Quaternary International xxx (2016) 1–10

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Fuel exploitation among Neanderthals based on the anthracological record from Abric Romaní (Capellades, NE Spain)

Ethel Allué [a, b, *], Alex Solé [a], Aitor Burguet-Coca [a, b]

[a] IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain
[b] Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avd. Catalunya 35, 43002 Tarragona, Spain

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Fuel management
Neanderthal behaviour
Middle Palaeolithic
Subsistence economy
Anthracology

ABSTRACT

Fuel is a basic resource enabling energy production, and its exploitation was a major activity in Neanderthal daily life. In this work we present charcoal results obtained from the Abric Romaní site in order to evaluate fuel use among the human groups occupying this rock shelter from 40 to 70 ka BP. The Abric Romaní, a Middle Palaeolithic site, has yielded evidence of a well-preserved sequence of Neanderthal occupations. The results of this taxonomic and taphonomic study have allowed us to characterise the charcoal assemblage as mainly comprising *Pinus sylvestris* type. This assemblage gives us an understanding of Neanderthal fuel acquisition strategies, mobility and occupation patterns.

1. Introduction

Fire was a revolutionary technological advance for human evolution and its study has been approached from different perspectives encompassing the entire fire *chaîne opératoire* (production, use, and disposal) (e.g. Perlés, 1977; Olive and Taborin, 1987; Collina-Girard, 1998). Although fuel is indispensable as an energetic resource for fire maintenance, its study is still marginal when considering the elements of fire technology. However, the history of fuel as an energy producer is closely related to an element of technology that is particularly relevant in human evolution. The main problem is that fuelwood is a perishable material, not a technological improvement. Consequently, research on this subject has had no real impact on the study of past communities or human evolution. However, energy is closely related to our past, present and future, and today is still the cause of territorial conflicts in some places (Asif and Muneer, 2007). Hence, fuel should be considered an important issue when studying earlier communities. According to the FAO, wood is still the most valued fuel in some parts of the world, for heat production, food transformation, lighting, and so on (FAO, 2005). Today, the problem with energy resources, especially wood fuel, is that the intensity of exploitation and demand in many regions with limited resources provokes important ecological, economic and health issues, leading to a concomitant interest in its study (Calen, 2008). In contrast, in the past it seems that, at least in the studied regions, woody fuel was widely available or, when it was not there, were sufficient other resources, meaning that energy resources themselves remain unexplored.

During early Palaeolithic times humans undoubtedly used all available resources. However, the interpretation of these resources as cultural records often comes up against narrow-minded scientific conceptions. Most archaeological studies on fuel are isolated or related to hearths, where fuels reach an insignificant role (see among others Meignen et al., 2009; Sandgathe et al., 2011; Goldberg et al., 2012). Resource management and the group of activities relating to fuel and fuel gathering is only considered in anthracological works, and is not seen as a key issue for understanding the complexity of Neanderthal behaviour. On the other hand, present day studies do take a major interest in fuels, focusing on scarcity, deforestation and health (Asif and Muneer, 2007; Calen, 2008).

The study of fuel use among Palaeolithic human groups has been approached from various different perspectives including the study of archaeological remains such as charcoal (Uzquiano, 1992, 2008; Théry-Parisot, 2001; Allué, 2002a), burnt bones (Théry-Parisot, 2002; Costamagno et al., 2009; Marquer et al., 2010; Yravedra and Uzquiano, 2013), and phytoliths (Albert et al., 2000; Madella et al., 2002; Cabanes et al., 2010). Taphonomy and ethnoarchaeology have also provided further evidence about the study of fuel (Thery-Parisot et al., 2010; Henry and Théry-Parisot, 2014).

* Corresponding author. IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain.
E-mail address: eallue@iphes.cat (E. Allué).

http://dx.doi.org/10.1016/j.quaint.2015.12.046
1040-6182/

These studies consider that fuel gathering and use were an important part of daily activities, hence they focus on understanding fuel use among hunter–gatherer groups in order to show general behavioural patterns.

However, it was anthracology that led to the development of fuel studies from different research approaches, including research on taphonomy, quantitative and qualitative taxonomic data sets, palaeoeconomy, and predictive foraging models (e.g. Uzquiano, 1992; Piqué, 1999; Théry-Parisot, 2001; Allué, 2002a; Théry-Parisot et al., 2009). Earlier research on Palaeolithic charcoal remains focused on palaeoenvironmental interpretations, suggesting that gathering occurred randomly in the local surroundings (Vernet, 1967; Bazile-Robert, 1979). However, some new methodological and theoretical approaches were developed to understand human behavioural aspects relating to fuel (Ford, 1988; Smart and Hoffman, 1988; February, 1992; Uzquiano, 1992; Piqué, 1999; Théry-Parisot, 2001; Allué, 2002a; Asouti and Austin, 2005; Allué and García-Antón, 2006). In addition, regional approaches have also provided new information, allowing behaviour to be compared regardless of the biogeographical setting, for example in South American (Solari, 1992; Piqué, 1999; Scheel-Ybert, 2001; Caruso-Fermé, 2012) and European contexts (Uzquiano, 1992, 1998; Badal et al., 2012; Théry-Parisot, 2001, 2002; Allué, 2002a; Allué et al., 2007, 2010, 2012a, 2012b, 2013; Théry-Parisot et al., 2009; Vidal-Matutano et al., 2015), as well as in Australia (Carah et al., 2014). Nevertheless, there are still very few studies in the context of early hunter–gatherer populations (Bazile-Robert, 1979; Ros, 1987; Uzquiano, 1992, 2008; Uzquiano and Cabrera, 1999; Théry-Parisot, 2001; Théry-Parisot and Texier, 2006; Uzquiano et al., 2008; Marquer et al., 2010; Badal et al., 2012; Uzquiano et al., 2012; Allué et al., 2012a; Ruiz et al., 2013; Solé et al., 2013; Vidal-Matutano et al., 2015).

The approaches used to study fuel use among Middle Palaeolithic hunter–gatherers have mainly been based on subsistence economy theories and site catchment analyses (Uzquiano, 1992, 1997, 2008; Uzquiano et al., 2008, 2012; Yravedra and Uzquiano, 2013). The results of these studies are interpreted according to logistical mobility, topography of the area studied, and comparisons with other biotic resources, such as faunal remains, as well as the corresponding hunting strategies and ecological distribution patterns (Uzquiano, 1992). In a synthetic overview of Middle and Upper Palaeolithic sites from Cantabria, Uzquiano (2008) suggests that changes in the exploitation of species might indicate choices made on the basis of different wood properties of the species and their specific uses. These arguments are based on the use of different areas, which provides information on mobility patterns, site functionality and spatial knowledge of the provisioning areas. Recently, based on biotope differentiation at a lower Palaeolithic site in southeastern Spain, Vidal-Matutano et al. (2015) suggested differences in fuel use through the establishment of procurement sources. The use of Binford's (1980) predictive model for hunter gatherers was synthetised by Asouti and Austin (2005) to understand fuel gathering among early hunter–gatherers. These authors propose that fuel use among hunter–gatherers is based on opportunistic gathering in the closest area. This general predictive model might be modified by different factors according to the economy of the group (foraging versus collector groups) and the exploitation range (Asouti and Austin, 2005). Among these groups the concept of “preferred fuel” or “good fuel” should be analysed cautiously (Théry-Parisot, 2001; Asouti and Austin, 2005; Allué and García-Antón, 2006; Henry and Théry-Parisot, 2014). From a theoretical perspective, fuel has to be considered an abiotic resource that is sought out, selected and gathered according to various factors: environmental constraints, availability and abundance in the environment, type and size of the hunter–gatherer group, type of occupation, final use, selection patterns and choices (Allué, 2002a).

The Abric Romaní site has yielded a continuous sequence (40–60 ka BP) enabling Neanderthal occupation models to be categorised. The anthracological record from Abric Romaní is exceptional, aiding in the analysis of this long-term sequence of recurrent Neanderthal occupation. The approach is based on anthracological and taphonomical analyses of the charcoal record. This allows us to discuss fuel, firstly, in regard to selection patterns according to fuel gathering, type of fuel used, its end use, and disposal; and secondly, its exploitation according to Neanderthal cultural behaviour and practices in relation to the occupation of Abric Romaní and the mobility of the human groups.

2. Site description

The Abric Romaní site is located in the town of Capellades (Barcelona), 280 m above sea level at 41° 32′N, 1° 41 ′30″E (Figs. 1 and 2). The site is a wide rock-shelter in the northern face of a long cliff carved out by a tectonic fault and the Anoia River. The stratigraphy comprises 20 m of well-stratified travertine sediments dated by U-Series as being between 40 and 70 ka years old and containing 25 archaeological layers (Fig. 3) (Vaquero et al., 2013). These layers were formed when rock-fall sedimentary processes dominated. The fluvial deposits contain a limited ensemble of archaeological remains, suggesting that the rock shelter was at times uninhabitable due to dripping water flowing over the surfaces (Vaquero et al., 2013). Climate variations included alternating wet and dry phases along the sequence with colder conditions than today (Vaquero et al., 2013). The palaeoecological record from Abric Romaní indicates a mosaic landscape, with different vegetal communities in the territory including forests, riparian forests, prairies, and steppe (Burjachs et al., 2012).

The study of the archaeological record has provided detailed information on this Middle Palaeolithic sequence with regard to Neanderthal hunting and animal processing strategies, technology, raw material management, and fire technology (Vallverdú et al., 2005, 2010, 2012a; Vaquero, 2008; Carbonell, 2012; Courty et al., 2012; Rosell et al., 2012; Vaquero et al., 2012, 2013, 2015; Solé et al., 2013; Gabucio et al., 2014).

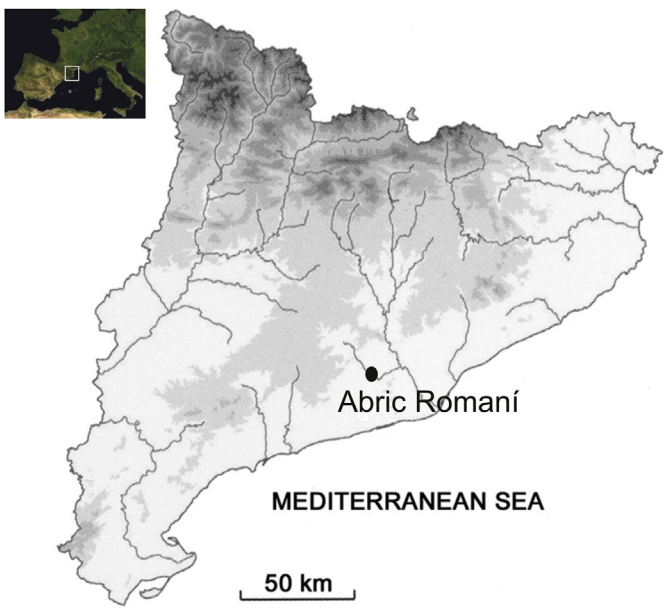

Fig. 1. Location map of the Abric Romaní site.

Please cite this article in press as: Allué, E., et al., Fuel exploitation among Neanderthals based on the anthracological record from Abric Romaní (Capellades, NE Spain), Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2015.12.046