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The need for a taphonomic perspective in spatial analysis: Formation processes at the Early Pleistocene site of Pirro Nord (P13), Apricena, Italy

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ABSTRACT

Ever since their percolation from neighbour disciplines, archaeology has employed spatial statistics to unravel, at different scales, past human behaviors from scatters of material culture. However, in the interpretation of the archaeological record, particular attention must be given to disturbance factors that operate in post-depositional processes. In this paper, we answer the need for a specific taphonomic perspective in spatial analysis by applying point pattern analysis of taphonomic alterations on the faunal and lithic assemblages from the Early Pleistocene site of Pirro Nord 13, Italy. The site, biochronologically dated between 1.3 and 1.6 Ma BP, provides evidence for an early hominin presence in Europe. The archaeological and paleontological deposits occur as filling of a karst structure that is currently exposed. We investigated the distribution of the archaeological and paleontological assemblages, as well as the distribution of identified taphonomic features, in order to evaluate the degree and reliability of the spatial association of the lithic artifacts with the faunal remains. Our results contribute to the interpretation of the diagenetic history of Pirro Nord 13 and support the stratigraphic integrity of the site.

1. Introduction

Studies of site formation processes and spatial analyses have long recognized the role of post-depositional factors in affecting the integrity of archaeological assemblages (Hodder and Orton, 1976; Petraglia and Nash, 1987; Schick, 1984; Schick, 1986; Schiffer, 1972, 1983, 1987; Wood and Johnson, 1978). More recently, a number of scholars have stressed the importance of establishing the degree of disturbance to archaeological deposits to fully comprehend the archaeological record (Dibble et al., 1997; Djindjian, 1999; Texier, 2000).

Besides geoarchaeological techniques, several archaeological and paleontological methods are widely applied to characterize the processes involved in the formation of an archaeological site and to assess any post-depositional 'background noise'. Taphonomy moves from its original definition (Efremov, 1940) to a wider conceptual framework, targeting vertebrate assemblages, as well as taphonomic entities produced by human behaviour (Domínguez-Rodrigo et al., 2011). Moreover and often in joint effort, from different spatial perspectives, fabric analysis (Benito-Calvo and de la Torre, 2011; Bernatchez, 2010; Bertran et al., 1997; Bertran and Texier, 1995; Domínguez-Rodrigo et al., 2014c; Lenoble and Bertran, 2004; McPherron, 2005; de la Torre and Benito-Calvo, 2013); refitting analysis (López-Ortega et al., 2011; Sisk and Shea, 2008; Villa, 1982); vertical (Anderson and Burke, 2008) and size distribution analysis (Bertran et al., 2006; Bertran et al., 2012; Petraglia and Potts, 1994) offer meaningful contributions in the unraveling of site formation and modification processes.

The importance of spatial statistics in the interpretation of archaeological sites has long been recognized (Hodder and Orton, 1976; Whallon, 1974). However, studies of spatial patterning mostly focus on the behaviour of past populations, assuming that scatters of material culture (if not disturbed) are reflections of prehistoric activities. Moreover, distribution maps still rely mainly on visual examinations and subjective interpretations (Bevan et al., 2013). On the other hand, quantitative methods, adopted from neighbor disciplines since the early 1970s (see Hodder and Orton, 1976; Orton, 1982; and references therein), continue to promote new impulses to archaeological spatial analyses and allow for the characterization of spatial patterns by adopting a more formal, inductive approach. Recent studies (Bevan and Conolly, 2006, 2009, 2013; Bevan et al., 2013; Bevan and Wilson, 2013; Crema, 2015; Crema et al., 2010; Crema and Bianchi, 2013; Eve and Crema, 2014; Orton, 2004), even acknowledging post-depositional effects or research biases, have continued to adopt at different scales (from intra-site to regional scales) improvements in spatial statistics to unravel past human behaviors from scatters of material culture. Yet, only a relatively limited number of scholars have applied spatial statistics to site formation and modification processes analysis (Carrer, 2015; Domínguez-Rodrigo et al., 2014b; Domínguez-Rodrigo et al., 2014a).

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In this paper, we adopt a taphonomic perspective to spatial point pattern analysis of the lithic and faunal assemblages from the Early Pleistocene site of Pirro Nord 13, Italy (Arzarello et al., 2007, 2009, 2012; Arzarello and Peretto, 2010).

The site (P13) provides important contributions to the ongoing debate about the first hominin occurrence in Europe (Carbonell et al., 2008; Crochet et al., 2009; Despriée et al., 2006, 2009, 2010; Lumley et al., 1988; Parés et al., 2006; Toro-Moyano et al., 2011, 2009, 2013). A 'Mode 1' lithic assemblage has been identified in stratigraphic association with late Villafranchian/early Biharian paleontological remains. Furthermore, the presence of the Arvicolinae species *Allophaiomys ruffoi* correlated to the *Mymomis savini-Mymomis pusillus* biozone, allows for a biochronologically refined age between 1.3 and 1.6 Ma, making P13 one of the most ancient localities with human evidence currently known in Western Europe (Lopez-García et al., 2015).

The paleontological and archaeological remains are preserved inside a complex karst system, exposed and partially destroyed by mining activities of a Mesozoic limestone quarry. The fissure P13 is a vertical fracture located at the stratigraphic boundary between the Mesozoic limestone and the Pleistocene calcarenite formation. The deposit of the fissure is, at the time of writing, more than 4 m thick. Four Sedimentary Units (SUs) have been distinguished on lithological basis. From the top to the bottom of the section, units A to D are characterized by sediments of clayey-sand of increasing thickness (Fig. 1). Unit A includes few coarse gravels and a very low number of paleontological and archaeological remains. Unit B contains more gravels, while an abrupt increase in the number and dimension of clasts and large blocks of Pleistocene calcarenite is evident within units C and D. These last units show poor size sorting of angular and sub-rounded gravels, probably correlating to a low degree of reworking that took place during a short interval of time. We also record a significant increase in the number of fossils and artifacts.

As a residual component of a wider karst system, it is worthwhile to assess the degree of any potential post-depositional reworking of the archaeological and paleontological remains and to evaluate the stratigraphic integrity of the site.

The main goal of our study is to use a taphonomic perspective in spatial data analysis, in order to evaluate degree and reliability of the spatial association of the lithic artifacts with the faunal remains that were used for the biochronological dating of the site.

By applying point pattern analysis of the spatial distribution of the lithic and faunal assemblages, we aim to

1. investigate the processes involved in the formation of the Pirro Nord (P13) deposit.

A positive spatial association of the two types of find would support the assumption, base on field observations, that the deposition of the archaeological and paleontological materials occurred simultaneously, as a result of subsequent mass wasting events.

With the application of point pattern analysis to identified taphonomic features on the lithic and faunal assemblages, our ultimate objective is to

2. evaluate the degree of post-depositional disturbance of the site.

Indeed, reworking and re-deposition processes could put in stratigraphic contact materials from diverse provenience. The identification

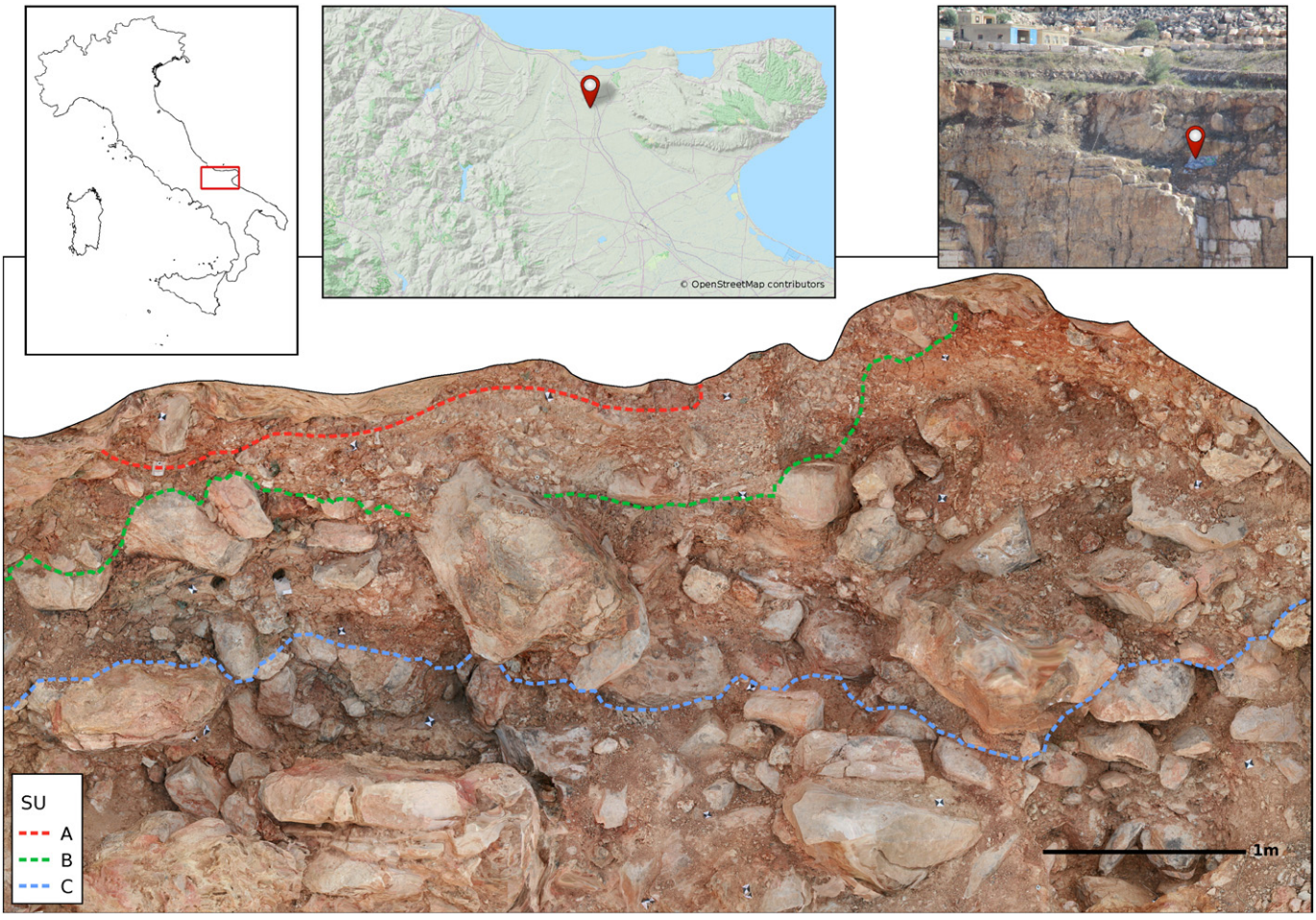

Fig. 1. Geographical location of the Pirro Nord site. Picture of the fissure P13 inside the Cave Dell'Erba quarry and view of the excavated area (2013), with marked bases of the sedimentary units.