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Spatulas and abraded astragalus: Two types of tools used to process ceramics? Examples from the Romanian prehistory

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ABSTRACT

In most of the Neolithic and Chalcolitic assemblages, north of the Danube, constantly appear two types of artifacts: spatulas made on longitudinal bipartitioned rib and abraded astragalus. Some specialists considered them tools used in different stages during the *chaîne opératoire* of ceramics production. Starting from this functional hypothesis, we developed an experimental program in order to establish its reality. Thus, the first task included the processing of tools, using both the types of raw materials (rib of *Bos taurus* and astragalus of *Ovis aries/Capra hircus*), and the technical transformation sequences identified in the case of archaeological artifacts. After the tools were processed, the spatulas were used in the action of modeling the ceramics' form, in order to eliminate the excess of raw material and to homogenize the surface. The astragalus, abraded prior to their utilization, were used for ceramic finishing, in order to mechanically polish the surface. In a third stage, the wear traces, developed on experimental samples, were compared with those present on archaeological pieces, illustrating a high degree of similarity. Our experimental program demonstrated the importance of experimental archaeology in the reconstruction the collective *savoir-faire* of Prehistoric communities.

1. Introduction

In Romanian archaeology, the pieces of hard animal materials for a long period of time, produced limited interest. Most studies mentioned in a single phrase their presence or, in the best of cases, there was an enumeration of the main typological categories, without functional or technological considerations. This is not unexpected, considering the preeminence of ceramics in Neolithic studies.

The very few excavation reports (e.g., Dumitrescu, 1924, 1965, 1966) or older studies (e.g., Comşa, 1985, 1986; Bolomey and Marinescu-Bîlcu, 1988, 2000; Andreescu, 1995, 1997, 2002; Andreescu and Popa, 1999–2000), concerned particularly with the animal hard material industry, aimed only at morphologic deciphering or the identification of similarities, with the purpose of classifying them in different typological categories. Traditional archaeology developed around identification and classification. Entire series of pieces, having the morphology of the active part as a common element, were integrated in an unique functional category, with no description of the wear traces, which would have allowed a more exact interpretation and a matching according to the real manner in which they were used. Moreover, publication of drawings which, by their nature, have a high degree of subjectivity, does not allow a reevaluation of those pieces.

In the last decade, an increased interest for this field has been manifested. Research tends to be oriented towards the reconstruction of the succession of the technical transformation sequences which allow the reestablishing of the "lost context" of these pieces. For the Neolithic on the Romanian territory, studies based on systematic technical-typological analysis include those coordinated by C. Beldiman and D.-M. Sztancs (e.g., Beldiman, 2007; Beldiman and Sztancs, 2009, 2013; Sztancs et al., 2010, 2013), especially for early Neolithic, or our own studies (e.g., Mărgărit et al., 2009, 2014a, 2014b; Mărgărit and Popovici, 2011, 2012; Mărgărit and Radu, 2014; Mărgărit, 2014a), especially on the archaeological assemblages of the Gumelniţa culture. Moreover, starting from the microscopic observations of the original objects, compared with the experimental results, specialists have tried to establish data bases for the different microscopic traces (e.g. Sztancs et al., 2013; Vornicu, 2013; Mărgărit, 2014b).

The experimental reference bases necessary for the understanding of Neolithic and Chalcolithic osseous industries north of the Danube are still few, despite the extraordinary potential, and there remains much work in order to reach the level attained especially by the French school (e.g., Sidéra, 1993; Christidou, 1999;

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Maigrot, 2003; Le Dosseur, 2006; Legrand, 2007; Manca, 2013). To begin to fill this gap, we have designed an experimental program (see http://www.eneolithicbonetools.ro/results/experimental-archaeology), extended during several years, to identify the transformation schemes and the usage modalities of the different artifacts, identified at the Neolithic and Chalcolithic communities.

2. Materials and methods

In most of the Neolithic and Chalcolithic assemblages north of the Danube, two types of artifacts constantly appear: spatulas made on longitudinal bipartitioned ribs and abraded astragalus. In the first case, the selected species was *Bos taurus* and in the second, *Ovis aries/Capra hircus*. Some Romanian specialists considered them tools used in different stages during the *chaîne opératoire* of ceramics production, with no interrogation regarding the wear traces identified at these pieces. Starting from this functional hypothesis, we developed an experimental program in order to establish its reality. Thus, the first task included the processing of tools, respecting both the types of raw materials and the technical transformation sequences identified in the archaeological artifacts. Thus, after the tools were processed, the spatulas were used in the action of modeling the ceramics' form, in order to eliminate the excess of raw material and to homogenize the surface. The astragalus, abraded prior to their utilization, were used for ceramic finishing, in order to mechanically polish the surface. In a third stage, the wear traces, developed on experimental samples, were compared with those present on archaeological pieces. The experimental and archaeological objects were examined with a stereoscopic microscope (Olympus SZ61, 20–90× magnification) and a digital microscope (VHX-600; 30–150× magnification), and pictures were focused with the aid of a camera incorporated within the digital microscope. Analytical criteria for the technological and functional interpretation of micro-stigmata were established based on comparison with recent publications on the osseous industries in Prehistory (e.g. Maigrot, 2003; Sidéra and Legrand, 2006; Legrand, 2007; Legrand and Sidéra, 2007; Gijn van, 2007; Gates St-Pierre, 2010; Buc, 2011).

2.1. Spatulas

In the north Danubian space, the Romanian literature (Boroneanţ, 2000; Păunescu, 2000), and direct study on some Mesolithic archaeological collections (Mărgărit, 2005, 2008), have not underlined the use of ribs as blanks for tool processing. The Mesolithic communities used the long bones diaphysis, derived from medium and large sized mammals, transformed as points and, more rarely, in bevelled-tools. The spatulas appear at the beginning of the Neolithic, for example, at Starčevo-Criş level (c. 6200–5300 BC) from Măgura "Buduiasca" ("Boldul lui Moş Ivănuş") and afterwards at the Dudeşti horizon (middle Neolithic – c.5500–5000 BC), in the same settlement. For the Starčevo-Criş culture, in the Romanian territory, 20 spatulas were processed on longitudinal bipartitioned ribs (Beldiman and Sztancs, 2013). Subsequently, they are present in all the Prehistoric cultures, from early Chalcolithic (5000–4500 BC) (e. g. Măgura "Buduiasca" – Vădastra culture; Radovanu – Boian culture), until late Chalcolithic (4600/4500–3800/3700 BC) (Hârşova-tell, Borduşani-Popină, Vităneşti, Sultana-Malu Roşu, Măriuţa-tell (Mărgărit et al., 2014b), Cuneşti (Mărgărit et al., 2013); Baia– Gumelniţa culture (Mihail and Ştefan, 2014); Suceveni-Stoborăni – cultural aspect Stoicani Aldeni (Beldiman et al., 2012)). Archaeological publications allowed us to identify the spatulas processed on the bipartitioned ribs and on other sites from the Balkan area: Starčevo-Grad (Starčevo culture) (Vitezović, 2013a), Grivac (Starčevo-Criş and Vinča cultures) (Vitezović, 2013b), Drenovac (Vinča culture) (Vitezović, 2011), and Vitkovo (Vinča culture) (Vitezović and Bulatović, 2013). Pieces of this type appear also in Hungary, in levels belonging to the cultural ensemble Starčevo-Criş-Körös, as in the case of the settlement from Ecsegfalva 23 (Choyke, 2007; Toth, 2012) or in the Chalcolithic, at Győr-Szabadrét-domb (Choyke, 2014).

The spatulas have an approximately rectangular morphology, with parallel rectilineal edges, slightly curved profile and an active extremity with a convex (Fig. 1, 1) or pointed morphology (Fig. 1, 2). The flat blank, a semi-rib, was obtained by three different methods of bipartition: direct percussion, abrasion on a stone, and scraping. These techniques were applied until spongy tissue was reached. Then, by indirect percussion, the two semi-ribs were partitioned. The active front was shaped by abrasion, applied from the inferior side for the convex spatulas, and combined with bilateral sawing with the abrasion for finishing pointed spatulas.

In their extended and fine usage polish (fine chips or depressions are lacking), spatulas seem to correspond to a functionality characterized by a prolonged movement on soft materials, such as skins (Averbouh and Buisson, 2003; Raskova Zelinkova, 2010) or clay pot processing (Struckmeyer, 2011). It was suggested that their manufacture out of longitudinally cut ribs had the purpose of assuring the flexibility of the equipment (Tartar, 2009).

2.2. Abraded astragalus

This type of artifact raised a higher interest than the spatulas, benefiting from numerous studies, so we were able to follow its presence through Prehistory, with the functional hypotheses proposed. For the period prior to the early Neolithic, no astragalus processed by abrasion have been identified in the north Danube area. The first pieces are confirmed at the level of Starčevo-Criş culture, as in the case of the settlement from Măgura "Buduiasca" ("Boldul lui Moş Ivănuş") (Mărgărit et al., 2014c). They are also present in the middle Neolithic (Dudeşti culture) at Măgura "Buduiasca", and in the early Chalcolithic, in the settlement from Radovanu (Boian culture) (Mărgărit et al., 2014a), and the settlement from Cheia (Hamangia culture) (Voinea and Neagu, 2009). They were also identified in the Precucuteni culture, at Ghigoeşti-Trudeşti (Marinescu-Bîlcu, 1974), Isaiia (Ursulescu et al., 2004), Târpeşti (Marinescu-Bîlcu, 1974) and Târgu Frumos (Vornicu, 2014). These pieces are present in the middle Chalcolithic, especially for the Gumelniţa culture, at Hârşova-tell, Borduşani-Popină, Vităneşti, Măriuţa-tell (Mărgărit et al., 2014b), Cuneşti (Mărgărit et al., 2013), Gumelniţa (Dumitrescu, 1966), Înşurăţei-Popină I (Pandrea et al., 2002), Năvodari-Insula la Ostrov (Marinescu-Bîlcu et al., 2001, 2003), and Iepureşti (Kogălniceanu et al., 2014). An abraded astragalus deposit was discovered in a burned dwelling from the Cucuteni settlement of Poduri-Dealul Ghindaru (Bejenaru et al., 2010). In other sites from the Balkan area, abraded astragalus are present at Drenovac (Vitezović, 2011), Divostin (Vitezović, 2013c), and Pavlovac-Kovačke Njive (Vinča culture) (Vitezović, 2015).

From the technological point of view, abrasion of the one, two or four sides took place which helped diminish the protuberances specific for this type of bone, which finally gave the pieces an approximately rectangular morphology (Fig. 2, 1). In a few cases, a perforation was made at the level of the depression present on the dorsal side, through rotation (Fig. 2, 2). Morphometrically, the dimensions are standardized, being determined both by the choosing of a single species, and by a similar processing technique. The technological analysis started from several suppositions concerning the technical transformation sequence of these pieces. These suppositions were later assessed by the microscopic study. The rectilinear aspect of the edges might have been created through previous processing (for example, cutting by sawing), but no

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