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Taphonomic processes inconsistent with indigenous Mesolithic acculturation during the transition to the Neolithic in the Western Mediterranean

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ABSTRACT

We applied taphonomic analysis combined with geostatistical approaches to investigate the hypothesis that Cocina cave (Eastern Iberia) represents an acculturation context for the appearance of Neolithic Cardial pottery. In the 1970s, Fortea suggested that this important site was a prime example of acculturation because of the presence of early Neolithic pottery in late Mesolithic contexts. Since that time Cocina cave has been heralded as an example of indigenous hunter-gatherers incorporating Neolithic cultural elements into their lifeways. We analyzed the area excavated by Fortea in the 1970s by digitizing archaeological records and testing the spatial distribution of artifacts using geostatistical analysis and high-resolution AMS radiocarbon dating. We contextualized the findings by discussing key issues of archaeological depositions with the goal to better understand the palimpsest that usually occur in prehistoric sequences. Our analysis indicates that the mixture of Mesolithic and Neolithic materials resulted from taphonomic processes rather than acculturation.

1. Introduction

Taphonomic approaches are crucial to investigate and explain archaeological palimpsests that usually define archaeological units (Dibble, 1987), particularly sites with deeply stratified deposits. Differentiating between natural and cultural processes (N-transforms vs. C-transforms; Schiffer, 1983) is essential for reconstructing past human behavior. Several Paleolithic and Neolithic assemblages have been analyzed in this manner, focusing on the nature of the deposition as a result of natural and/or cultural factors (see Malinsky-Buller et al., 2011 for references) or examining the integrity of activity areas on living surfaces (Leakey, 1971; Dibble et al., 1997). Some cases emphasize faunal assemblages due to the ability to distinguish natural and cultural processes, such as carnivore activities or marrow extraction (Stahl, 1996). Other work highlights systematic survey to determine the degree of displacement of surface collections according to mechanical attributes described in the lithic and pottery record (Barton et al., 1999, 2004).

In this paper we focus on the stratigraphic sequence of Cocina cave (Dos Aguas, Valencia), a well-known site and major point of reference for the Neolithic transition on the Iberian Peninsula. In the 1970s Javier Fortea conducted several seasons of fieldwork in order to establish the archaeological sequence of the site (Fortea Pérez et al., 1987). He identified an archaeological unit named 'H Level' and interpreted it as an acculturation context due to the presence of Early Neolithic pottery in a Late Mesolithic lithic context, known as 'blades and trapezes Mesolithic' or 'Geometric Mesolithic' in the Iberian literature. This interpretation confirmed his previous research on material from Pericot, 1945 excavation. Accordingly, Fortea interpreted the long archaeological sequence by dividing it into several phases starting with the

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Late Mesolithic (*Geometric Mesolithic* phase A (with trapezes) and B (with triangles Cocina type) deposits in the bottom, followed by subsequent levels with pottery that Fortea considers as a consequence of an acculturation process (Fortea Pérez, 1973).

We apply a taphonomic analysis of the archaeological record recovered from Fortea's H level in order to evaluate the degree of disturbance of the sequence and, therefore, the strength of the interpretation offered 35 years ago by Fortea. To do this, we followed a multi-step procedure: 1) digitized spatial information related to individual artefacts and ecofacts recovered in Fortea's fieldwork; 2) tested the degree of disturbance in relation to the living floors based on spatial analysis; 3) generated refit information of pottery remains and analyzed bone processing patterns; and 4) placed the resulting data in a robust chronological framework.

2. Archaeological framework

2.1. Post-depositional problems in the Neolithisation process of Iberia: an overview

The spread of farming and herding practices along the Western Mediterranean is explained through demic and/or cultural models (Zvelebil, 2000; Guilaine, 2001; Cruz Berrocal, 2012; Fort, 2012; Pardo Gordó et al., 2015; Bernabeu Aubán et al., 2017; García Puchol et al., 2017b; Isern et al., 2017; Pardo-Gordó et al., 2017a; Perrin et al., 2017). This debate also exists in Iberia where most researchers consider some degree of demic expansion supported by DNA results (Olalde et al., 2015). The first domesticated plants and animals arrived in this region *circa* 7600 cal. BP associated with Impressed Ware pottery. Early Neolithic settlement shows a primary coastal dispersal pattern, while following major waterways as the Ebro river. Although a current consensus focuses on a north-eastern dispersal route (Bernabeu et al., 2009; Zilhão, 2014), some research has opened the possibility that African contact may have played a role as well (Manen et al., 2007; García Borja et al., 2014; Isern et al., 2014; Pardo Gordó, 2015).

Despite the emphasis on demic diffusion, examples of acculturation continue to be examined based primarily on radiocarbon dates that were not consistent with the general chronological framework (García Puchol et al., 2017d). Some of these are contexts where Neolithic materials (e.g., pottery or domestic animal bone) were found in Late Mesolithic levels. A few papers have emphasized the problems relating to radiocarbon dates and these archaeological contexts (Bernabeu et al., 1999, 2001). In the 1990s, Zilhão (1993) criticised particular radiocarbon dates and opened the debate of the existence of stratigraphic disturbances behind some early dates associated with Neolithic remains.

In order to identify this kind of palimpsests, Bernabeu et al. (1999) identified distinctive patterns of faunal remains based on meat processing between hunter-gatherer and farmer groups. The focus on faunal remains triggered interest in using taphonomic data to identify disturbed deposits (Bernabeu et al., 2001). Bernabeu et al. (2001) concluded that hunter-gatherer practices of processing meat resulted in specific fractures and cut marks associated with removing flesh and extracting bone marrow. In contrast, bones in Neolithic contexts did not exhibit the tell-tale signs of marrow extraction. In addition, the presence of canid marks on bones were widespread in farming contexts, again suggesting different taphonomic processes for the deposition of bones at these sites (Bernabeu et al., 2001). These examples highlight the complexities with reconstructing behavioral practices in archaeological sites occupied over long periods of time. A correspondence analysis of the data revealed 3 different groups: a) Mesolithic; b) Neolithic and c) Mixed (including Mesolithic or other pre-Neolithic levels). The majority of archaeological levels included in this last group were from sites with long sequences that encompass Neolithic and pre-Neolithic levels. Radiocarbon dating of levels from this mixed group illustrate the need to select high quality short-lived samples (e.g., seeds or animal bones, Bernabeu et al., 2001).

In the 2000s, Zilhão (2001) proposed the Maritime Pioneer colonization model based on the analysis of radiocarbon dates from domestic remains that were published at that time in a wide region spanning southern Italy to Portugal. The model indicates how the spread of farming took place very quickly and suggested a coastal route, a hypothesis that has recently been expanded and corroborated using computational modelling (Pardo Gordó, 2015; Bergin, 2016; Isern et al., 2017). At the same time Zilhão (2001) highlighted the necessity to focus on radiocarbon dates on domesticated plant and animal remains to define the spread of the Neolithic.

Debate continues regarding the role of acculturation in Iberia and is fueled by the publication of radiocarbon dates on old wood and/or whose results do not support the expected archaeological association (see Bernabeu, 2006; Rojo et al., 2006; Alday, 2011; Zilhão, 2011; García Puchol et al., 2017c). Some papers highlight the need to directly date domestic remains in order to characterize the onset of the Neolithic, while others have pointed to the difficulty of identifying domesticated remains in some animal genera (*Capra, Ovis, Bos, Sus* and *Equus*), suggesting the need to apply molecular techniques in to eliminate uncertainty (Wood, 2015).

Summarizing, emphasis should be put on the identification of criteria used to define Neolithic contexts and sampling them with high quality radiometric programs considering the: 1) identification of plant and animal remains, 2) selection of short lived samples, 3) application of ultrafiltration methods and molecular analysis if necessary (Kennett et al., 2017), 4) analysis of results according to accurate information provided by laboratories, 5) and Bayesian modelling as a chronological approach (Kennett et al., 2014).

2.2. The site of Cocina cave

Cocina cave is a well-known archaeological site located in eastern Spain (Fig. 1).

The sequence includes Holocene levels with evidence of episodic use by Mesolithic hunter-gatherers over the course of a millennium, and several discontinuous archaeological levels dated from the Early Neolithic until the Bronze Age (García Puchol et al., 2017a). The presence of Early Neolithic pottery (Impressed ware) among Geometric Mesolithic levels (Castelnovian tradition including blades and trapezes) has been interpreted previously as evidence for the acculturation of Mesolithic hunter-gatherers (Fortea Pérez, 1973).

The first archaeological investigations in the cave took place in the 1940's, when Pericot excavated a large area of 80 square meters at the entrance of the cavity (south-eastern area) over the course of 4 seasons. Results of these excavations showed the richness of the archaeological record (Pericot, 1945), although it was Javier Fortea in the 1970's who highlighted the importance of the site for the Mesolithic-Neolithic transition after analyzing the lithics from the 1945 campaign (Fortea Pérez, 1973). The study showed potential for characterizing the last hunter-gatherer cultural sequence and the processes associated with the appearance of the first Neolithic people in the region. Fortea's work focused on the hypothesis that Cocina cave represented evidence of acculturation whereby the last hunter-gatherer groups became farmers in a gradual process (Fortea Pérez, 1973). Using new excavation methodologies that included recording all archaeological remains in three-dimensional space, Fortea worked at Cocina cave for seven field seasons, from 1974 to 1981, excavating a large area in the inner part of the cave. Unfortunately, most of the information from his project remained unpublished (Fortea Pérez et al., 1987).

Our current research projects, MESO-COCINA (Har2012-33111) and EVOLPAST (Har2015-68962), constitute a renewed attempt to investigate site deposits in the context of the Neolithic Transition. One of the goals is to analyze the cultural and biotic assemblages recovered in the previous excavations with new methodological advances in archaeometry and include the spatial data in a 3D environment (Diez Castillo et al.,