Journal of Anthropological Archaeology 44 (2016) 87–104

Contents lists available at ScienceDirect

Journal of Anthropological Archaeology

journal homepage: www.elsevier.com/locate/jaa

On the origin of the European Acheulian

Kenneth Martínez [a], Joan Garcia Garriga [a,b,*]

[a] URV, Universitat Rovira i Virgili, Àrea de Prehistòria, Avinguda de Catalunya 35, 43002 Tarragona, Spain
[b] UOC, Universitat Oberta de Catalunya, Avinguda del Tibidabo 39-43, 08035 Barcelona, Spain

ARTICLE INFO

Article history:
Received 2 February 2016
Revision received 11 September 2016
Accepted 16 September 2016
Available online 30 September 2016

Keywords:
Mode 1
Acheulian
Technological transition
Early Middle Pleistocene

ABSTRACT

The Mode 1 to Mode 2 transition in Europe has become a key research debate on early hominins. In this paper, the available data are used to propose a new interpretation of the origin of the Acheulian by analysing the transition through the lithic industry at key circum-Mediterranean sites with Early-Middle Pleistocene chronology: Vallparadís, Gran Dolina TD6, Barranc de la Boella, and Caune de l'Arago 'P' levels. Regarding these lithic records, we propose here the hypothesis based on an evolution of new technological behaviours in Europe before 0.5 Myr carried out from autochthonous populations with Mode 1 industries, combined with external adaptive and technological influences. We interpret the chronology and lithic assemblages of these sites within the transition process towards Acheulian, in which structural continuity of Mode 1 is complemented with the gradual appearance of some foreign innovations (bifacial technology). This technological transition is envisaged as a historical process: the outcome of the cultural evolution resulted from contacts and exchanges between hominin groups from western Eurasia with different social and technological adaptations, in contact and competition with each other. This historical process would explain the time lag between Africa, Levant, and Europe in the spread of the Acheulian, as well as a technological evolution of the European Mode 1 and the gradual expansion of the Acheulian across Europe.

1. Introduction

Until the mid-1990s, the first hominin occupation of Europe was associated with the expansion of the Acheulian, or Mode 2 technology (Clark, 1969), out of Africa in the Middle Pleistocene (ca. 0.5 Myr), mainly based on the artefacts and hominin remains at Boxgrove and Mauer (Rightmire, 1998; Roberts et al., 1994; Roberts and Parfitt, 1999). Since then, the amount of archaeological evidence has increased and we now propose that Europe was occupied during the Early Pleistocene up to the Matuyama-Brunhes boundary (ca. 0.78 Myr) (Garcia et al., 2011). Research has been conducted mainly in Spain, at Atapuerca (Sima del Elefante TE9 and Gran Dolina TD6; Carbonell et al., 1995, 2008), Orce (Fuente Nueva 3 and Barranco León D: Oms et al., 2000; Toro-Moyano et al., 2011, 2013), and Vallparadís EVT7 (Garcia et al., 2014; Martínez et al., 2010), but also in Italy (Monte Poggiolo; Arzarello and Peretto, 2010; Peretto et al., 1998), France (Pont de Lavaud; Despriée et al., 2006, 2010), England (Happisburgh 3; Parfitt et al., 2010), and Germany (Untermassfeld; Garcia et al., 2013a; Kahlke, 2000, 2006; Kahlke and Gaudzinski, 2005; Landeck, 2010; Landeck and Garcia Garriga, 2016). All of these sites are associated with Mode 1 lithic technology (Carbonell et al., 1999; Garcia et al., 2013b; Toro-Moyano et al., 2011, 2013). Moreover, research has also succeeded in determining the dates and the climate and vegetation conditions in which the first hominin occupations took place (Agustí et al., 2009; Carrión et al., 2011; Finlayson et al., 2011; González-Sampériz et al., 2010), the adaptive strategies, linked to the procurement of meat resources (Espigares et al., 2013; Huguet et al., 2013; Martínez et al., 2010; Landeck and Garcia Garriga, 2016; Saladié et al., 2011), and even the phylogenetic relations among European hominins and with African and Asian fossil remains (Bermúdez de Castro et al., 2015).

The proposal of continuous occupation based on the available archaeological record would contradict the hypotheses which, until recently, defined the hominin presence in Europe in the Early Pleistocene as intermittent and insignificant demographically, limited to climate pulses that allowed the spread of certain landscapes types across southern Europe, and thus the entry of hominin groups from the Levant (Dennell, 2003, 2010; Roebroeks and Van Kolfshoten, 1994). In the same way, the hypothesis that the climate and vegetation potential for the hominin occupation of Europe was not older than the Jaramillo subchron in the MIS22 (0.9 Myr) may also be challenged. This had questioned the chronology of the sites of Orce and Sima del Elefante in Spain, and Monte Poggiolo in Italy

* Corresponding author at: URV, Universitat Rovira i Virgili, Àrea de Prehistòria, Avinguda de Catalunya 35, 43002 Tarragona, Spain.
E-mail address: jgarc338@xtec.cat (J. Garcia Garriga).

http://dx.doi.org/10.1016/j.jaa.2016.09.003
0278-4165/

(Muttoni et al., 2010, 2011, 2013). Palaeomagnetism, radiometric data and macromammals at these sites and, above all, rodent biochronology is conclusive about hominin presence before the Jaramillo event, as it divides Early Pleistocene sites in Spain into two biozones: *Victoriamys lavocati* at Orce and Sima del Elefante, and *Victoriamys chalinei* at Vallparadís and Gran Dolina TD6 (Cuenca-Bescós et al., 2015; Garcia et al., 2014).

Additionally, archaeological similarities and the chronological succession between these Early Pleistocene sites suggest continuity in the occupation of Europe, at least in the Iberian Peninsula, from the oldest levels at Orce and Sima del Elefante (1.4–1.2 Myr) to Vallparadís (0.9 Myr) and Gran Dolina TD6 (0.8 Myr) (Bermúdez de Castro et al., 2013; Dennell et al., 2011; Garcia et al., 2011; MacDonald et al., 2012; Martínez et al., 2010). This continuity would include the successive arrival of new populations from the Levant and times when the European population was reduced to refugia in the Mediterranean peninsulas (Dennell et al., 2011; Leroy et al., 2011; Stewart and Stringer, 2012). This circumstance would result in episodes of interbreeding, speciation and bottlenecks, which would explain the diversity of archaic traits derived from the fossil remains at Sima del Elefante TE9 and from *Homo antecessor* at TD6, in turn attributed to different species as a consequence of an undetermined number of speciation events occurring in western Eurasia (Bermúdez de Castro et al., 2011, 2015). These same processes took place later, as inferred from diversity in the Middle Pleistocene fossil record (Gómez-Robles et al., 2015; Manzi, 2011; Martinón-Torres et al., 2007, 2013; Mounier et al., 2011; Mounier and Caparrós, 2015; Rink et al., 2013; Roksandic et al., 2011).

In contrast, a population gap has been proposed between the first Mode 1 occupations in the Early Pleistocene and the arrival of the Mode 2 or Acheulian in Europe, in the early Middle Pleistocene (Mosquera et al., 2013; Rodríguez-Gómez et al., 2014). This hypothesis is based on the record at the site of Gran Dolina in Atapuerca, between levels TD6 (ca. 0.8 Myr) and TD10 (ca. 0.45 Myr), and the archaeological record in terraces in central France, between Mode 1 deposits like Pont de Lavaud (ca. 1.0 Myr) and La Noira (ca. 0.7 Myr) (Despriée et al., 2006, 2010, 2011; Moncel et al., 2013). However, these population gaps at Atapuerca and central France do not coincide chronologically, and the datation of all these sites fills a putative population gap in Europe. Moreover, other archaeological data in western Europe also cover this supposed gap. The sequence at Vallparadís documents lithic artefacts in different levels between units EVT7, dated to 0.99 Myr, and EVT3, with an age of <0.6 Myr (Martínez et al., 2013). 'P' levels at Arago (Barsky and de Lumley, 2010), Isernia la Pineta (Coltorti et al., 2005; Gallotti and Peretto, 2015; Peretto, 1994; Thun Hohenstein et al., 2009), Notarchirico (Lefevre et al., 2010; Piperno, 1999), Happisburgh 3 (Parfitt et al., 2005, 2010), level TD6 at Gran Dolina (Duval et al., 2012), and La Noira (Moncel et al., 2013) equally attest hominin presence in Europe around the Matuyama-Brunhes boundary (ca. 078 Myr).

Mode 2 or Acheulian, with or without standardisation of large cutting tools (LCTs) bifacially or unifacially shaped on flakes and cobbles, is characterized by a high array of small retouched morphotypes, longer *chaînes opératoires*, large-size flakes, intensive core exploitation sequences, and an increasing use of the centripetal bifacial knapping method and multiplatform strategies (Santonja and Villa, 2006). It is also related with higher complexity behaviours which will gradually be integrated into the archaeological record: fire control, systematic faunal selection, and processing or ritual behaviour (Blasco et al., 2013; Carbonell and Mosquera, 2006; Gowlett, 2016; Sala et al., 2015; Zutovski and Barkai, 2016).

In the Early Pleistocene in western Eurasia, the first evidence of this technological and behavioural Mode 2 or Acheulian record is seen in the Levant, in Ubeidiya at 1.4 Myr (Bar-Yosef and Goren-Inbar, 1993). After 0.9 Myr at Gesher Benot Ya'aqov, this technology would be fully established in the region (Goren-Inbar, 1998; Goren-Inbar and Saragusti, 1996; Goren-Inbar et al., 2000). In contrast, in western Europe, Acheulian technology is not generally documented until the Middle Pleistocene. The oldest examples of the Acheulian in Europe, before it became widespread after 0.5 Myr, have been documented in the 'P' Levels at Arago (Mediterranean France), at Notarchirico (Italy), and La Noira (central France) at 0.7–0.65 Myr (Barsky and de Lumley, 2010; Falguères et al., 2015; Moncel et al., 2013; Pereira et al., 2015; Piperno, 1999). In Spain, despite some reserves about their chronological attribution and the scanty record, the earliest known examples are two handaxes, assigned to the Early Pleistocene at the sites of Estrecho de Quípar and Solana del Zamborino (Jiménez-Arenas et al., 2011; Scott and Gibert, 2009), and the site of Barranc de la Boella in Tarragona, where two large bifacially-shaped tools made on massive flakes (a pick and a cleaver-like tool) were recovered (Mosquera et al., 2015, 2016; Vallverdú et al., 2014).

Therefore, the available record in western Eurasia points to the existence of hominin populations with Mode 1 technologies in Europe, and Mode 2 in the Levant in the late Early Pleistocene and early Middle Pleistocene. This scenario reveals a time lag of 200–300 kyrs in the development of Mode 2 between these two regions. The causes for this chronological difference need to be investigated. Equally, bearing in mind the temporal and geographic proximity of Vallparadís, Gran Dolina TD6, La Boella, and Arago, the technological and historical relationship between all these sites needs interpreting. Without forgetting the limitations of the record currently available, we propose a historical process of expansion and/or diffusion of the Acheulian in western Europe based on an interpretation of lithic assemblages at the sites of Vallparadís, Gran Dolina TD6, La Boella, and Arago. The existence of hominin populations with different technology and adaptive strategies evolving during millennia in western Eurasia may have slowed down the diffusion of ideas and/or the spread of Acheulian populations across Europe (Barsky et al., 2013; Garcia et al., 2013b). As a result of this historical process of contact, interaction, and rejection between populations with different technology and social organisation in Eurasia, the Acheulian may have reached western Europe in an ebb-and-flow process.

2. The archaeological sites

All four archaeological sites are located in southern Europe: Vallparadís, La Boella, and Arago in the Mediterranean region, in north-eastern Spain and south-eastern France, respectively, at distances of about 300 km from each other and under 30 km from the modern coastline. In turn, Gran Dolina is situated in Atapuerca, in inland Iberia, at 890 m a.s.l. and about 500 km from the other three sites. Gran Dolina TD6 and Arago are cave sites, while Vallparadís and Barranc de la Boella are open-air sites in alluvial/fluvial deposits (Fig. 1).

2.1. Vallparadís

The site is located by the Vallparadís stream, within the city of Terrassa (Barcelona, north-east Spain), on the left bank of the stream. This Quaternary deposit forms part of the alluvial fan of Terrassa, encased in Miocene alluvials. The Vallparadís site comprises a 14 m-thick succession of mainly fluvial lutites deposited in a floodplain context, intercalated with alluvial sediments formed by lutites from mud flow episodes and alluvial/colluvial conglomerates deposited during debris flow episodes (Martínez et al., 2010). Unit EVT7 (archaeological levels 10 and 10c) is the main archaeological unit and contains a rich Mode 1 lithic assemblage