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Dancing to the rhythms of the Pleistocene? Early Middle Paleolithic population dynamics in NW Iberia (Duero Basin and Cantabrian Region)

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ABSTRACT

The Northwest of Iberia has yielded one of the most complete European Middle Paleolithic records. Despite this wealth of information, very little is known about population dynamics during this period. For that reason, the main concern of this paper is to provide socio-environmental models that may help explain Early Middle Paleolithic (EMP) population dynamics in NW Iberia, assessing to what extent they were shaped by climate forces. The archaeological record is analyzed on the basis of the heuristics of ecological models, already employed in the European Pleistocene record but never at a regional scale, in order to detect long-term changes in the composition of EMP populations, and the environmental, biological and sociocultural process influencing those changes. According to the models proposed, we have detected a long-term population dynamic between MIS 11 and MIS 6, characterized by low environmental stress, high biological productivity, interaction among populations and sociocultural complexity. Eventually, this population dynamic was broken due to an extreme climate phase in late MIS 6 that had a profound impact on populations and sociocultural structures. As a result, the Upper Pleistocene population of NW Iberia was concentrated in the Cantabrian region. This area became an isolated Neanderthal glacial refugium that hosted a population with different origins and fragile long-term demographic stability.

1. Introduction

The impact of climate and environmental changes on human demographic, migrational and cultural patterns during the Pleistocene is a topic of great current interest in Quaternary studies. Although there are interesting proposals that place less emphasis on the climate background to demographic and cultural change in the Paleolithic (e.g. Tzedakis et al., 2007; Banks et al., 2008; Roebroeks, 2008; Rodríguez et al., 2011; Moncel, 2012), the mainstream view among researchers is that climate had a tremendous impact both on population and cultural dynamics (e.g. Gamble, 1993; Housley et al., 1997; Stringer et al., 2003; Finlayson and Carrión, 2007; Shea, 2009; Hublin and Roebroeks, 2009; Dennell et al., 2011). In fact, the increasing number of high-resolution climate records for Europe during the Last Glacial cycle (i.e. Ganopolski and Rahmstorf, 2001; d'Errico and Sánchez-Goñi, 2003) are currently fueling this approach (i.e. Banks et al., 2008; Müller et al., 2012; Schmidt et al., 2012).

As has been amply demonstrated over the last decades, the Middle Pleistocene climatic oscillations continually moved both the human and geographic frontiers in Europe and, consequently, the pattern of hominin occupation responded to repeated expansions and contractions: populations expanded northwards in favorable circumstances, and then retreated southwards into refugia when conditions deteriorated (i.e. Gamble, 1993; Housley et al., 1997; Bocquet-Appel and Demars, 2000; Gamble et al., 2004; Bocquet-Appel et al., 2005; Green et al., 2010). The current emphasis that some researchers have put on regional extinction is seen in scenarios of population fragmentation, recombination, extinction and expansion, and thus Pleistocene glacial refugia have been renamed as bottlenecks (i.e Hewitt, 1999; Jöris et al., 2003; Hublin and Roebroeks, 2009; Verpoorte, 2009; Dennell et al., 2011; Bradtmöller et al., 2012; Widlok et al., 2012). According to this,

Abbreviations: EMP, Early Middle Paleolithic; SSM, Source-Sink Model; ACM, Adaptive Cycle Mode; CM, Cascade Mode; DB, Duero Basin; CR, Cantabrian Region; EM, Early Mousterian; LA, Later Acheulean.

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Southern Europe would have worked as a glacial source for populating the northerly areas when climate conditions allowed, but in certain periods it may have also become depopulated, and recolonized from a source outside Europe (Dennell et al., 2011; MacDonald et al., 2012; Bermúdez and Martinón, 2013). Regardless of whether successful colonizing movements or population collapses are emphasized, the Pleistocene settlement of Europe was characterized by frequent spatial and geographic discontinuities (Bermúdez et al., 2013).

In these fluctuating conditions in Europe, the Lower to Middle Paleolithic transition occurs during the second part of the Middle Pleistocene (Chazan, 2009; Villa, 2009; Moncel et al., 2012). This phenomenon runs parallel to the biological process of speciation from *Homo heidelbergensis* to *Homo neanderthalensis* (Hublin, 2009; Arsuaga et al., 2014). Since the beginning of the twentieth century it has been thought that the beginning of the European Middle Paleolithic is marked by the appearance of Levallois technology (Sánchez Yustos, 2012). Nowadays, empirical evidence suggests that the Levallois method is part of a complex technological reorganization process that also implies a progressive abandonment of large-sized tools, increasing variability and formal standardization of both production and retouching of small flakes, and intense fragmentation of lithic reduction and the consequent importance of the traveling component (i.e. Geneste, 1989; Chase, 1990; Wyner et al., 1993; Gamble and Roebroeks, 1999; White and Ashton, 2003; Bourguignon et al., 2004; Barsky et al., 2005; Santonja and Pérez, 2006; Fernández Peris et al., 2008; White et al., 2011; Moncel et al., 2012; Ollé et al., 2013; Picin et al., 2013; Turq et al., 2013; Santonja et al., 2014). Furthermore, this technological reorganization process is part of profound behavioral changes that included the habitual use of fire (Roebroeks and Villa, 2011), new mobility patterns (Chazan, 2009), elaborate hunting strategies (Blasco et al., 2010), the mastery of hafting (Rots, 2013) or the manipulation of pigments (Roebroeks, 2012).

Early Middle Paleolithic (EMP) technology is traditionally distinguished from Mousterian technology mainly on chronological grounds (EMP ≧ MIS 5) and the generalization of the above-mentioned techno-economical changes, particularly Levallois technology. The appearance of such changes during the EMP is geographically and temporally discontinuous and coexisted for a long time with the Acheulean technocomplex. This fact has fueled the still open debate about the relationships between both technocomplexes in the second part of the Middle Pleistocene in Europe (i.e. Foley and Lahr, 1997; Tuffreau et al., 1997; Roebroeks and Tuffreau, 1999; Wynn and Coolidge, 2004; Bourguignon et al., 2004, 2008; Moncel, 2006; Monnier, 2006; Peris, 2007; Brenet et al., 2008; Picin et al., 2013; Adler et al., 2014; Santonja et al., 2014). Despite these disagreements, many archaeologists agree that Levallois technology resulted from the gradual synthesis of the shaping method characteristic of bifaces, and Acheulian bifacial technology and Levallois technology reflect an ancestor-descendant relationship (i.e. Bordes, 1971; Pigeot, 1991; Rolland, 1995; Tuffreau, 1995; De Bono and Goren-Inbar, 2001; White and Ashton, 2003; Bar-Yosef and Dibble, 2005; White et al., 2011; Adler et al., 2014).

The NW of Iberia, particularly the Cantabrian Region (CR) and the nearby Duero Basin (DB), has provided one of the most complete European Middle Paleolithic records, with numerous archaeostratigraphic sequences well contextualized geochronologically and paleo-ecologically. The CR is one of the areas of greatest interest for the study of the final Middle Paleolithic at European scale (i.e. Maíllo-Fernández et al., 2004; Bernardo de Quirós et al., 2008; Baena et al., 2012). Its different ecological units (coast, inland valleys and mountains) are especially attractive for analyzing this period. The Middle Paleolithic settlement in this region is quite recent compared to the nearby DB, the largest Cenozoic basin in Iberia, where a long-term EMP settlement has been registered. The abundance of the archaeological record in all the ecological units of this basin (plains, plateaus and mountainous borders) has provided one of the most complete pictures of hominin settlement and techno-economic behavior during the second part of the European Middle Pleistocene. Notwithstanding this wealth of information, very little is known about the kind of relationship that existed between the populations in these neighboring regions. For this reason, the interest of this paper is to provide models that may help explain the Pleistocene population scenario in NW Iberia. Recalling Gamble's words, part of in the interest of this paper is also to indicate to what extent these populations were “dancing to the rhythms of the Pleistocene” (Gamble, 1999: 125); or in other words, how far population dynamics were shaped by climate forces.

2. Materials and methods

The chronological, economic, technological, paleo-ecological and paleo-anthropological data presented here derive from the EMP sites (≧MIS 5) in the DB and CR. An overview of the late Acheulean (LA) open-air sites in both regions is also presented due to the chronological and techno-typological parallels that keep with the early Middle Paleolithic sites. The level of resolution of the data is the distribution of archaeological sites within the landscape plotted against chronology. The data are analyzed on the basis on the heuristics of the following ecological models, already employed in Pleistocene Europe but never at regional scale, in order to detect long-term changes in the composition of EMP populations, and the environmental, biological and sociological process influencing those changes. Population is used here as a synonym of “deme”, defined as “the aggregate of local populations of a species inhabiting a geographic subdivision of the range of the species” (Howell, 1999: 8–9).

2.1. Source-Sink Model

Pleistocene human population dynamics have been modeled as “sources and sinks” (Eller et al., 2004; Hawks, 2009; Dennell et al., 2011; Bermúdez and Martinón, 2013). “Source-sink dynamics” is a theoretical ecological model, originally developed by Pulliam (1988), to analyze the impact of habitat-specific demographic rates on population growth and regulation. According to the “Source-Sink Model” (SSM), which describes how variation in habitat quality may affect the growth or decline of a population, the particular species assemblage occupying any region may consist of a mixture of source and sink populations and may be as much or more influenced by type or proximity of another habitat as by the resources and other conditions in the region.

A sink habitat is a region where the average rate of reproduction is below replacement levels. Despite this, it may support large populations that would eventually disappear without continued immigration from an adjacent, more reproductive area that is named a source habitat. Therefore, the population regulation between source and sink depends on active dispersal from source habitats. Individuals choose to leave the source whenever their expected reproductive success is higher in the sink. There is no reason why the source-sink dynamic needs to be constant.

2.2. Adaptive Cycle Model

The “Adaptive Cycle Model” (ACM) was generated from observations in ecosystems (Holling, 2001; Gunderson and Holling, 2002) and successfully adapted to the analysis of current socio-