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Let the cutmarks speak! Experimental butchery to reconstruct carcass processing

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ABSTRACT

This paper presents data on cutmarks obtained through experimental butchery performed within a collective project called “des Traces & des Hommes”. Eighteen half-carcasses of red deer (*Cervus elaphus*) were processed using replicas of Middle Palaeolithic stone tools. The butchery complied with a strict protocol to allow the activity that produced each cutmark to be identified with confidence. The gestures of the butcher and every instance of contact between the tools and bones were also recorded. Each bone has been analyzed using a magnifying lens, and the cutmarks have been recorded on graphic templates of the bones. Comparison of our experimental data with the other available reference sets highlights several differences and important issues potentially leading to misinterpretation of butchering activities in archaeological contexts. In order to improve our ability to document butchering patterns, we introduce an updated, more complete and more detailed version of the cutmark coding system created by Binford (1981) and later supplemented by Nilssen (2000). The experiments conducted also allowed us to expand our understanding of some poorly documented activities, such as tendon-extraction and skinning.

1. Introduction

Many variables, governed by natural and/or cultural contingencies, can affect the butchering activities performed by a human group (e.g., Binford, 1981; Lyman 1987). For example, the removal of the skin of a prey animal differs if it is simply a step toward accessing the meat or if the skin is to be saved for making clothes, and this choice is first determined by the quality of the skin and, thus, by the season of the hunt (Binford, 1978, 1981; Grønnow et al., 1983; Morrison, 1997). Besides these functional and economics factors, the ethnological and anthropological literature stresses that the social identity of each group is well expressed in food-processing activities (e.g., Chenal-Velarde and Velarde, 2004; D'Iatchenko et al., 2007; Fischler, 1988; Guevara, 1988; Havelange, 1998; Lalhou, 1998; Malaurie, 1989; Politis and Saunders, 2002; Serra Mallol, 2010; Simoons, 1994; Vialles, 1998). The codes, rituals and taboos specific to each society can indeed influence the butchery tasks performed, which translates into distinct processing activities. For example, the Dena'Ina people express their respect for their prey by meticulous crushing of all of the bones after butchery (Russell, 1995), while, for the Evenki, this translates into a systematic disarticulation of all the carpal and tarsal bones (Abe, 2005). By decrypting the actions of the butcher, it is thus technically possible to retrace the intentions of the butcher and to observe the technical skills, if not the culture, of a human group (e.g., Dumont, 1987; Vigne et al., 1987). The sociological dimension of food practices is, however, very difficult to perceive for human groups that did not leave any written testimonies. The cutmarks observed on bone remains in archaeological contexts were rapidly identified as compelling evidence of meat processing by past human societies (Henri-Martin, 1906; Lartet, 1860; Milne-Edwards, 1875). Therefore, food waste bears evidence of the technical traditions of a human group, much like the artifacts more commonly recognized as material culture, and can be used to retrace the processing activities of past human societies. These marks—associated with other evidence of butchering, manufacturing, or use-wear marks—are frequently used in studies of past human societies as proxies to reconstruct the *chaîne opératoire* of carcass processing (e.g., Castel, 1999, 2003; Castel et al., 1998; Costamagno, 2012; Fontana et al., 2009; Johnson and Bement, 2009; Laroulandie, 2004; Leduc, 2010; Mallye et al., 2013; Soulier, 2013, 2014).

The ethnological observations conducted by Binford (1978, 1981) on Nunamiut groups from the *Anaktuvuk Pass* area (Alaska) marked a fundamental step in the study of cutmarks. Binford made careful observations of 37 butchery sequences performed with metal knives by skilled Nunamiut butchers, and processed 13 carcasses himself. By matching the cutmarks he observed at recently abandoned Nunamiut camps to the butchery episodes he observed, Binford has suggested a coding system for cutmarks (Binford, 1981). According to the location and orientation of the cutmarks, these codes allow the identification of skinning, disarticulation and defleshing activities.

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Ethnoarchaeological studies have since developed further (e.g., Abe, 2005; Costamagno and David, 2009; Gifford-Gonzalez, 1989; Lupo and O'Connell, 2002). Despite the recognized need for butchering observations using traditional methods—that broaden our knowledge of the range of the possibilities of prey uses—these studies have not attempted to complete the coding established by Binford and no inventory of cutmarks according to activity is available due the lack of control with regard to distinct butchery activities. The work of Nilssen (2000) is a great addition to Binford's work because most of the butchery activities were videotaped. This protocol allowed Nilssen to attribute most of the cutmarks he observed to specific butchering activities and to complete Binford's reference set by offering new codes for previously undocumented cutmarks. Nilssen's reference set is based on butchery performed using metal blades and, occasionally, stone tools. The butchery tasks were completed by a skilled butcher and hunters, and were aimed at producing dried meat and sausages from African antelopes in the *Karoo* region (South Africa). This work highlights that the interpretation of cutmarks is not as simple as suggested by Binford, with the observation that defleshing and disarticulation cutmarks can sometimes be superimposed. This reference set, however results from butchery performed with metal knives and, as noted by Nilssen (2000:28), "Some butchery tasks carried out with a metal blade could not be accomplished with stone tools." The reference sets available therefore appear not to be fully transposable to Palaeolithic assemblages.

Examples of experimental butchery performed with stone tools do exist. Some of these were aimed at adjusting Binford's reference set to small game (Cochard, 2004; Laroulandie, 2001; Mallye, 2011; Willis et al., 2008) but cannot be applied to ungulates because of their significant morphological differences. For ungulates, experimental butchery were mostly aimed at testing some specific aspects, such as the relationship between butchering-intensity/meat-quantity/carcass-size and the number of cutmarks produced or the impact of the tool used on the number/location/morphology of the cutmarks (e.g., Dewbury and Russell, 2007; Domínguez-Rodrigo and Barba, 2005; Egeland, 2003; Egeland et al., 2014; Galán and Domínguez-Rodrigo, 2013; Pobiner and Braun, 2005; Val et al., 2017; Walker, 1978; Walker and Long, 1977), and most of them do not provide any extensive documentation of cutmarks. Bez (1995) used stone tools for experimental butchery on a domestic goat, a domestic sheep and a horse's head; only part of the cutmarks he observed are illustrated on bone templates. The experiments conducted by Padilla (2008) were also performed on domestic cows (immature) and with stone tools to document the variability of the gestures made by professional butchers and persons not familiar with mammal anatomy. All of the cutmarks were recorded on bone templates but no distinction was made between the traces resulting from defleshing and disarticulation. Domestication involves morphological changes including changes to the musculature (e.g., O'Regan and Kitchener, 2005), and one can expect that domestic carcasses might be easier to butcher compared to wild animals. Therefore, these data might not be entirely relevant for studies on archaeological assemblages from periods that predate domestication. To our knowledge, the experimental butchery by Galán and Domínguez-Rodrigo (2013) are the only experiments to have been performed both with stone tools and on wild ungulates (*Cervus elaphus*). The butcher, a skilled hunter, had to make oblique gestures for disarticulation and exclusively transverse motions for defleshing and skinning. The orientations of the cutmarks were consequently used to determine the activity during which the cutmarks were generated. The protocol used to determine the activity that produced a cutmark, however, limits its relevance for accessing carcass processing because the orientation of a cutmark is a major criterion for its attribution to a specific activity (Binford, 1981; Nilssen, 2000; Soulier and Morin, 2016).

To gain better knowledge of carcass processing on wild ungulates, we performed highly controlled butchery on wild red deer using replicas of Middle Palaeolithic stone tools, in the framework of a collective project (Thiébaut et al., 2009) called "*des Traces & des Hommes*" (T&H). Data obtained on limb bones for each activity (skinning, disarticulation, defleshing and tendon-removal) are here presented separately to provide an overview of all the cutmarks produced during each step of the butchery process. We then compare this new reference set with those already available. This comparison allows us to readjust the previously established cutmark codes and to suggest some new codes for activities that lacked descriptions.

2. Materials and methods

A total of 18 half-carcasses (Table 1) of wild red deer were processed between 2007 and 2012. Six of the deer were purchased from a several-hectare hunting park, two were shot by local hunters, and one was hit by a car. Except for carcass 1, which was beheaded, all of the carcasses were complete (six carcasses were partially eviscerated for sanitary reasons). The deer were killed shortly before the butchery was conducted (Table 1) and were kept in a refrigerated truck until processing.

The butchery activities were performed by archaeologists with experience of experimental butchery, except in the case of carcass 9, which was processed by a professional butcher (left side of the deer) and his apprentice (right side). All of the butchery activities were performed using replicas of Middle Palaeolithic stone tools. The diversity of the tools and the raw material utilized (Table 1) correspond to the parameters that lithic specialists participating in the experimental program wanted to test (i.e., the incidence of the type of tools, the edge aspect and the raw material used in particular butchering activities: Claud et al., 2009, 2015; Thiébaut et al., 2009). All the butchery activities

Table 1
Description of the experimental material.

ID	Description	Side	Lithic tool	Raw material
1	Hunting park. Adult ♂ headless. Death: 1 day before	R	Denticulate	Flint
		L	Mousterian point	Flint
2	Hunting park. Adult ♀ eviscerated. Death: 1 day before	R	Unretouched flake	Quartzite
		L	Denticulate	Flint
3	Hunting park. Adult ♀ complete. Death: 1 day before	R	Denticulate	Quartzite
		L	Unretouched point	Flint
4	Hunting park. Adult ♀ eviscerated. Death: 1 day before	R	Cleaver	Quartzite
		L	Denticulate	Quartzite
5	Hunting park. Sub-adult ♂ complete. Death: 1 day before	R	Cleaver	Quartzite
		L	Cleaver	Ophite
6	Wild. Sub-adult ♀ eviscerated. Death: 1 day before	R	Unretouched flake	Quartzite
		L	Unretouched flake	Schist
7	Hunting park. Adult ♀ eviscerated. Death: 2 days before	R	Unretouched flake	Quartzite
		L	Unretouched flake	Quartzite
8	Wild. Adult ♀ eviscerated. Death: 2 days before	R	Denticulate	Quartzite
		L	Denticulate	Quartzite
9	Wild. Adult ♀ eviscerated. Death: 3 days before	R	Unretouched flake	Flint
		L	Unretouched flake	Flint