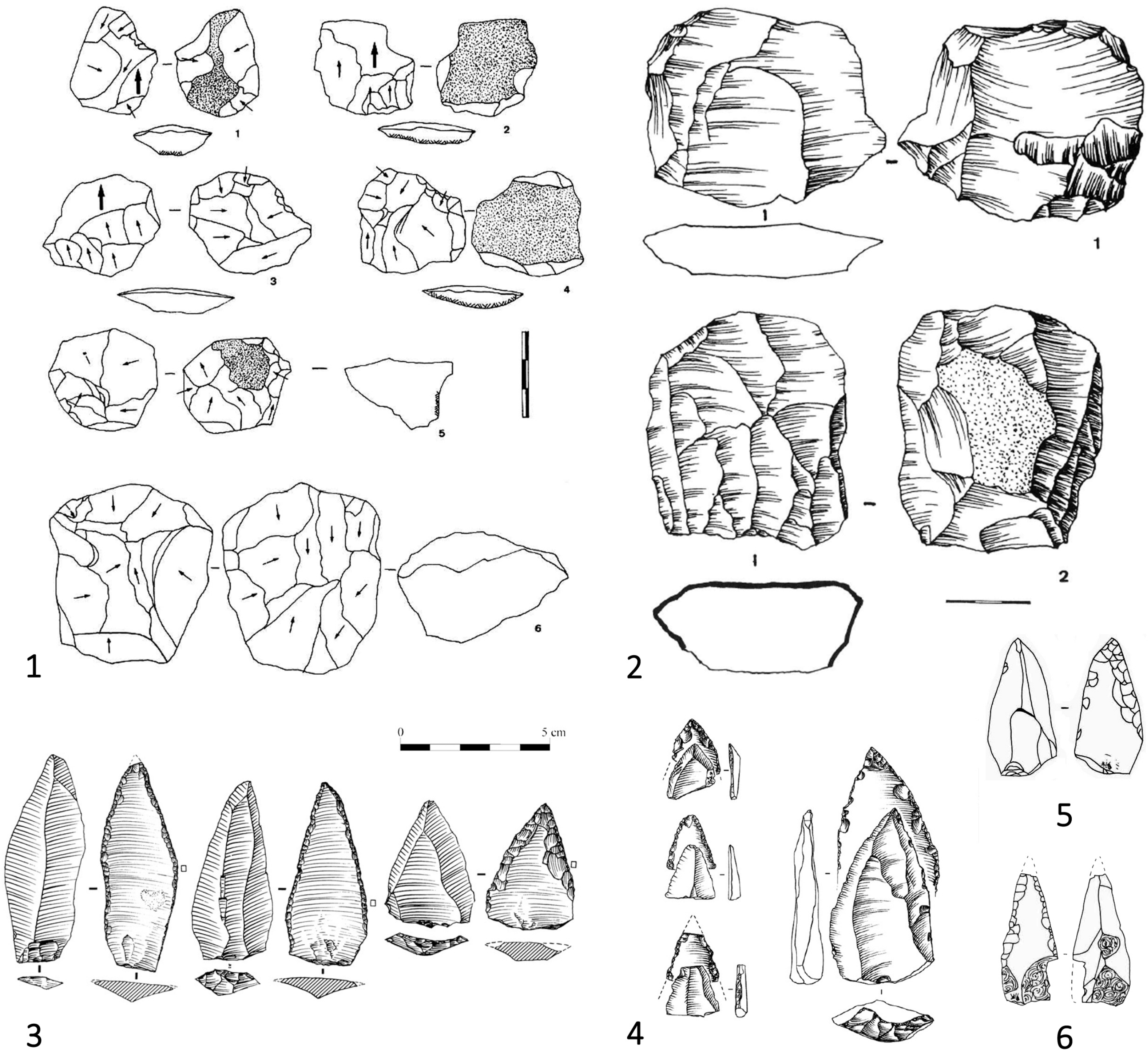

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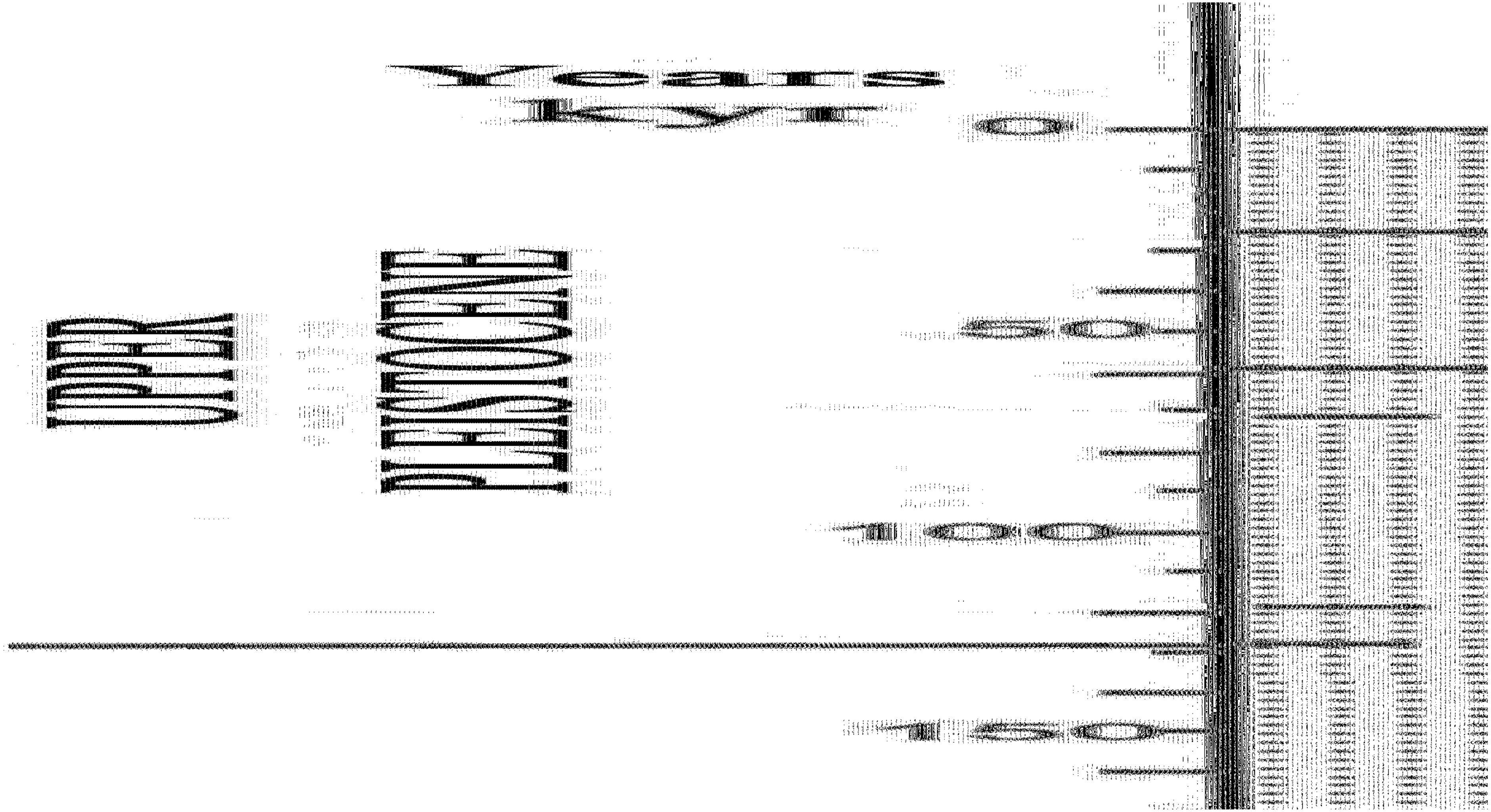

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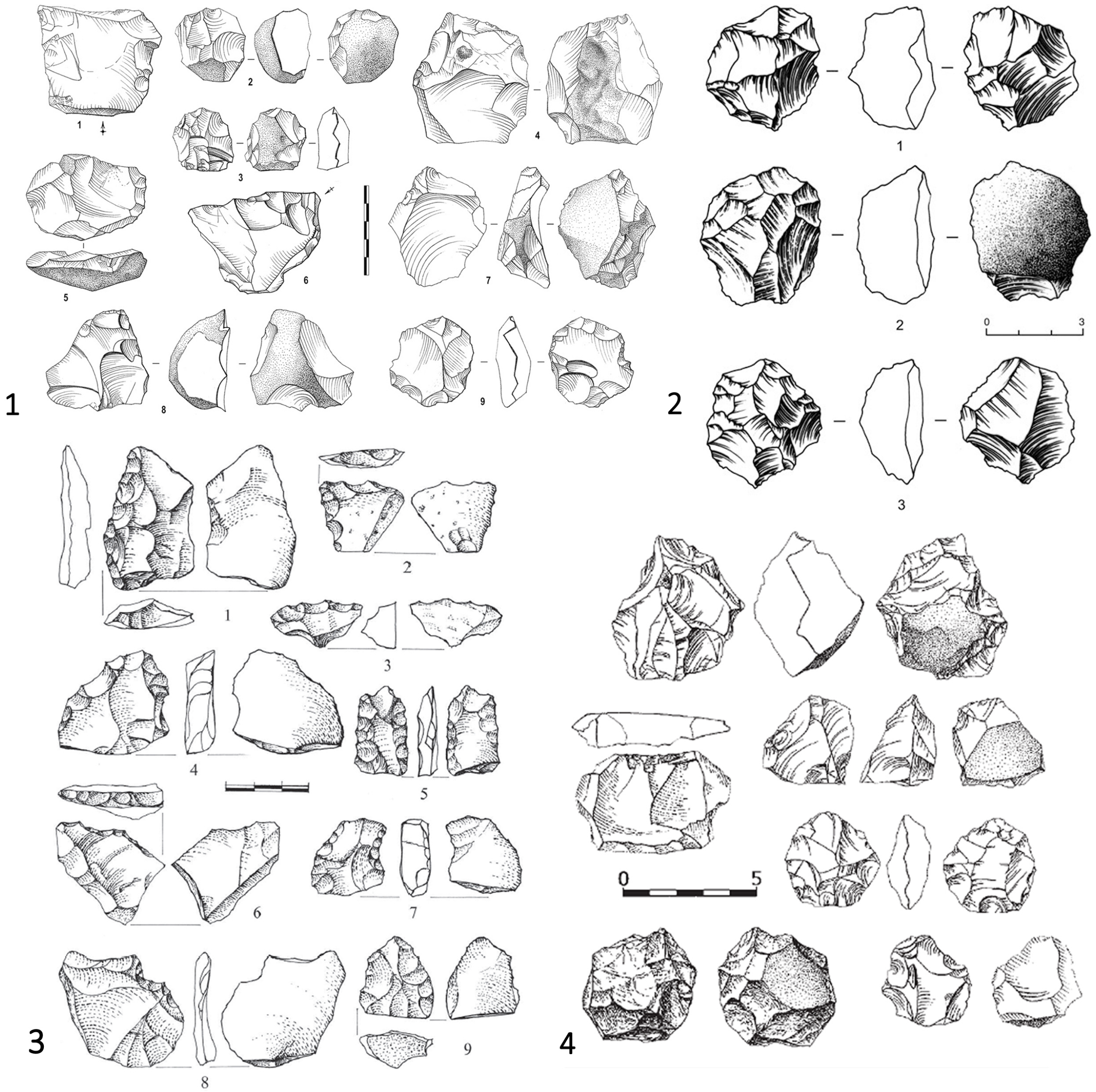
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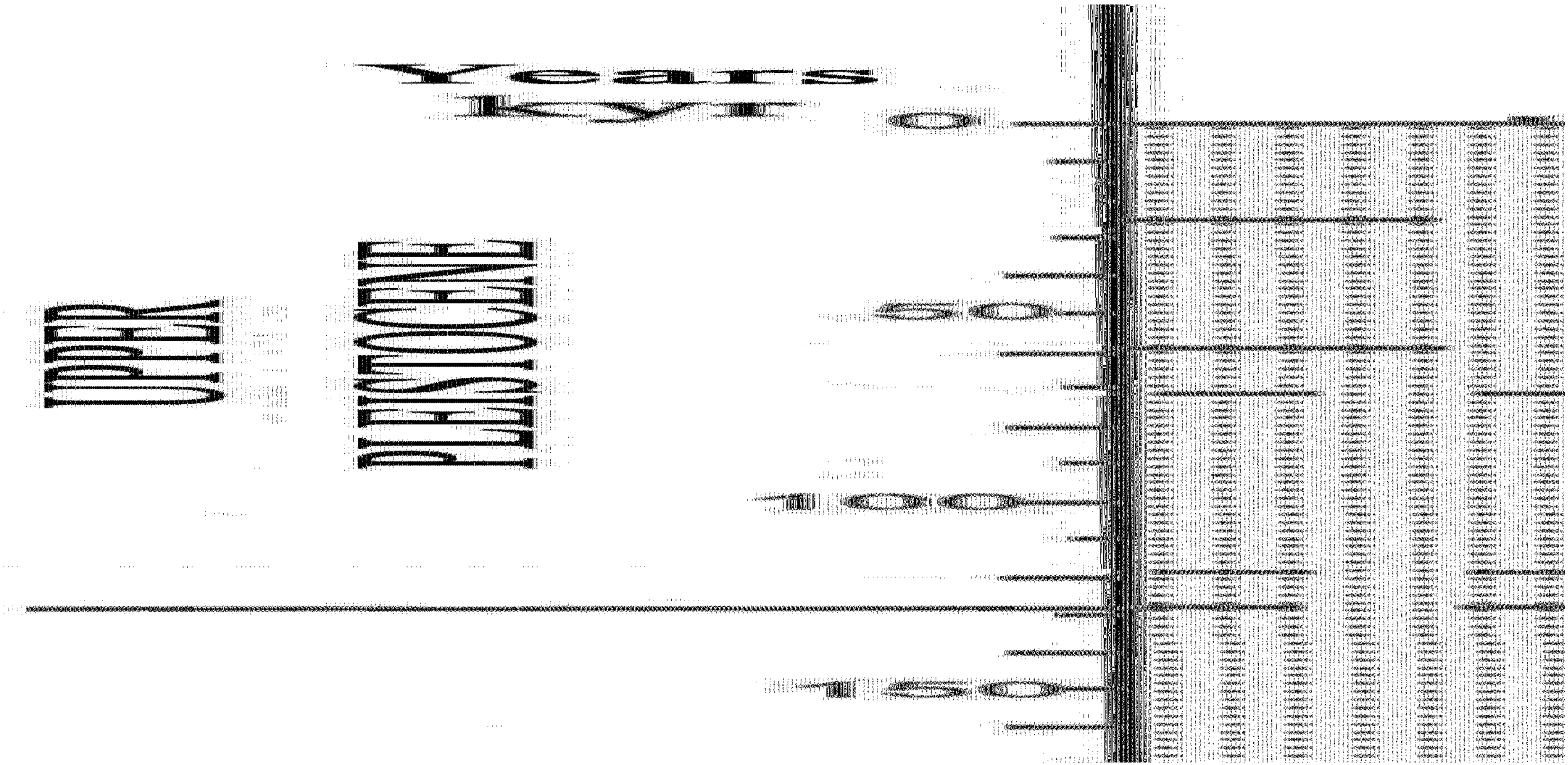
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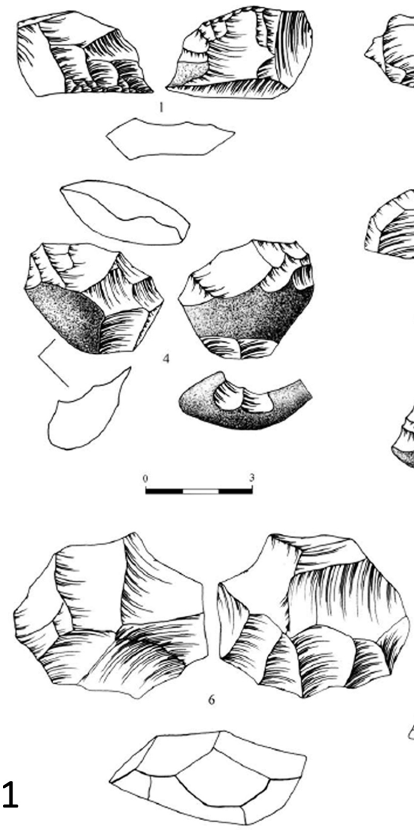

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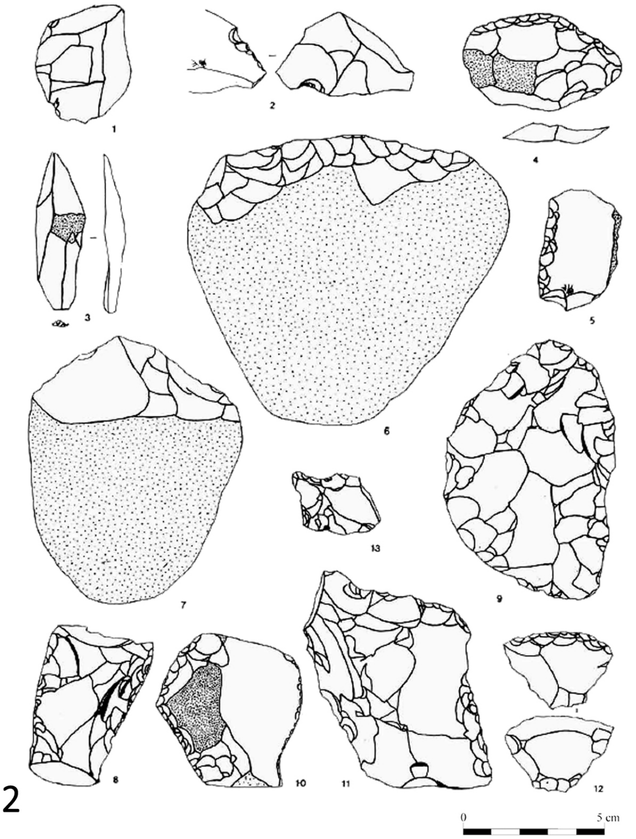

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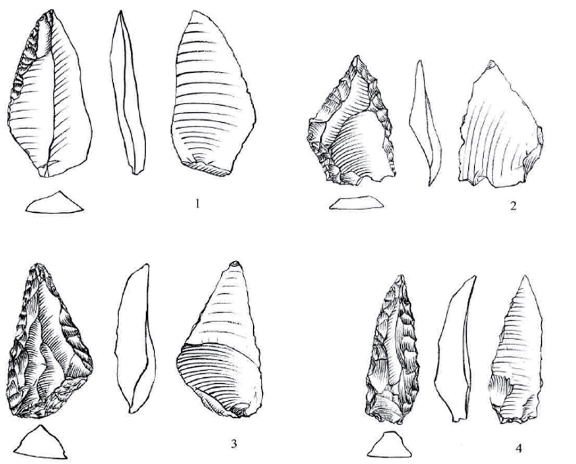

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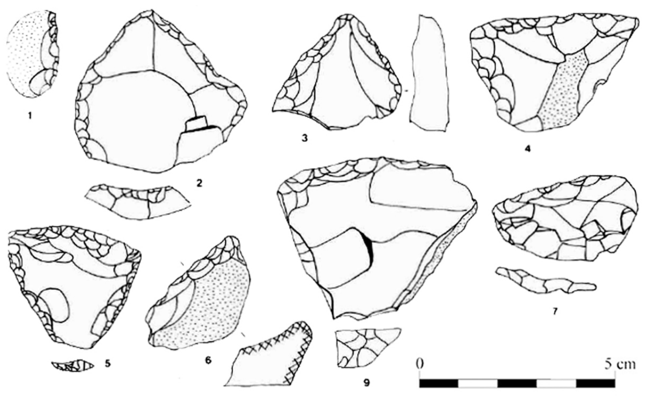

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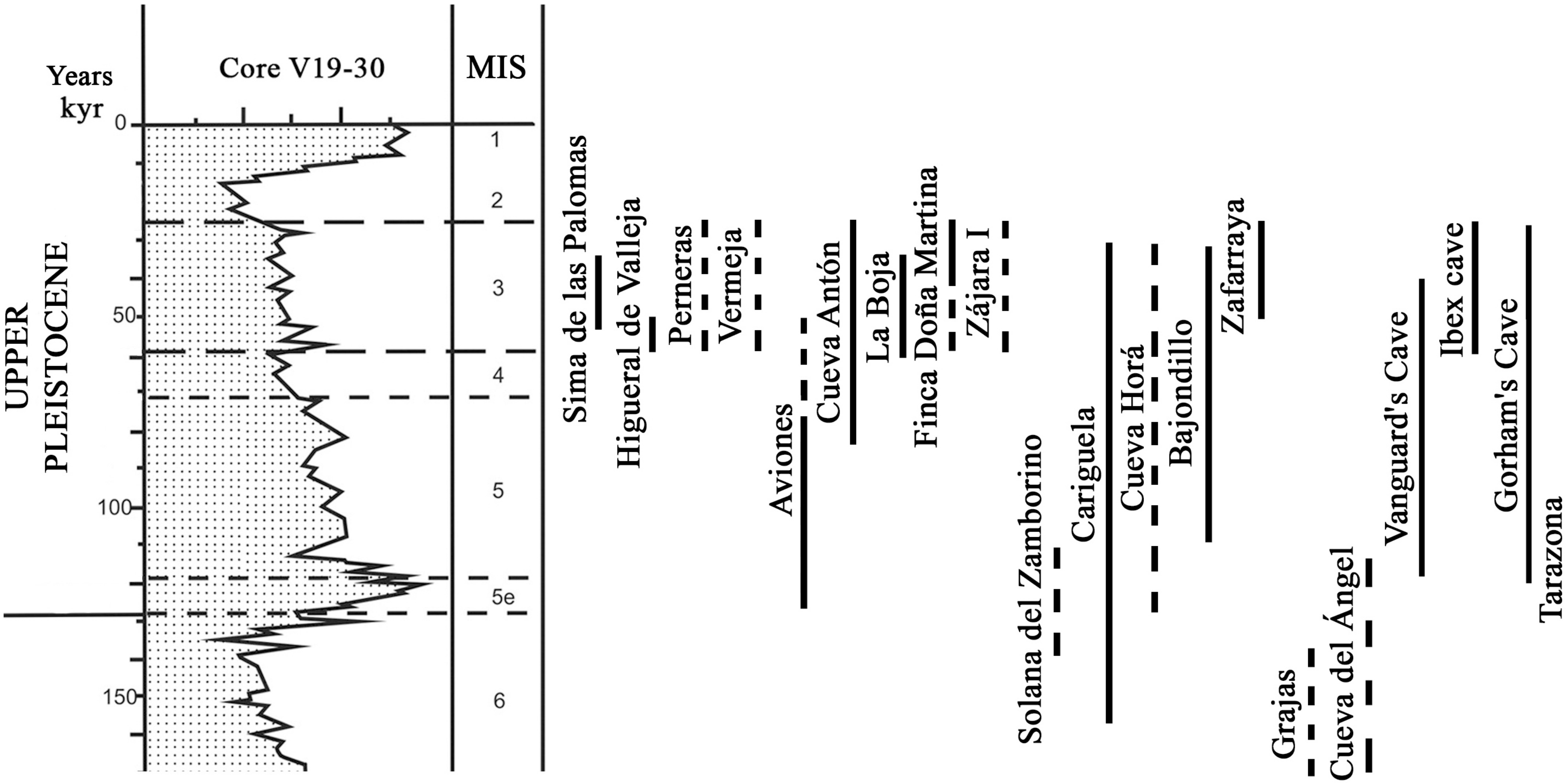
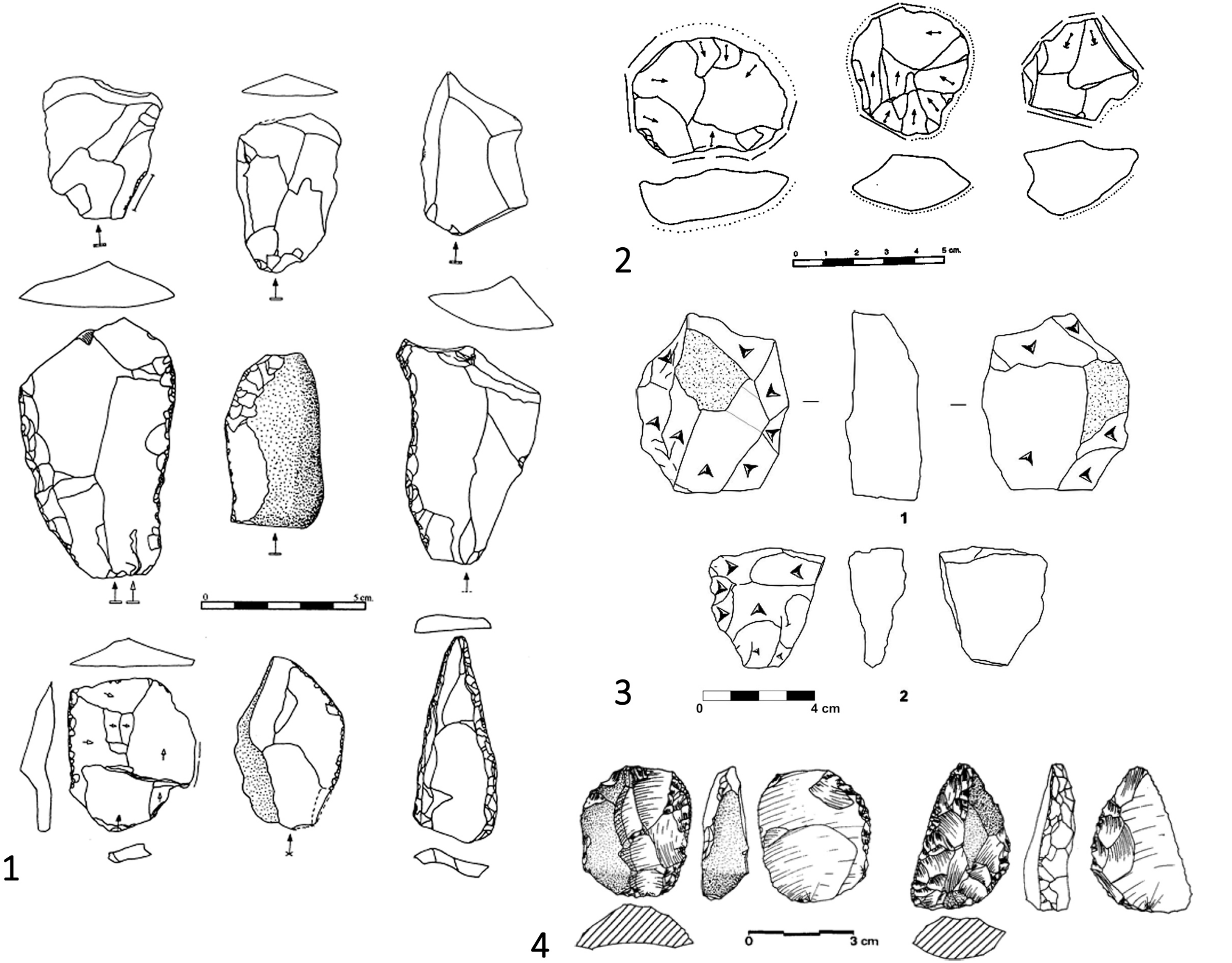


Years kyr
Core V19-30
MIS
0
50
100
150
1
2
3
4
5
5e
6
UPPER PLEISTOCENE
Sima de las Palomas
Higueral de Valleja
Perneras
Vermeja
Aviones
Cueva Antón
La Boja
Finca Doña Martina
Zájara I
Solana del Zamborino
Cariguela
Cueva Horá
Bajondillo
Zafarraya
Grajas
Cueva del Ángel
Vanguard's Cave
Ibex cave
Gorham's Cave
Tarazona


1
0
5 cm.
2
0 1 2 3 4 5 cm.
3
1
2
0
4 cm
4
0
3 cm