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## Making different things, but eating the same food? Correlation between cultural and subsistence changes during the Pleistocene–Holocene boundary in the northeastern Iberian Peninsula

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### ABSTRACT

The end of the Pleistocene is characterized by a succession of climatic oscillations from the onset of MIS 2. These oscillations were associated with important environmental transformations that culminated in the Pleistocene to the Holocene transition, with latter climate amelioration. However, the changes during this period are not only restricted to the environment, as important cultural transformations took place. The cultural traditions characteristics from the end of the Upper Paleolithic disappear with the emergence of the traits characteristic of the Mesolithic culture. This is clearly attested in the well-known lithic record, but also in other domains of material culture, like bone industry and art. Nevertheless, the extent to which these cultural and environmental transformations were associated with changes in subsistence strategies remains unclear, at least at the Mediterranean basin of the Iberian Peninsula. Apparently, the exploitation of faunal resources during the Mesolithic does not seem to change so much with respect to the end of the Upper Paleolithic, especially concerning the consumption of small prey.

The main goal of this paper is (1) to analyze how environmental transformations could or could not intervene on the modes of life of Prehistoric populations during these transitional periods, and (2) to discuss the apparent dichotomy between cultural changes and subsistence strategies at the end of the Upper Paleolithic and the Mesolithic in northeastern Iberia. In that sense, we will include the case of the Molí del Salt site (Catalonia, Spain) as an example to explain these trends. This site has an archaeological sequence from the Upper Magdalenian to the Mesolithic, which makes it a reference place to comprehend the dynamics of human populations during this period.

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### 1. Introduction

Perspectives based on evolutionary ecology have emphasized the determining role of environmental changes in the transformations seen in the archaeological record throughout prehistory (e.g., [Aura et al., 2009](#)). Given the adaptive nature of material culture, variations in the type, distribution and availability of animal and plant resources should have a profound impact on all aspects of human behavior, especially on the manufacture of artifacts, most of which are related, directly or indirectly, to the collection and processing of those resources. In this context, numerous studies have

linked the changes in the archaeological record of prehistoric hunter-gatherer populations with the complex climatic evolution that took place throughout the Pleistocene (e.g., [Kuhn, 1995](#); [Sherratt, 1997](#); [Blades, 2001](#); [Delagnes and Rendu, 2011](#); [Burke et al., 2014](#); [Bicho et al., 2017](#)).

Since the Pleistocene climatic sequence is a succession of glacial/interglacial cycles, the moments of transition between glacial and interglacial phases are particularly appropriate to analyze the impact of environmental changes on material culture. Of these transitional moments, the Pleistocene/Holocene boundary has abundant climatic and archaeological records that are of great resolution and are well dated. The paleoenvironmental data indicate that the improvement in the climatic conditions resulted in important changes in plant and animal populations, as well as in the dynamics of human settlements, with the colonization of territories that were scarcely occupied previously. However, the

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impact of these transformations on material culture is a matter of debate and shows considerable variability at the regional level. In some regions, archaeological sites dating to the early Holocene show continuity with those at the end of the Pleistocene, with no significant rupture in technical behavior (Bicho, 1994; Thévenin, 1999; Kozłowski and Kaczanowska, 2009; Lo Vetro and Martini, 2016). On the other hand, in other regions, a radical change in material culture coincides with the Pleistocene/Holocene boundary (Araújo et al., 2009; Vaquero et al., 2009). In these cases, the question arises as to the extent to which technological change is related to transformations in the strategies of the exploitation of animal and plant resources.

The end of the Paleolithic is characterized by important environmental transformations culminating with the warmer conditions that define the climate amelioration of the Holocene. This moment is marked by the cold Younger Dryas event (Greenland Stadial 1 or GS-1), defined by a decline in temperature and a marked decrease in precipitation. As a consequence, the annual mean temperature decreased from 2 to 5 °C, and the advance of glaciers is attested in different mountain formations (Kerschner and Ivy-Oschs, 2008; García-Ruiz et al., 2016). This process had consequences on vegetation, as the general cooling and aridity favored the loss of forests and an increase in species typical from steppe environments, such as xerophyte plants and/or *Juniperus* (Carrión et al., 2010; García-Ruiz et al., 2016). In the Iberian Peninsula, a significant temperature drop reflected the environmental changes and the expansion of aridity (Cacho et al., 2002; Rodrigues et al., 2010; Moreno et al., 2012; Naughton et al., 2016). A reduction of 35% of arboreal pollen was attested during the Younger Dryas event. After that cold period, coinciding with the beginning of the Holocene, the climate ameliorated. As consequence, angiosperm species arose and the thermophile forest expanded (Carrión et al., 2010; Fletcher et al., 2010a, 2010b; García-Ruiz et al., 2016).

The Iberian Peninsula is a good example of the correlation between environmental and cultural changes at the Pleistocene-Holocene boundary. The archaeological complexes at the end of the Pleistocene show the continuity of the technical traditions characteristic of the Late Paleolithic period. Regardless of the different terms used to designate them (Microlaminar Epipaleolithic, Epimagdalenian, Azilian), these assemblages seem to be clearly rooted in the Upper Magdalenian (Aura et al., 1998; Fernández-Tresguerres, 2006; Vaquero et al., 2009; Roman-Monroig, 2012; Villaverde Bonilla et al., 2012; Straus, 2017). The lithic assemblages are characterized by the importance of the production of blades and, above all, bladelets, and by a toolkit in which the typical Paleolithic artifacts predominate (endscrapers, burins, truncations, backed elements). With respect to the Upper Magdalenian, there are some tendencies of change at the technological and typological levels, in addition to the progressive disappearance of the artistic manifestations and the simplification of the bone industry. However, these are gradual changes, without significant ruptures.

The beginning of the Holocene is marked by a substantial transformation of material culture. The assemblages of the Magdalenian tradition documented at the end of the Pleistocene are replaced by Mesolithic industries characterized by the predominance of expedient technical behavior. Lithic technology is based on the production of flakes from poorly elaborated reduction strategies, without predetermination of the products. There is an almost exclusive use of local raw materials, which often involves the exploitation of poor quality materials that had been little used during the Upper Paleolithic. The typical Paleolithic tools decrease and there is a predominance of notches and denticulates, as well as worked cobbles and picks in some cases, as in the Asturian of the

Cantabrian region. These technological changes are associated with the complete disappearance of the figurative art of the Paleolithic style and to a rare and highly expedient bone industry. These industries, which have been given different denominations (Macro-lithic Mesolithic, Mesolithic of notches and denticulates, Asturian), have been documented in the entire Iberian Peninsula, but they are especially common in the Mediterranean basin and the Cantabrian region (Alday, 2002, 2006; Aura et al., 2006; Martínez-Moreno et al., 2006; Montes et al., 2006; Vaquero, 2006; Araújo et al., 2009; Straus, 2017).

The Northeast Iberian Peninsula has an abundant archaeological record corresponding to the end of the Upper Paleolithic and the Macro-lithic Mesolithic, although the amount of evidence decreases significantly coinciding with the Pleistocene/Holocene boundary. The Magdalenian tradition assemblages are particularly numerous during GI-1, but decline during the GS-1. In parallel, the Mesolithic assemblages are better documented in the Boreal period than in the Preboreal period. Several stratigraphic discontinuities coinciding with the Pleistocene/Holocene boundary have been detected in several sequences from the Mediterranean basin, suggesting that the decrease in the number of assemblages may be due to an increase in erosive dynamics. Nevertheless, the assemblages dated immediately before and after the Pleistocene/Holocene transition clearly show a significant break in technical behavior. This is evident if we compare the GS-1 assemblages, such as the Parco Cave and Filador rockshelter, to the Boreal Mesolithic assemblages documented at the Agut and Guilanyà rockshelters. The Younger Dryas assemblages exhibit the microlaminar technology typical of Upper Paleolithic technocomplexes. The toolkits contain high percentages of endscrapers and backed elements, with the addition of microlithic geometrics. On the contrary, the characteristics of Pre-boreal assemblages fully agree with the expedient character of Mesolithic technocomplexes, to the extent that one of these sites (Agut rockshelter) was once considered as Mousterian (Vaquero et al., 2002).

Regarding animal representation, it would be expected that the environmental changes occurring during the Pleistocene-Holocene transition influenced the taxa in the landscape. As a consequence, if new species were available, they could be potentially hunted by human populations, which should be reflected in the archaeological record. Nonetheless, little is known about subsistence strategies in northeastern Iberia, and the few studies available seem to suggest continuity in the faunal spectrum represented in the archaeological sequences (e.g. Guilaine and Martzloff, 1995; Guilaine et al., 2008; Casanova et al., 2007; Utrilla and Mazo, 2014). Additionally, the poor preservation of faunal resources in archaeological sites encourages studies focused on other facets of material culture, rather than on faunal remains. For this reason, our main goal is to thoroughly investigate this question, in an attempt to determine how environmental changes could intervene in the lifestyle of prehistoric populations from the point of view of subsistence strategies. To complement the available data, new information about the Late Upper Paleolithic and Mesolithic site of Molí del Salt will be provided. This will broaden the knowledge of human groups during this transitional period. Another goal is to observe if cultural changes could influence this change in procurement strategies.

### 1.1. Northeastern Iberia: a case study

The transitional period from the Late Upper Paleolithic to the Mesolithic is well known in the northern part of Iberia, in the Cantabrian region. There, multiple examples of Upper Paleolithic sites are known, allowing a good overview of human populations during this period (Altuna, 1992; Marín-Arroyo, 2007, 2013;

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