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A technomorphological and functional study of Late Pleistocene and Middle Holocene lithic assemblages from Patagonia Argentina

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ABSTRACT

In this paper, we analyze the lithic assemblages from three sites from the Central Plateau of Santa Cruz in the Argentine Patagonia. Functional analysis was combined with a techno-morphological and distributional approach, the investigation on raw materials and the study of the technological strategies of production and consumption. The significance of combining functional analysis with other research methods involving lithic remains is emphasized. By articulating different methodologies, it is possible to understand the systems of technological organization.

Two sites refer to Final Pleistocene occupations (Cerro Tres Tetas 1 and Casa del Minero 1). The integration of approaches showed the diversity of strategies developed in the production and use of tools, as well as the existence of activity areas within the sites. The third site is a Middle Holocene context (Cueva 13 of Los Toldos). The combination of perspectives allowed a redefinition of the toolkit structure and showed that blade production was part of a standardized technological system.

1. Introduction

During the middle of the 20th century, technological studies became important as a means of reconstructing tool production processes and function. Observation methods were developed, making it possible to recognize how tools were used (Semenov, 1964). During the last decades, functional analysis has expanded. It is now applied within the study of the technological organization of societies (Roebroeks et al., 1997; van Gijn, 2003; Banks, 2004).

Functional analysis helps researchers to understand different types of socio-economical organizations and the historical context in which they develop. In order to answer these issues, it should be carried out in conjunction with other avenues of research. It is necessary to articulate functional analysis with the technomorphological study of the assemblages, the investigation regarding the properties and availability of the raw materials, spatial organization and the study of the technological strategies of production and use (Odell, 1981; Geneste, 1991; Álvarez, 2003; Briz, 2010). Through combining these different methods, substantial interpretations about past societies can be generated.

In this context, the goal of this article is to analyze Late Pleistocene and Middle Holocene stone assemblages from the Central Plateau of Santa Cruz, Argentine Patagonia, in order to discuss the strategies of production and consumption of the societies. Microscopic based functional analysis was combined with other methodological avenues and inserted into larger contextual investigations related to the technological organization of human groups.

2. A contextual view of functional analysis

In this paper functional analysis is integrated to the study of technological organization. From this perspective, it is believed that economic, social, and environmental factors affect the strategies which guide the technological component of human behavior (Bamforth, 1991; Nelson, 1991; Dobres and Hoffman, 1994; Terradas, 2001).

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The investigations conducted by the authors evaluate the processes of production and consumption of lithic artifacts in specific spatiotemporal contexts. The goal is to reconstruct technological strategies and to interpret why the organization of lithic production takes particular characteristics in different contexts.

Every archaeological artifact is the materialization of social relations of production and consumption, which are the forces that shape a society (Briz, 2006–2007). Every tool is the final product of a manufacturing process as well as an implement which will be used in another process. Tools can be regarded as having two hemispheres: one is defined by *how it was made*, the other one by *what it was made for*.

The *how* hemisphere includes the raw material, the way it was acquired, the ideas about how the object should be made and the techniques and gestures that enable the idea to become material (Nami, 1986; Pelegrin et al., 1988; Geneste, 1991; Andrefsky, 2005). At the same time, these factors are affected by the practical needs, stylistic traditions, skills and knowledge of the societies (Ingold, 1997; Álvarez, 2003).

Lithics retain evidence of the succession of gestures carried out prior to their own detachment. Hence, it becomes possible to reconstruct knapping processes, techniques, and the aims of the actors (Tixier et al., 1980; Apel, 2008; Álvarez et al., 2008). Technomorphological analyses should be oriented towards the detection of possible relationships between a set of features – understood as products of human work – in order to identify which morphological traits are relevant for each stage of production and for the use of a given tool (Boëda et al., 1990; Briz, 2006–2007).

The *what for* hemisphere implies the utilitarian or symbolic use of an object and the type of functions it had. Since each tool is manufactured for certain purposes, its design must fulfill minimum requirements to carry out that activity. For instance, the macroscopic characteristics of the artifacts (size, shape, presence of backed dorsal faces or stems) and edges (angle, length and shape) should be analyzed in order to understand the variability in the relationship between shape and function of the tools. These features, together with microscopic observations, can show if a certain kind of artifact/edge was used on a regular basis for a specific function. At the same time, relationships can be established, between the size of the tool, the fragility of the raw material and the processing of materials with specific characteristics (size, hardness). Besides, it is possible to identify if there are functional relationships between certain parts of the tools (stems, notches, flutes, necks) and specific use-wear traces. This helps to know if the tool was hafted (Odell, 1981; Finlayson and Mithen, 1997; Rots, 2010) or how the tool was hold while it was used. Therefore, this approach enables the reorientation of the research focus towards different scales of analysis (the edge, the tool, the assemblage) and to identify significant relationships at different levels which respond to technological factors (Briz, 2004).

Both the traces of the manufacture and use of an artifact can be regarded as the material traces of socially organized work. Work is developed in different places across the territory of a given society. The use of diverse spaces, both in the intrasite and regional scales, can differ due to several reasons such as the uneven distribution of resources or the way production tasks are socially organized. In this sense, there is a hierarchy of spaces for each society. As manufacture and use of tools are inevitably tied, it is possible to state that spatial analyses can link both hemispheres, by tracing the life of the artifacts, from the acquisition of the raw material until their discard and deposition. In other words, they help to understand how work is structured within a society. Therefore, in order to understand the issues linked to the organization of lithic technology, it is necessary to analyze the artifacts in a contextual perspective using a distributional approach (Cahen et al., 1979; Boëda et al., 1990; Leesch, 1997; van Gijn, 2003).

3. Methodological framework

This methodology demands the articulation of the analytical procedures. An integrative classification of the assemblages is made, taking into consideration morphological, technical and functional features. In the first stage, a typological classification and the techno-morphological description of all the cores, debitage and formal (retouched) tools of the assemblages are performed. Criteria specifically developed for Patagonia are employed (Cardich and Flegenheimer, 1978; Aschero, 1983), complemented by international bibliography (Tixier et al., 1980; Andrefsky, 2005, among others). Afterwards, the analysis of the technomorphological variability of the assemblage is performed through two different approaches. First, the variability of each kind of attribute (i.e. platforms) within the assemblage is evaluated. Second, the technomorphological characteristics of the remains produced during each manufacture stage (i.e. decortication) are analyzed. This approach enables the identification of differences and similarities in tool production strategies (Boëda et al., 1990; Geneste, 1991; Frank, 2011; Cueto and Castro, 2012).

This characterization is designed for the development of an observation strategy which is oriented towards the subsequent functional analysis. The applied methodology is based in Semenov's traceological method (1964) which is the one most commonly employed for the identification of the uses given to lithic tools (Hayden, 1979; Keeley, 1980; Anderson-Gerfaud, 1981; Vaughan, 1981; Mansur-Franchomme, 1983; Plisson, 1985; van Gijn, 2003). Initially, experiments are performed, based on hypotheses formulated regarding the use of tools. Models built with ethnographic and ethnoarchaeological data are taken into account, as they show the dynamics of social conducts in analog situations (Vila, 2006). This experience is then extrapolated during the functional analysis of the archaeological assemblages. From each lithic assemblage, functional analysis is performed on a sample of formal tools and flakes. A stratified sampling is developed, which takes into consideration their size (length and/or width should be greater to 20 mm), the kind of raw material, the horizontal distribution of the pieces within the site and, in flakes, the presence of at least one *potentially functional edge* (sensu Paunero and Castro, 2001). Potentially used flakes without retouch refer to debitage with an adequate size for holding (length or width should be greater than 20 mm), and have edges which are at least 20 mm long. These edges should be straight or convex and have an angle of less than 70°. Prior to functional analysis, it is hypothesized that these potentially used flakes were used to cut. However, the identification of the actual tasks that were performed with these tools is made once the microscopic functional analysis is complete. The results from functional analyses are then interpreted together with the technomorphological characteristics of the artifacts and enable, in some cases, the redefinition of the tool categories used in the studies (Castro, 1994; Briz, 2006–2007).

Studies regarding raw material distribution are also implemented. The formations in which potential lithic sources could be located are identified on geological maps. Afterwards, field surveys are performed in order to locate these sources. Comparisons are made between the raw materials from the sources and those found at the archaeological sites, according to their lithology and quality. The analysis of petrographic thin sections from archaeological remains and raw material from potential sources was performed by various researchers for the study area (Cattáneo, 2002; Hermo, 2008a; Skarbun and Páez, 2012). These studies have been useful for a better identification of the types of rocks. However, the authors

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