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The method of debitage by bipartition in the exploitation of bone: An overview of its application in Neolithic groups of Sardinia

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ABSTRACT

This paper investigates some techniques and procedures applied by Neolithic groups of Sardinia for the exploitation of osseous materials. The identification of several rods and final objects in the rich collections of two sites, Su Coddu (Canelles, Cagliari) and Cuccuru s'Arriu (Cabras, Oristano), has enabled the individuation of the products potentially obtained by the method of production of blanks by bipartition. The morphological and technical characteristics of these objects suggest they were obtained by the application of a technique of breaking by indirect percussion in a splitting procedure. In order to verify this hypothesis, and to distinguish and characterize the marks on the archaeological remains better, we realized a programme of experimental reconstruction on bones of the type mainly exploited during the Late Neolithic era and the Early Copper Age in Sardinia: sheep and goat metapodials. From our replicative experiments and subsequent research in the faunal assemblages of Su Coddu and Cuccuru s'Arriu, we identified several remains associated with the production of blanks by the bipartition method. Finally, a discussion about the diffusion of this blank production method in Neolithic Sardinia is proposed in order to define its role in the exploitation of osseous materials.

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1. Background and research questions

In the western Europe, studies on hard animal material industries began forty years ago (Averbouh, 2000; Averbouh and Choyke, 2012; Goutas and Tejero, 2016). These studies initially concerned the morphological and dimensional description of the tools and the ornaments manufactured and a classification of finished objects from a typological point of view (e.g. Barandiarán, 1967; Hahn, 1977; Taborin, 1974, 1977; Bonnichsen, 1979; Stordeur, 1974, 1978; Cabrera Valdes and Bernaldo de Quiros, 1978). At the same time in France, thanks to the initiative to H. Camps Fabrer, the thematic meetings of « Commission de nomenclature de l'industrie de l'os préhistorique » were organized in order to develop the analysis and the reconstruction of techniques, the identification and the classification of finished objects and the definition of their chronological value in archaeological contexts (Camps-Fabrer, 1974, 1977a, 1977b, 1984; Camps-Fabrer and D'Anna, 1977; Stordeur and

Camps-Fabrer, 1979). During the last two decades of the past century, after the development of the application of technological approach to lithic industries (particularly in France, with Tixier, 1978; Tixier et al., 1980), timidly began the first studies in hard animal material industries that applied a technological approach (Billamboz, 1977; Stordeur, 1979; Julien, 1982), with the identification and technical characterisation of different products (finished objects, roughouts, blanks and wastes) in order to reconstruct the sequences of transformation. However, only in a second time, after the increase of studies between the '80s and the beginning of this millennium, we attend to a methodological reflection on the application of technological analysis to the study of the hard animal material industries. In particular, the definition of technical terms and the acquisition of more efficiently practical application of analytical procedures enable developing the researches about the reconstruction of the transformation schemes and their characterization through the identification of methods, procedures and techniques in the prehistoric groups and their role in the socio-economic activities of ancient groups (particularly in France: Averbouh and Provenzano 1999; Averbouh, 2000, 2001; for a larger panorama of references see: Gates St-Pierre and Walker, 2007). Our knowledge in osseous industry production during the Neolithic and

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Chalcolithic period is nowadays quite extensive thanks to the exponential increase of typological and technological studies (e.g. Rodanés, 1987; Sidéra, 1991, 1994, 2004; Sénépart, 1992, 1995; Pascual Benito, 1993, 1994, 1998; Estrada and Nadal, 1999; Choi, 1999; Giomi, 1999; Fiore et al., 2006, 2012; Malerba et al., 2006a, 2006b; Maicas Ramos, 2007; Legrand and Sidéra, 2007; Alustiza, 2008; Gàl, 2010; Fiore and Tagliacozzo, 2011; Petrullo, 2016; Cuenca-Solana et al., in press; Gutiérrez-Zugasti et al., 2016). In addition, international research groups, like The WBRG - (Worked Bone Research Group) working group of the ICAZ (International Council for Archaeozoology) - and the GDRE PREHISTOS -CNRS European Research Group on the 'Exploitation of osseous materials in Europe', contribute exponentially to development of research, encouraging the comparison between researchers and promoting joint research themes (Averbouh and Choyke, 2012; Averbouh et al., 2016b).

If these advances in research have allowed gradually to increase our knowledge on hard animal material industries and to highlight their importance in the characterization of the ancient groups, the application of technological analysis, though often used, is far from being systematically applied. In Sardinia, the osseous industry is still an underexplored topic. The importance of hard animal material industries in prehistoric Sardinia is attested by their presence in various archaeological backgrounds (sepulchral, housing and cultural) and their involvement in several practices (transformation and acquisition of different materials, symbolic range and social identity). The diffusion in all the prehistoric phases, from the Early Neolithic to the Late Copper Age, attests the exploitation of these materials for the production of tools and ornamental objects (Atzeni, 1957, 1962, 1986, 1998; Ferrarese Ceruti, 1975, 1989, 1997; Tanda, 1976; Cornaggia-Castiglioni and Calegari, 1978; Loria and Trump, 1978; Trump, 1982, 1983; Lilliu, 1985, 1995; Lo Schiavo, 1986, 1988; Basoli, 1989; Manunza, 1996a, 1996b, 1998, 2001a, 2001b; Ragucci and Usai, 1994–1998; Pau, 2004; Manca, 2010). Nonetheless, in the publications of the past and more recent excavations, detailed characterization of these finds is sporadic; only the finished objects are described and they are rarely analysed from a morphological and typological point of view. Technological and functional analysis has only recently started, following extensive bibliographical research undertaken with the aim of normalizing all the data available in the scientific literature (Manca, 2006, 2007). Recently, the technological study of several industries from the Middle Neolithic to Bell Beaker culture in Sardinia has contributed to characterizing more precisely the toolkit used in different phases of prehistory and the techno-economical aspects involved in this production (modalities of acquisition, transformation and use) (Manca, 2011, 2012, 2013, 2014).

In the panorama of the most recent studies of the hard animal material industries in Sardinia, the series of the neo-Eneolithic sites of Su Coddu (Selargius, Cagliari) and Cuccuru S'Arriu (Cabras, Oristano), presented here, are relevant. Firstly, because the series are composed of a large number of pieces. Secondly, because the pieces are relatively well preserved, that gives more possibilities to better characterize the hard animal material industry. Not surprisingly, these series enable to define the tendencies in the modalities of transformation of the hard animal material industries.

In a first time, the technological approach and the presentation of archaeological sites from which the corpus has founded will be presented here, including a brief excursus of débitage methods attested. In a second time, this article aims to present the elements now available to identify more precisely the products obtained through the method of débitage by bipartition in order to aid in their identification.

2. The technological approach: from techniques to reconstruction of operational sequence

The identification, characterization and interpretation of the technical marks allow us to determine the techniques used for the transformation of the blocks of raw material in the process of transformation. The determination of the chronological relations between different marks identified on the surfaces of products is also fundamental to reorganize information and to be able to understand what intentions guided the transformation. In other words, the objective is to establish a link between one or several technical actions and the aims of transformation. In this perspective, one or several techniques related to one technical intention allow us to characterize a procedure, which composes the actions of the technical chain of transformation (débitage, façonnage and finishing) (Averbouh, 2000, p. 56), to a greater degree of conception 'ensemble raisonné d'opérations successivement menées selon des procédés définis' (Tixier et al., 1980 in Averbouh, 2000, p. 56). Whether processes or methods, they can be defined as 'débitage', 'shaping' or 'finishing', according to their relevance to the different operations of the technical processing chain.

The operational sequence of transformation refers to the set of technical gestures ordained, organically connected by a technical intent (Pelegrin et al., 1988; Pigeot, 1991, p. 43; Averbouh, 2000, p. 57). It allows us to have a vision of the gestures that brought the finished objects to realization, starting from the first phase of transformation of a block of raw material. In order to reconstruct the technical modalities implemented to achieve a finished object, it is not sufficient to identify the technical marks, procedures and methods of transformation. It is necessary also to achieve a dynamic reading of the operations, by the method of refitting by default (Averbouh, 2000, p. 24; 2001; Averbouh et al., 2016a), then by the reconstitution of the acts that make up the operational sequence of transformation and finally of the various operational sequences of transformation (depending on the number of blocks of raw material processed) in the operating scheme (Pigeot, 1991; Averbouh, 2000, p. 57; for translation of several terms into French, Italian and Spanish, see Averbouh, 2010).

From a practical point of view, these methodological principles allow a reading of material production at two levels. The first concerns technical observation, i.e., the evaluation of each product of the transformation in order to identify its place in the operational sequence. The second consists in the interpretation of the existing connection between the products that compose the sequence, even if it is not complete (Inizan et al., 1995, p. 16). This last phase of analytic process is possible through refitting (physical or mental), which is a methodological principle to reposition the different elements of a block achieving important technical and economic results (Tixier et al., 1980; Inizan et al., 1995; Averbouh, 2000, p. 24; 2001; Averbouh et al., 2016a).

For this reason, the individuation of processed products and the understanding of the relationships that form complementary sets are essential to reconstitute the operational sequence. However, the identification of certain products (wastes, blanks and rough-outs) is still difficult because, if the comparative data are rich in examples, the application of this method of analysis is often limited to finished objects, particularly with regard to the bone industry. Indeed, it is very rare to recognize all the elements of an operational sequence because this result is only possible in the case of an optimal state of conservation of the pieces. Taphonomical action of biological, chemical, edaphic and physical agents causes the loss of certain components and the deterioration of some parts, which necessarily restricts the technical reading and, therefore, the potential of the study. The modalities of selection of finds for technological study may be another factor which contributes to limiting

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