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Claire Delhon. Is choice acceptable? How the Anthracological Paradigm May Hinder the Consideration of Fuel Gathering as a Cultural Behaviour. *Environnemental Archaeology*, 2018, pp.on line. 10.1080/14614103.2018.1522783 . hal-02046418

HAL Id: hal-02046418

<https://hal.science/hal-02046418>

Submitted on 16 Nov 2021

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To cite this article: Claire Delhon (2018): Is Choice Acceptable? How the Anthracological Paradigm May Hinder the Consideration of Fuel Gathering as a Cultural Behaviour, Environmental Archaeology, DOI: [10.1080/14614103.2018.1522783](https://doi.org/10.1080/14614103.2018.1522783)

To link to this article: <https://doi.org/10.1080/14614103.2018.1522783>

Published online: 26 Sep 2018.

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Is Choice Acceptable? How the Anthracological Paradigm May Hinder the Consideration of Fuel Gathering as a Cultural Behaviour

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ABSTRACT

Charcoal analysis is a powerful and well-established means of documenting past environments and the impact of ancient societies on vegetation. Nowadays, the palaeoecological accuracy of anthracological spectra built from scattered charcoal derived from long-term use of domestic fuel is widely acknowledged. This broadly accepted paradigm relies on the hypothesis that firewood gathering is done following the Least Effort Principle, in areas frequented for routine activities, and may include any species encountered therein. Nevertheless, ethnographic studies, despite the fact that they often underline the opportunistic aspects of wood gathering, always reveal that choice comes into play at some stage of the process. Moreover, most anthracologists think in terms of 'fuel management', admitting that firewood gathering is subject to technical, economic and cultural prescriptions. For historical times and specialised activities, we easily accept that fuel may be chosen according to various properties, including species. However, we still deny that prehistoric societies potentially preferred or rejected certain wood species for feeding their domestic fires. Through concrete ethnographic and archaeobotanical examples and a case-study, this paper aims to question our capacity to consider that fuel procurement could be affected by cultural traits, to identify the behaviours that could make the charcoal record differ from the vegetation and, finally, to consider charcoal assemblages from an anthropological angle.

ARTICLE HISTORY

Received 27 April 2018
Revised 16 July 2018
Accepted 6 September 2018

KEYWORDS

Firewood selection; charcoal analysis; prehistory; ethno-archaeology; resource management

Introduction: the anthracological paradigm of random harvesting of firewood

Charcoal analysis is nowadays a well-established means of documenting past environments and the impact of ancient societies on vegetation, but it has not always been so, and the legitimacy of anthracology as a palaeoecological tool was initially the subject of heated debate. One of the main concerns was: how representative of the past vegetation growing around the site is the archaeological charcoal assemblage? Is there a distortion of the signal from the past landscape to the charcoal spectrum? In particular, the impact of taphonomic processes on the composition of the charcoal spectra, including all of the post-depositional hazards that occur from the combustion itself to the recovery by archaeologists, have been widely investigated (Théry-Parisot, Chabal, and Chrzavzez 2010; Chrzavzez et al. 2014; Dussol, Elliott, and Théry-Parisot 2017). In addition to the possible distortions of the signal linked to charcoal preservation, the way charcoal assemblages form was thought to weaken them as palaeoenvironmental records. The fact that wood gathering by past societies might not have been random, and might thus distort the image of the vegetation has been questioned (Asouti and Austin 2005). From the 1980s onwards, anthracologists have worked hard in order

to demonstrate that charcoal spectra are reliable proxies of the ligneous vegetation and of its variations through time. Thanks to these studies, and especially (but not only) to the papers of L. Chabal and the team of Montpellier (Chabal 1992, 1997; Chabal et al. 1999), the palaeoecological accuracy of anthracological spectra built from scattered charcoal derived from long-term use of domestic fuel has been demonstrated and is now widely acknowledged.

The paradigm of the palaeoecological accuracy of charcoal assemblages relies on the hypothesis that daily firewood is collected randomly from the surrounding vegetation. As far as domestic hearths are concerned, it is assumed that no specific choice occurs during the gathering. As a result, after several fires fed by the wood from different harvests, the charcoal spectrum is representative of the surrounding vegetation which means that all of the species occur in proportions related to their abundance in the vegetation. The best picture of the vegetation is then given by the analysis of domestic 'long-term deposits' (Asouti and Austin 2005). In contrast, charcoal concentrations, and above all those from hearths, are considered to be poor records of the woody vegetation, as they may contain the remains of only a few logs from the last fire. As a consequence, they are disregarded by anthracologists

who prefer charcoal scattered within the archaeological levels. Nevertheless, when only charcoal concentrations are preserved, they may also give a valuable picture of the vegetation, provided that they are numerous enough to represent a sufficient number of harvests (Delhon 2006, 2016).

No cherry-picking in domestic fuel gathering?

The hypothesis that domestic firewood is randomly collected and that the availability of the species is the only criteria for their selection by the prehistoric populations is based on the 'Principle of the least effort' (Shackleton and Prins 1992; Dufraisse 2014). Because it is a necessary and repetitive activity, firewood is collected as close as possible to the site, in the areas frequented during the other daily activities, and may concern every species encountered therein.

Random harvest in selected areas

This theoretical view is broadly confirmed by ethnographic reports. For example, in the tropical forest of Papua New Guinea, Dufraisse, Pétrequin, and Pétrequin (2007) observed that the species collected by communities of gardeners for domestic firewood vary from one house to another, despite an unselective harvest. Supply areas, and thus the available woody species, depend on the paths followed by each person or small group, particularly those paths used to access their gardens, which explains the discrepancies between households. In Equatorial Guinea, the Fang slash-and-burn farmers from the Monte Alen region use for domestic fuel the trunks and branches that escape burning during land clearance and field preparation in the orchards. In the case of sporadic rises in wood consumption, a young tree may be cut down in a fallow orchard. Firewood is never collected from the primary forest, but only from socialised spaces such as orchards and fallows grounds, and more occasionally along the pathways (Picornell, Asouti, and Allué 2011). These studies show that, even if not selective, wood gathering appears to be polarised within the parts of the landscape used for the activities during which wood gathering is carried out. This means that certain areas, despite being accessible, are not exploited for fuel supply. As a result, the plant associations growing in these areas will not be recorded in the charcoal archive. In other words, even if ligneous resources intended for use as fuel are collected randomly, the part of the landscape where the harvesting is carried out is not random.

Choice and selection as ubiquitous human behaviours

Even if it seems reasonable and sustainable to adopt effort-saving strategies, humans are prone to turn

towards more selective behaviour, since choice is possible, and even sometimes when it appears to be largely time and energy-consuming and thus economically unprofitable. Indeed, it is widely accepted that, for any other activity carried out in the framework of a social group, raw material supply is selective and highly influenced by cultural considerations, sometimes stemming from technical requirements, but also often disconnected from any actual necessity. For example, despite clay being a widespread material, the clay used by potters is often not randomly chosen: its acquisition may be highly selective, and this selection does not always target the most technically relevant material. For example in the Neolithic site of Pendi-moun, located on the French eastern Mediterranean littoral, the *Impressa* potters used granitic clay collected in the Alpine Argentera-Mercantour massif, at around 2000 metres in altitude, for the fabrication of ceramics. Apart from the fact that it comes from distant sources, this material is also very difficult to work with (Gabriele 2014), showing that minimisation of the overall effort is not necessarily the first concern when it comes to fitting cultural prescriptions.

Selectivity depends on the abundance of the resource

According to Shackleton and Prins (1992), the level of selection of a given resource depends on its availability. When choice is affordable and sustainable, due to resources available in quantities that exceed the needs, it is usually practiced at variable degrees. Thus, the 'Principle of the least effort' predicts that the vegetation will be exhaustively and unselectively sampled after a while only when the resource becomes limited. As long as wood is not lacking in the vicinity of the site, there is no reason for the community to refrain from choosing which species, calibre, state or provenances they target for fuel supply. In the Neolithic lakeshore settlement of Chalais 4 (French Jura), the oak forest is the only woody association recorded in the charcoal spectra when the village is initially established. Soon after, beech forests start to be exploited while oak declines in the anthracological diagram (Dufraisse 2005). After having consumed the nearby oak grove, the inhabitants of the site had to turn towards beech formations, located somewhat further away (Dufraisse 2005, 2008). It is only when the *in situ* resource became insufficient that the search for a firewood supply shifted to the other parts of the landscape and that the vegetation record becomes more complete. In a totally different environmental and chronocultural context, the Mousterian occupation of Esquilleu cave, in northern Spain, shows that the surrounding pine formations were initially practically the only catchment areas used for fuel, until this species' biomass became insufficient to cover the needs because of more intense occupation

and/or climate oscillation. Neanderthal groups subsequently resorted to a wider range of environments (river sides, karstic shrublands, heathlands) for firewood gathering, which resulted in charcoal assemblages that reflect more accurately the palaeoecological background of the site (Uzquiano et al. 2012).

In temperate areas and in context of moderate anthropic pressure on the vegetation, wood is abundant enough to allow choice to be affordable and sustainable. As a consequence, there is no reason for considering firewood differently from any other natural resource the gathering of which obeys cultural or economic laws, which sometimes results in an opportunistic random exploitation of the available species, but which might also, potentially, result in the targeted use of only few species.

Ethnographic reports of domestic firewood selection and relevant archaeobotanical data

Indeed, ethnographic studies, despite the fact that they often underline the opportunistic aspects of wood gathering, always reveal that choice comes into play at some stage of the process (table 1).

As related above, the Fang populations from Equatorial Guinea almost exclusively use the trunks and branches of the trees previously cut down for field preparation. Despite the fact that it seems unselective, wood collection only concerns socialised spaces and always avoids the primary forest (Picornell, Asouti, and Allué 2011). Due to the selection of the areas from which firewood must be acquired, the list of taxa used as fuel is only representative of highly frequented and managed zones and is blind to a major regional-scale ecosystem, the primary forest. A parallel can be drawn between Fang management of firewood as a part of the orcharding system and what is found on certain Neolithic sites, where proto-domestication, or at least special management, of fruit bearing trees is suspected. In the Late Neolithic of the Visoko Basin, in Bosnia, *Maloidea*, hazel and dogwood seem to benefit from a maintenance or protection of their stands (Schroedter et al. 2012); at Giribaldi, in south-eastern France, during the Middle Neolithic, Olive trees may have received special treatment (Thiébaud 2001). In both cases, the curves of these edible taxa in the charcoal diagram provide clues regarding their special position in the economic system and the fact that they are either favoured in the landscape or pruned in order to enhance fruit production.

The state of the wood may also influence its use in the domestic hearth. Selection of green and moist or, on the contrary, of decayed branches is reported from ethnographical studies (Henry and Théry-Parisot 2014) and has been evidenced in Palaeolithic contexts (Vidal-Matutano, Henry, and Théry-Parisot 2017). In

these cases, smoke production is the intended goal (in order to preserve meat, prepare hides or repel insects). Thus one could argue that such a selection occurs only when it comes to feeding specialised combustion structures, dedicated to very specific functions, and does not apply durably to domestic, multipurpose hearths used on a daily basis. Nevertheless, several studies point to a preferential use of dead, seasoned, and/or partly decayed wood, not only by Palaeolithic nomads looking for already dry wood, but also by more sedentary societies, and in the absence of evidence that it was linked to a single specific activity. For example, during the Neolithic and Chalcolithic at Çatalhöyük, in Anatolia, where charcoal accumulation is believed to result from daily disposal of fuel waste over a long period, deadwood seems to have been preferred, in particular in the case of riparian taxa, suggesting that the deadwood productivity of riparian forest was high (Kabukcu 2017). Dry wood burns more easily than green wood. Using naturally self-pruned branches, which have fallen to the ground several months previously, or an intentionally seasoned stock of wood are ways of facilitating ignition and combustion (Théry-Parisot 2002). The first practice, at least, may influence the charcoal spectra, leading to an over-representation of naturally pruning trees, for example pine at Chauvet cave (Théry-Parisot and Thiébaud 2005) or *Salicaceae* at Çatalhöyük (Fairbairn et al. 2002; Kabukcu 2017).

The calibre of wood is another criterion that is likely to be considered during harvesting, either because of the way in which harvesting is carried out (distance from the site, physical capacity of the collectors, tools used, concurrent activities...) or because of the way in which combustion will be conducted, but also sometimes because the larger stems are assigned to other uses (timber). However, large trees can also sometimes be sought. During the monsoon, the Tamang of the Ganesh Himal, in Nepal, use only the trunks of previously felled large trees (60 cm at 1.30 m from the ground). Nevertheless, they also unselectively gather dead wood during winter (Toffin and Wiert 1985). Concerning prehistoric charcoal assemblages from domestic daily activities, the diameter of the branches or logs is seldom assessable, due to the small size of the fragments and to various limitations of the techniques available for diameter estimation. Nevertheless, at Chalais (Jura, France) the estimation of firewood diameters pointed to a preferential use of saplings and branches under 15 cm in diameter for fuel, probably for technical reasons (small pieces of wood allow a better control of flames and sparks and are therefore safer for use in the wooden houses inhabited by the Late Neolithic lake-dwellers) but also perhaps in order to preserve mature trees (Dufraisse 2008).

Finally, the feature primarily and most commonly noted by charcoal-analysts, the species – or any

Table 1. Non-exhaustive list of the potential choices facing a prehistoric group in relation to firewood supply, their potential modalities and the way they may affect the floristic composition of firewood. The term ‘species’ is used for a group of individuals which resemble each other more than they resemble individuals from others groups, for criteria that may differ from those used in modern taxonomy. Note that the deliberate selection or rejection of a ‘species’ is only one among several other selective behaviours.

Potential choices that may present themselves during the gathering process	Examples of modalities		Ways choice may impact the floristic composition of firewood
	WHO? - All the group - Part of the group		The ability of the persons involved in wood gathering may, for example, influence the weight or the height of the branches or logs collected. → Over/under representation of large trees/shrubs/self-pruning taxa etc.
	HOW? - Use of tools - Without the use of tools		The kind of tools used may influence the size of the collected branches or logs and the recourse to cutting down, pruning or picking up fallen wood. → Over/under representation of large trees/shrubs/self-pruning taxa etc.
	WHEN? - Targeted expeditions - Collateral benefit arising from another activity or from several other activities		The activities conducted in parallel to wood harvesting may influence the quantity and the size of the branches and logs collected. They also determine the visited areas (see «Where?»). → Over/under representation of large trees/shrubs/self-pruning taxa etc. → Over/under representation of taxa growing in some habitats
	HOW OFTEN? - Daily activity - Recurrent activity - Seasonal activity	with or without a reserve	The frequency of wood harvesting may influence the recourse to cutting down of few trees vs. the collection of numerous smaller branches from several trees; seasonality may influence the access to some species (in seasonally unreachable areas, or for small-sized shrub covered by snow, for example) → Over/under representation of large trees/shrubs/self-pruning taxa etc. → Overrepresentation of a single (few) species if one (few) large tree is cut down as a medium-term reserve
	WHERE? - In dedicated areas - In areas dedicated to other activities during which wood gathering is carried out - Outside avoided/forbidden areas - Everywhere - Tree layer, shrub layer or both		The harvest area influences the spectrum of encountered species. → Over/under representation of taxa growing in some habitats
	WHAT? - Selection of the calibers or not - Selection of the state of the wood or not - Selection of the location of the wood (on the tree/on the ground/drift wood...) or not - Preferred «species» or not - Avoided «species» or not		The nature and the form of the wood or of the tree/shrubs may be selected. → Over/under representation of large trees/shrubs/self-pruning taxa etc. → Over/under representation of drifted taxa → Over/under representation of preferred/avoided taxa

categorisation based on the will to classify the living kind according to the similarities and differences between the individuals – must also be considered as a possible source of selection among available woody resources. As argued above, non-selective gathering is all the more effort-saving when the resource is limited. Ethnographic reports mention that there are often ‘preferred’ or ‘rejected’ species, even when these theoretical prescriptions are not always strictly respected. In Siberia, the Evenk reindeer herders from the taiga in the Amur region only target three species for fuel supply, among 20 species commonly used for various purposes, with a strong preference for larch. In contrast, birch is completely avoided because it is believed to be harmful (Henry and Théry-Parisot 2014). The farmers of the Gzaua tribe, in the Moroccan western Rif, use a wide range of species for firewood, but dwarf palm is confined to other purposes (basketry), oleander is avoided because of its smoke production and toxicity, and other common species are burnt only occasionally (myrtle, willow, elderberry) (Zapata Peña et al. 2003). The Tamangs of central Nepal give priority to oaks when cutting down the trees to be used as fuel during the monsoon, but the use of alternative species can compensate for the absence of this preferred firewood (Toffin and Wiart 1985). The Balamogi from Uganda use a very wide range of ligneous plant for their domestic fires, but several others are not used for cooking due to various cultural taboos (Tabuti, Dhillion, and Lye 2003). As a component of everyday life, firewood collection is not free from beliefs, traditions, taboos or value judgements leading to possible preferences or rejections. Despite the above actualistic

evidences, some anthracologists still refuse to accept that some trees or shrubs may have been preferred, for certain reasons, by prehistoric populations, even when choice is the most obvious explanation for the observed charcoal spectra. Nevertheless, patterns involving availability and selection or avoidance have already been proposed for prehistoric groups. Most of the time, resource availability is considered as the primary driver of firewood collection, while choice only occurs secondarily. Preferences for certain trees are suggested in the case of the Neolithic populations from the coastal sites of the Dutch wetlands (Pomoidae) (Out 2009) or the Early Neolithic groups from Pınarbaşı in Anatolia (almond and terebinth) (Asouti 2003), but in both cases the taxa involved are also thought to be among the most abundant in the surrounding vegetation. At La Garrotxa, in the Iberian Pre-Pyrenees, deciduous oak and box remain the species most used for fuel, even when evergreen oak becomes far more abundant in the surrounding vegetation, as shown by pollen records (Piqué et al. 2018). In the Sierra de Cantabria (Basque Country), the Neolithic populations seem to have preferred oak and pine, although the latter one was probably scarce in the vicinities of the settlement sites and may have been collected through targeted expeditions; they spared hazel which was quite abundant but probably dedicated to other purposes (Ruiz-Alonso et al. 2017). A discrepancy between the palaeovegetation as reconstructed by pollen data and the anthracological record is also noticed in the Neolithic LBK sites from Central Europe. The peculiar lack of lime tree in the charcoal assemblages has been interpreted as a

disinterest in this widespread taxon for fuel, perhaps linked to technical limitations (Kreuz 1992).

Despite these precedents, it remains difficult to argue for a selective use of firewood during Prehistory, which is often considered as the least plausible hypothesis, as illustrated by the case study presented hereafter.

Case study: Cazan-Le clos du Moulin, Vernègues (middle Neolithic, southern France)

Cazan-Le clos du Moulin, near Vernègues, is a middle Neolithic site in the south of France and is the first village of the Chassey culture identified in the area (Moreau et al. 2017). On this site, archaeological floors were not preserved and charcoal was only found trapped in hollow features. The studied anthracological assemblages were sampled from a well and in several large heated-stone hearths located at the centre of the village. Such large combustion structures are characteristic of the Chassey Middle Neolithic culture, but unfortunately up to now they have hardly ever been considered from an anthracological point of view. While the hearths provided charcoal concentrations possibly formed through a limited number of fires over a short period of time, the well may represent a long-term deposit as it was used throughout the occupation of the site, which lasted around three centuries. Moreover, the seven studied heated-stone hearths were not all in use at the same time and they also cover most of the time-span of the Neolithic occupation, as indicated by the ^{14}C dates and to other evidences (Moreau et al. 2017).

The results of the charcoal analysis show that a single species, *Arbutus* sp., represents more than 90% of the charcoal fragments from the fire-places (Figure 1). The same species also dominates the spectrum from the well, but to a lesser extent with 46% of the fragments (Delhon et al. 2017). *Arbutus* grows in Mediterranean scrublands. It prefers acid substrata, which are absent from the surroundings of the site, and can be favoured by disturbances such as fire, grazing or frequent cutting (Rameau et al. 2008). Nevertheless, it very rarely forms dense, pure stands. Instead, it is usually found in the form of more or less scattered trees, in more or less shrubby formations dominated by evergreen oak, Mediterranean pine or *Erica arborea*. These species are absent in the charcoal assemblage, except Aleppo pine which is weakly represented.

As a random harvest of wood among the available species in the scrublands would have provided a more exhaustive sampling of the vegetation, we assumed that the selection of *Arbutus* for fuel supply is the simplest and most obvious explanation for its abundance in the hearths, throughout the occupation of the site (Delhon et al. 2017). This hypothesis did not gain unanimous support when initially presented

to other anthracologists. Regardless of the arguments in favour of a selection of *Arbutus*, the idea that domestic fuel could be chosen goes against the anthracological paradigm on which palaeoenvironmental reconstructions rely, and thus sounded unacceptable to some charcoal specialists. Two alternative explanations, conforming to the precept of an unselective collection of fire wood, were then suggested by peers. The first explanation is that the samples from hearths are not representative of the whole vegetation but only of the logs used for the last fire(s). The abundance of *Arbutus* would then be only due to its use for feeding the hearths shortly before they were abandoned. This argument could be admitted and would even be the most obvious explanation if only one or two fire-places were studied, but is it conceivable that several hearths, used over a three centuries time interval, were all abandoned after a last fire made of the same species, which was probably not the most abundant in the area? Moreover, *Arbutus* is also continuously present in lower but still significant amounts (around 45%) in the long-term record of the well. As it was used as a dump, the well contains refuse from various kinds of activities carried out on the site. Its charcoal spectra tend to prove that *Arbutus* was indeed continuously used on the site for fuel-consuming activities. Due to the erosion of the site and to the scope of the excavation, which was restricted to only part of the archaeological occupation, not all these activities are recorded within the studied area. However, it seems likely that the abundance of *Arbutus* charcoal in the well has something to do with its use in the heated-stone structures. The second explanation proposed for the very high proportions of *Arbutus* in the hearths directly stems from the assumption that domestic fuel accurately reflects the vegetal landscape. The explanation is, therefore, that *Arbutus* was indeed very dominant in the surrounding vegetation, and thus that a random collection of wood led to a reliable record in the charcoal spectra of its proportion in the vegetation at the time the site was occupied. The problem is that such vegetation has no present-day analogue in edaphic contexts comparable to that of the site. Moreover, the record from the well suggests that the fuel from the heated-stone hearths only explains part of the global charcoal spectrum, which means that other species were well represented in the surroundings and that they were not chosen for these fires, which is to say that *Arbutus* was, in fact, deliberately selected.

In this case-study, Occam's razor (principle of parsimony) brings to the fore the hypothesis of targeted harvesting of one species among those available around the site to be used in heated-stones hearths. Nevertheless, such a hypothesis is not easily accepted because it goes against our routine reasoning as anthracologists, built on solid methodological and theoretical bases since the 1980s.

Figure 1. Results of the charcoal analysis of Cazan-Le clos du Moulin (Vernègues, south of France). Raw data is available in Delhon et al. 2017.

Choice as a potential step in the management of the resource

It is striking that alongside the consensus for a random collection of firewood, most of us think in terms of fuel - or at least woodland - 'management' (e.g. Théry-Parisot 2001; Uzquiano 2002; Dufraisse 2008; Henry 2011; Vidal-Matutano et al. 2015; Kabukcu 2017), admitting that firewood gathering is subject - as other activities - to technical, economic and cultural prescriptions. For historical times and/or for specialised activities, we easily accept that fuel may be chosen according to various properties, including the species (for protohistoric and historic fuel selection and the related policies and regulations, see for example: Ntinou et al. 2013; for fuel involved in specialised activities, see for example: Medina-Alcaide, Sanchidrián Torti, and Zapata Peña 2015 and references therein, Théry-Parisot et al. 2018 (Palaeolithic); Newman et al. 2007; Heiss and Oegg 2008 (Bronze and Iron Age); Durand, Duval, and Vaschalde 2010 (Iron Age-Medieval period). However, we still deny that prehistoric societies potentially preferred or rejected certain wood species for use in domestic fires. In spite of this, charcoal analysts admit that choice could have come into play for various other criteria than species. The size of the branches, or the state of the wood are acknowledged as having been subject to selection (Théry-Parisot and Texier 2006; Dufraisse 2008; Heiss and Oegg 2008; Kabukcu 2017;

Chabal et al. 2011; Vidal-Matutano, Henry, and Théry-Parisot 2017). The area where wood was collected is also often considered to have been deliberately and not randomly chosen. These criteria may result in the preferential use of one or a few species, because of the calibre of their branches, their natural self-pruning or their abundance in the lands frequented for firewood collection. Thus, in cases of abnormally high frequency of one or several species, the possibility of a planned selection based on a quality somehow linked with the species should not be *a priori* discounted.

Conclusion

Ethnographical reports show that 'fuelscapes' are an expression of how people perceive, represent and interact with the landscape around them (Maxwell 2011). Anthracology has now sufficiently proved its accuracy for tracing past vegetation and it is time to consider that even for prehistoric times fuel procurement is part of the socio-cultural system and not only the result of an environmental determinism defined by 'availability'. Considering that charcoal assemblages may also be accurate palaeoethnological proxies, we should try to identify the situations in which wood selection is probable in order to examine the criteria involved. The selected feature may not be primarily the species but the vegetal association, the size and the accessibility

of the branches or other phenotypic or phenological characteristics. For example, in Cazan-Le Clos-du-Moulin it is possible that *Arbutus* was not selected *per se* but as a pervasive species in pasturelands, and/or as an alternative to the use of oak, which was preferred for timber (Delhon et al. 2017). While some criteria will always remain incomprehensible to us, many kinds of selection may impact upon the floristic list and may thus be accessible to our knowledge, as we are easily able to identify the species through wood anatomy. In return, we need to be cautious in our interpretations so as in order not to lend an undue significance to the 'species' criteria, as the selection of a particular species may only be the result of an interest in another of its properties. Moreover, even when the species was indeed preferred, we must keep in mind that the systems of plant classification shaped by prehistoric societies may be based on a concept of 'species' very different from ours (Levi-Strauss 1962).

The fact that we allow ourselves to consider the possibility of choice in firewood harvesting, even for domestic fires and even for prehistoric times, does not question the reliability of charcoal analysis for the reconstruction of past vegetation. Anthracologists have an expertise in plant ecology and phytosociology. They are able to detect inconsistencies in the list or in the proportions of taxa that can lead to the identification of selective collection of wood and to the identification of the records that are congruent with conceivable plant associations. Moreover, even if the environmental record is altered (partial or showing biased proportions), it is still possible to propose a reconstruction of the landscape that corrects the observed inconsistencies. However, this can only be done once the distortion of the environmental data has been identified, which supposes that the likelihood of choice is not rejected without having been examined.

By considering the possibility of selection of firewood, particularly in the cases of monodominant charcoal assemblages, we can gain new insights into facets of the socio-economic and cultural practices of prehistoric societies. It may allow us reposition firewood gathering among the other daily activities, to better understand the system of management of wood and more broadly that of the natural resources at large.

Acknowledgements

This paper stems from a presentation at the 23rd Annual Meeting of the European Association of Archaeologists, in a session organised by D. E. Mooney and E. Pinta, to whom I am grateful for accepting my proposition. This work owes much to discussions with various colleagues, particularly during the 6th International Anthracology Meeting in Friburg (Germany) in 2015, where the results from Le Clos du Moulin were first presented. The paper also benefited from valuable suggestions by two anonymous reviewers.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Claire Delhon is a Specialist of charcoal and phytolith analyses in archaeological and palaeoenvironment contexts (Lateglacial-Holocene).

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