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Compositional variability in Mediterranean archaeofaunas from Upper Paleolithic Southwest Europe

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ABSTRACT

Recent meta-analyses of Upper Paleolithic Southwestern European archaeofaunas (Jones, 2015, 2016) have identified a consistent "Mediterranean" cluster from the Last Glacial Maximum through the early Holocene, suggesting similarities in environment and/or consistency in hunting strategy across this region through time despite radical changes in climate. However, while these archaeofaunas from this cluster all derive from sites located within today's Mediterranean bioclimatic region, many of them are from locations far from the Mediterranean Sea – Atlantic Portugal, the Spanish Meseta – which today differ significantly from each other in biotic composition. In this paper, I explore clustering (through cluster analysis and non-metric multidimensional scaling) within the Mediterranean archaeofaunal group. I test for the influence of sample size as well as the geographic variables of site elevation, latitude, and longitude on variability in the large mammal portions of archaeofaunal assemblages. ANOVA shows no relationship between cluster-defined groups and site elevation or longitude; instead, site latitude appears to be a primary contributor to patterning. However, the overall compositional similarity of the Mediterranean archaeofaunas in this dataset suggests more consistency than variability in Upper Paleolithic hunting strategy in this region.

1. Introduction

Southwest Europe can be divided into several bioclimatic regions based on differences in temperature and precipitation, the two most extensive of which are Temperate Euro-Siberian and Mediterranean (Council of Europe Directorate-General for Environment, 2011; Rivas-Martínez et al., 2004a). Although the biological composition of these regions has certainly changed from the Pleistocene to today, they nonetheless seem to correspond with distinct patterns in human behavior in the Upper Paleolithic (e.g., Banks et al., 2008, 2009; Barton et al., 2013; Demars, 2008; Jones, 2013), suggesting that the regional boundaries, if not regional biological characteristics, persisted at least as far back as the Last Glacial Maximum. One example of such correlation comes from recent meta-analyses of Upper Paleolithic archaeofaunas from Southwest Europe, where a consistent "Mediterranean" cluster in zooarchaeological composition has been identified spanning the period from the Last Glacial Maximum through the early Holocene. This finding suggests similarities in environment and/or consistency in hunting strategy within the Mediterranean bioclimatic region. These similarities appear to have persisted through time in spite of radical changes in climate (Jones, 2015, 2016).

However, the present-day Mediterranean bioclimatic region (as defined by Rivas-Martínez et al., 2004a) encompasses a large degree of variability in biotic composition as well as in elevation. Indeed, while the Mediterranean bioclimatic region encompasses most of the Iberian Peninsula and the eastern portion of southern France, when this area is divided into sub-regions based on plant communities, it may be considered home to as many as six biogeographic regions: Coastal Lusitano-Andalusian (Atlantic Portugal and southwestern Spain); Mediterranean West Iberian (interior Portugal and western Spain); Betican (southern Spain); Murcian-Almerian (southeastern Spain); Mediterranean Central Iberian (interior central Spain); and Balearic-Catalonian-Provencal (northeastern Spain and Mediterranean France) (Rivas-Martínez et al., 2004b).

Since prehistoric peoples would likely much of the time have been responding to the presence of different plant and animal taxa rather than directly to climate, this leads to the question, can today's variability in environment within the Mediterranean bioclimatic region be seen in the archaeofaunal record? In this paper, I

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use clustering (cluster analysis and non-metric multidimensional scaling [NMDS]) within the "Mediterranean" archaeofaunal group identified in previous publications (Jones, 2015, 2016) to explore relationships between mammalian archaeofaunal composition and assemblage size, latitude, longitude, and site elevation.

2. The Mediterranean bioclimatic region in Upper Paleolithic Southwest Europe

2.1. Regionalization in Southwest Europe today

Biogeographers use different means to divide regions into biogeographical zones. Often, such divisions are based on differences in vegetation, with zones established based on the locations of present-day plant communities (e.g., Braun-Blanquet, 1951; Rivas-Martinez, 2005; Rivas-Martinez et al., 1997; Rivas-Martínez et al., 2004b; Tarroso, 2008). Bioclimatic regions, in which zones are created based on similar climate regimes, are also widely used (e.g., Rivas-Martínez et al., 2004a; Rivas-Martinez and Rivas-Saenz, 2009). While vegetation and climatic zones may overlap considerably, and often do so in Western Europe in particular (Huntley, 1988, 1990), the shape and location of these zones reflect the units used to create them (Rivas-Martinez et al., 1997; Rivas-Martínez et al., 2004a, b).

In Western Europe, present-day biogeographic zones, particularly bioclimatic regions, are strongly latitudinal in nature (Svenning et al., 2011). Many attribute this latitudinal influence to Pleistocene biogeography, when many plant and animal taxa were restricted to refugia in southern Europe (Dobrovolski et al., 2012; Sommer and Nadachowski, 2006; Stewart and Cooper, 2008; Turner and Hanson, 1988). The fact that zones based on plant communities are more variable in these former refugia, especially on the Iberian Peninsula (which is widely considered to have been home to refugia during the Last Glacial Maximum; see discussion and references in Jones, 2013) lends support to this hypothesis. In present-day Iberia, both longitude and elevation seem to have a marked impact on biotas (Wu et al., 2007). Biogeographical regionalization in the late Pleistocene is thus an important component of present-day Western European biogeography.

2.2. Regionalization in the Upper Paleolithic of Southwestern Europe

The Upper Paleolithic, the cultural period that corresponds with the latest portion of the Pleistocene, of Southwest Europe is thus an excellent time and place in which to explore questions about regionalization. Latest Pleistocene Southwest Europe appears to have been as marked by regional biogeographical variation as present-day Southwest Europe is (e.g., Allen et al., 1996; Álvarez-Lao and García, 2010; Cuenca-Bescos et al., 2009; Fløjgaard et al., 2009; Naughton et al., 2007), and previous studies have shown correspondence between environmental regions and human behavior during the Upper Paleolithic here (e.g., Banks et al., 2009; Davidson, 1976; Jones, 2013; McClure and Schmich, 2009; Straus, 2013). In particular, meta-analyses of archaeofaunal data suggest hunting strategies in Southwest Europe were strongly regional, with distinct patterns in the "Euro-Siberian" and "Mediterranean" bioclimatic regions (Jones, 2015, 2016).

As discussed earlier, however, the Mediterranean bioclimatic region in Southwest Europe encompasses a large degree of variability today, and likely did so in the Pleistocene as well (Tarroso, 2008); both longitudinal and elevation gradients impact biotas in this region, as does the the latitudinal gradient. In addition, there was certainly variability in regional biotic composition through time. The Upper Paleolithic as defined here encompasses not only the Last Glacial Maximum (around 22 cal ka), when glaciers were at their maximum extent and Europe at its coldest of the last glacial, but also the gradual warming that followed the Last Glacial Maximum, when forests began to spread within Southwestern Europe; the Younger Dryas (12.9–11.7 cal ka), a period marked by an abrupt return to cold climates and associated constriction of forested zones; and the transition to the Holocene, when warmer climates and more modern biotas became established (see full discussion in Jones, 2016).

Can any of this variability be seen in the archaeofaunal record? Because radiocarbon dates are not available for many of the assemblages in this dataset, I use the Upper Paleolithic technochronological units of Gravettian (approximately 30–25 cal ka), Solutrean (approximately 25–20 cal ka), Magdalenian (approximately 20–14 cal ka), and Epipaleolithic (approximately 14–11 cal ka) to control for time. I use the distribution of these units to assess the possible influence of chronology on patterning within the dataset. To test for the presence of longitudinal and elevation impacts on the archaeofaunal record of Upper Paleolithic Southwest Europe, I explore the archaeofaunal composition of assemblages drawn from archaeological sites in the Mediterranean regions of Southern France and Iberia throughout the Upper Paleolithic.

3. Materials and methods

I used the Mediterranean archaeofaunas from Jones (2016) as the basis for this study (Fig. 1, Table 1; full dataset available at http://hdl.handle.net/1928/31653). This dataset includes 40 discrete archaeofaunal assemblages from 22 Upper Paleolithic archaeological sites, all located with the Mediterranean bioclimatic regions (as defined by Rivas-Martínez et al., 2004a) of present-day France, Spain, and Portugal. It is important to note that the archaeofaunal data in this set are limited to ungulates and lagomorphs; birds, fish, reptiles, shellfish, and smaller mammals were not included. I made this decision in part because for some assemblages, identification had been limited to the larger mammals. However, excluding micromammals, birds, fish, reptiles and shellfish also allowed me to be reasonably certain that the assemblages included represent human hunting activity rather than that of non-human predators (although non-human predators are often implicated in sites containing lagomorphs, I excluded archaeofaunas without associated taphonomic studies from this study; see further discussions in Arriaza et al.; Cochard, 2008; Jones, 2016; Lloveras et al., 2009, 2010). In addition, collection and counting methods for smaller taxa are often different than those for larger mammals, which causes challenges for analyses considering both.

Although necessary given the constraints of the data, the focus of this study on larger mammals does restrict the conclusions that can be drawn from these analyses. Birds, fish, reptiles, shellfish, and small mammals, all of which are present in some if not all Southwestern European Upper Paleolithic faunas (e.g., Pokines, 2000; Villaverde et al., 1998), are often better signals of local environments than are ungulates and lagomorphs (e.g., Post and Stenseth, 1999). Although excluding smaller taxa makes it more likely that this dataset reflects human hunting activity – and thus, increases the likelihood that the results will reflect human decision-making – it also means these data may be less sensitive to local environmental differences, and therefore less likely to reflect finer-grained biogeographic variation.

Similarly, because several of these assemblages are drawn from different occupations of the same sites, interdependence is one potential challenge to understanding patterns in these data. While interdependence will not invalidate cluster results (see Deza and Deza, 2006; Lyman, 2008), it may present an issue in