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Approaching the demography of late prehistoric Iberia through summed calibrated date probability distributions (7000–2000 cal BC)

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ABSTRACT

We present the first summed calibrated date probability distributions for the later prehistory of the Iberian Peninsula. The SCDPD is based on 4402 determination between 8000 and 3000 BP, a time range beginning in the regional late Mesolithic and running through the Bronze Age. This period is known to see the first introduction of farming at the beginning of the Neolithic, the development of the first large population aggregations during the Copper Age and the subsequent abrupt transition to the substantially diverse Iberian Bronze Age 'cultures'. The results conform to an exponential model for demographic growth, with a slight "boom and bust" episode between 5300 and 5150 cal BC, some 300 years after the first dated evidence for agriculture in Iberia. The evidence suggest that if migrants from outside Iberia were involved in the introduction of domesticates, this must have happened at a small scale, one not observable through SCDPD. The dating of the observed population "boom" coincides with the decline in frequency of the cardial-impressed and the wide spread of "epicardial" wares throughout the Peninsula. It thus seems reasonable to suppose that these patterns indicate a moderate increase in fertility rates of early farming groups. The SCDPD analysis also suggests that explanatory models for the rise of Copper Age 'complexity' or the transition to the Bronze Age should not rely on substantial changes in overall Iberian population densities.

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1. Introduction

Summed Calibrated Date Probability Distributions (SCDPD) of radiocarbon dates (Shennan et al., 2013) have become an increasingly popular tool for estimating changes in prehistoric population size (e.g. Gamble et al., 2005; Shennan and Edinborough, 2007; Collard et al., 2010; Shennan et al., 2013). This approach makes the assumption that the quantity of radiocarbon dates can serve as a proxy for population size: more people, more garbage; more garbage, more dates.

In recent years such analyses have incorporated adjustments that correct many of the problems associated with uncritical applications of SCDPD. These problems would include factors such as the effects of the calibration curve (Michczyńska and Michczyńska, 2006), the size of the samples (Michczyńska et al., 2007), taphonomic loss (Surovell et al., 2009), and various kinds of archaeological sampling bias (e.g. William, 2012; Crombé and Robinson, 2014). Recently, the development of a multi-proxy approach using juvenility indices from prehistoric European cemeteries has reinforced the validity of SCDPD as a demographic proxy (Downey et al., 2014), although the debate is far from settled (e.g. Contreras and Meadows, 2014).

Undoubtedly, the main value of this approach is, as Shennan et al. (2013) have indicated, that it establishes a standardized measure by which regional trends may be compared. This is particularly relevant for European prehistory, during which one supposes that particular historical processes such as the so-called

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Neolithic Demographic Transition (Bocquet-Appel, 2008, 2011), the Neolithic demic expansion (Ammerman and Cavalli-Sforza, 1971), or the introduction of new technologies such as plow agriculture (Greenfield, 2010) had an impact on a continental scale.

In this article we present the first SCDPD analysis for the later prehistory of the Iberian Peninsula. This analysis is based on 4402 determinations between 8000 and 3000 BP derived from the radiocarbon date list for the Iberian Peninsula compiled by one of us (A. Gilman). Radiocarbon dates for the Peninsula began to be compiled by Almagro Gorbea in the 1970s (Almagro Gorbea and Fernández Miranda, 1978), updated to 1984 by Gilman (1992). The last list to encompass the later prehistory of the entire Peninsula is that of Castro Martínez et al. (1996). The date list from which the determinations in this analysis were drawn covers the period from 10,000 BP to 500 AD and includes over 1500 archaeological sites and 7400 radiocarbon dates. This list is currently being transformed into an interactive data base with a Spatial Data Infrastructure. Like the British Isles, the Iberian Peninsula constitutes a relatively isolated and distinctive culture area within prehistoric Europe, and as such provides a useful basis for comparison with patterns observed elsewhere in the continent. Taking the whole Peninsula as a single unit compensates for the greatly differing intensity of research in its various regions.

Our results show that, if one accepts SCDPD as a proxy for population density, between 7000 y 2000 cal BC the Iberian Peninsula conforms to an exponential model of demographic growth. One can also observe a slight “boom and bust” episode between 5300 and 5150 cal BC, following upon the introduction of plant and animal domestication. This resembles what Shennan et al. (2013) have observed in other regions of western Europe. An exposition of the facts, our methods and our results now follows.

2. Materials and methods

As of June 2014 the above-mentioned date list included 4739 determinations from 1167 archaeological sites falling between 8000 and 3000 BP. This time range begins in the late Mesolithic and runs through the Bronze Age. Thus it covers three key episodes in the later prehistoric development of Iberia: the introduction of farming at the beginning of the Neolithic (Zilhão, 2001), the development of the first large settlements during the Copper Age (the 3rd millennium BC) (Díaz-del-Río, 2011; García Sanjuán and Murillo-Barroso, 2013) and the abrupt subsequent transition to the Bronze Age (Gilman, 2001).

For the purpose of our analysis we discarded all dates with a standard deviation equal or greater than 200 years and all that were based on shell. This first filter left a total of 4402 determinations from 1116 sites, distributed in the Peninsula as indicated in Fig. 1. It is obvious that there are important regional differences in the distribution of radiocarbon dates. There are notable concentrations of dated sites in the vicinity of major cities (Lisbon, Madrid, Barcelona) and other areas of intensive research such as the southern Spanish Levant. At the same time, there are empty quarters, like Sierra Morena and large parts of the southern Meseta. Areas such as the Guadaquivir valley, in the middle range, are under-represented in relation to their soil fertility and presumed importance in such historical processes as the development of social complexity (García Sanjuán and Murillo Barroso, 2013). As a result, the conclusions we reach can only be assessed at the scale we have chosen and cannot be extrapolated to the various inter-regional densities within the Peninsula. Nevertheless, taking all of Iberia as a unit does permit comparison with the population dynamics in other regions of continental Europe, as well as the British Isles (Shennan and Edinborough, 2007; Collard et al., 2010; Shennan et al., 2013; Downey et al., 2014).

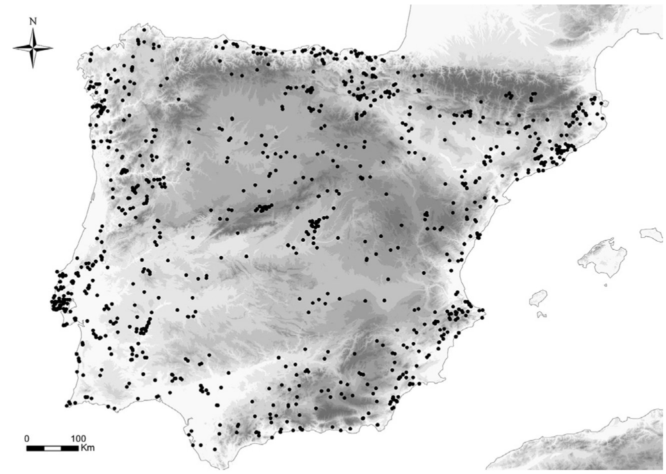

Fig. 1. Distribution of dated sites from Iberia included in the SCDPD.

With respect to the nature of the samples incorporated in the analysis, half consist of carbon and other long-life elements, 40% consist of short-life samples (seeds, bone, etc), and 10% of samples whose material is not stated (and that should be included with the former). The proportion of long- and short-life samples used in this study is practically identical to the proportions as in the 1072 samples reported from southern Iberia by Balsera et al. (2015: 141). As might be expected for a later prehistoric chronology, the vast majority of samples were obtained from open-air anthropogenic contexts. Of these, only 11 samples (0.2% the total) were gathered in contexts reported as non-anthropogenic. The mean standard deviation is ±65 years. Both the sample size and the standard deviation meet the conditions indicated by William (2012) for a robust SCDPD.

The summed probabilities of these dates are shown in Fig. 2A. In order to reduce redundancy we have combined (using the R_Combine function of OxCal that performs a chi-square test) all statistically equivalent determinations from each site. This procedure takes as its premise that all statistically equivalent dates represent a single occupational event. We believe this procedure is

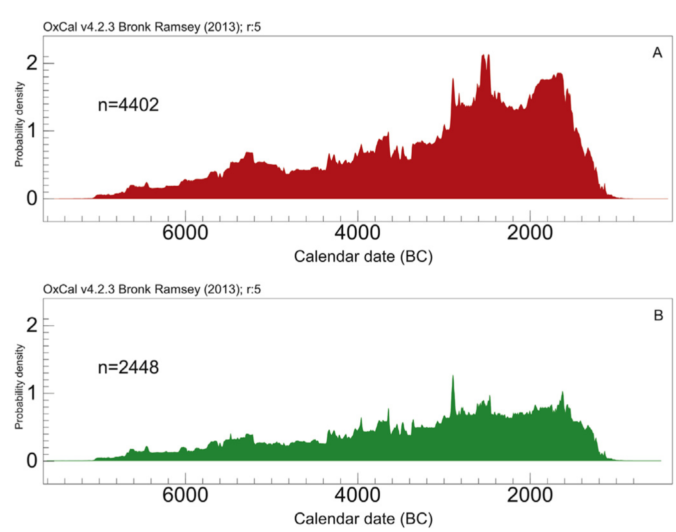

Fig. 2. A. SCDPD of Iberian radiocarbon dates. B. SCDPD after reducing redundancy through the combination of all statistically identical dates from each individual site.

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