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Sylvain Burri, Aline Durand

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New insights into the mobility and seasonal temporary dwellings of charcoal burners from an ethnoarchaeological study in Morocco.

Abstract

Pre-industrial economic activities related to the seasonal exploitation of forest resources, including charcoal production, led to temporary and mobile settlements in the European and Mediterranean outlands. Because they have left few and tenuous traces in the archaeological record, these temporary dwellings and the itinerant lifestyles associated with them are largely unknown. In order to better detect, and interpret such remains, we conducted an ethnoarchaeological survey in Morocco, where some charcoal burners still maintain an itinerant lifestyle. We first examine the types of seasonal temporary encampments of contemporary charcoal burners in two regional contrasting situations (Gharb and Middle Atlas). We then address three archaeological issues: 1) the intra-personal variability and the agility of charcoal burners in adapting the architecture and organization of their encampments, 2) the impact of natural and anthropogenic post-depositional processes on site formation, and 3) the difficulty of associating a temporary dwelling with a particular economic activity.

Key-words

Temporary dwelling; mobility; residential strategies; activity areas; charcoal production; site formation process; wooden building; Morocco

In pre-industrial Europe and the Mediterranean, economic activities related to the seasonal exploitation of natural resources (e.g. various forest products, temporary cultivation of wooded areas, fish, game, ores, minerals, kelp harvesting, etc.) led to temporary settlements in a wide range of environments, from coastlines to the highest mountain ranges, from deserts to boreal forests (Dixon and Theune eds 2021). The creation of temporary dwellings depended on the complex combination of spatial (i.e., distance from residence to production site), temporal (i.e., duration of the operating season, determined by the availability of resources in the environment) and technical (i.e., operating time and monitoring) constraints specific to each activity, whether agropastoral or artisanal (Burri 2012; 2014; 2016; Burri and Durand 2021). Temporary dwellings differed from simple shelters in that they represented an extended form of household (Stagno 2016).

So far, however, archaeological research has focused mainly on upland pastoral dwelling associated with various forms of vertical mobility and transhumance (e.g. Rendu 2003; Collis et al. 2016; Costello and Svensson 2018; Costello 2020; Dixon and Theune eds 2021). Although they were very common in the outlands, the temporary dwellings and the itinerant lifestyles of people who lived off the seasonal exploitation of forest resources are largely unknown, including those of charcoal burners (Burri and Durand 2021).

Charcoal was the main fuel for crafts and industries before the use of coal and other fossil fuels in modern and contemporary times. Its production was widespread in European and Mediterranean forests, and particularly intensive in mining and metallurgical regions. This activity has left material and datable remains in the landscape (i.e., charcoal kiln platforms or pits) (Paradis-Grenouillet, Burri, and Rouaud eds 2018). Charcoal production sites are primarily considered as archives for studying past human-environment interactions and their legacy on present-day forests (e.g. Eriksson and Lundin 2021; Fouedjeu et al. 2021; Máliš et al. 2021). However, little is known about the social aspects of charcoal production and the lifestyle of the

charcoal burners. According to medieval and modern historical data, charcoal burners used to live for several months at a time in huts that were built in the forest (Birrell 1969; Jehan and Dion 2002; Burri 2018; Burri and Durand 2021). Depending on the individual situation, they settled alone, with other charcoal burners (e.g., a partner, an employee, or an apprentice), or with their family. There was little or no regulation of the construction of such seasonal settlements, especially on common land, provided they remained temporary. Charcoal burners' temporary dwellings were built mainly from wood and other perishable materials according to iconography and written documents. This use has endured over time, as 19th and early 20th century oral testimonies and photographs attest (Lugli and Pracchia 1995; Bond 2007). For these reasons, temporary settlements have left few and tenuous traces that are difficult to detect in the archaeological record.

Ethnoarchaeology can contribute to the better detection, study and interpretation of such remains. However, little data is available on charcoal burners temporary dwellings. In fact, European ethnographic and ethnoarchaeological research has focused more on technical, social and symbolic aspects of charcoal production (Lugli and Pracchia 1995; Musset 1996; 2000; De Guio and Zanusso 2000; Hanus, 2000; 2007; Acovitsioti-Hameau 2005; Bond 2007; Martín-Seijo and Teira-Brión 2018; Durand et al. 2018), rather than settlement strategies and associated lifestyles (Acovitsioti-Hameau 2000; Lugli 1998; Lugli and Stopiello 2000; Brincatt et al. 2004; Burri 2008). Unlike in many countries of the Global South, charcoal production in Europe has been largely mechanized and the charcoal burners have become sedentary (e.g., in Southern Italy, Romania and Poland, the main European producer).

This paper presents the results of an ethnoarchaeological survey carried out in 2008, 2009, and 2012 in Morocco, where some charcoal burners still maintain their itinerant way of life (Burri, Durand and Alilou 2013). There, the state is the main owner of forest land. The National Forestry Code regulates the management and use of forest resources, including charcoal

production, to ensure the sustainability of resources and to combat desertification. The legal procedure is to allocate forest land to an individual producer or a cooperative for a fixed period of time. Each holder of an allocation must comply with specific rules that limit the species and volume of wood that can be charred and the multi-year production cycle of the same forest plot. The spatial organization of charcoal production sites also depends on fire prevention regulations (access, distance from the nearest road or building, water supply, etc.). According to the operating contract, charcoal burners are allowed to harvest some wood material for the construction of their temporary dwellings. However, no details are given. Forest regulations, if strictly applied, may conflict with the traditional customary rights of local communities to use forest resources, especially in mountainous areas. This explains why illegal charcoal burning appears to be widespread in remote areas, either to meet household needs or to generate additional income during the 'off-season'. Small-scale illicit charcoal production takes place directly in the forest, without creating temporary settlements, as well as at home. Two techniques are used for charcoal production. On the one hand, circular charcoal kilns built on platforms are used to produce charcoal from various tree species (e.g. eucalyptus, oak, pines, old fruit trees, etc - Burri, Durand and Alilou 2013). On the other hand, charcoal production in pits is mainly used for the small-scale production of heather charcoal for metalworking in the Rif region (Durand et al. 2018).

We conducted three two-week surveys among groups of legal charcoal burners using the circular charcoal kiln technique in two regions: the Gharb Plain and the Middle Atlas ([Figure 1](#)). The surveys consisted of oral interviews, non-invasive archaeological surveys of occupied temporary encampments and abandoned sites. Oral interviews focused on five teams of charcoal burners (two male teams; two family groups; one individual working alone). A more in-depth oral survey involved a team of charcoal burners (Hassan C. and Rachid El. A.) who were visited and interviewed during each individual survey. The archaeological work consisted

of photographic documentation, plans and profiles of the various structures that made up the encampments (i.e., temporary dwellings, associated structures, and outdoor activity areas). We tried to select representative sites, although our survey was limited by the Water and Forest Department's permission to access the production sites, and by the people's consent to be interviewed and to have access to their private encampment. We have documented the architecture and spatio-functional organization of ten occupied camps (four in Gharb and six in the Middle Atlas). Two sites were reexamined after a year of abandonment (one in Gharb and one in the Middle Atlas). Soil sampling for chemical analysis was conducted at one site to test the potential of organic chemistry to detect the traces of temporary occupation in the soils. In addition, five abandoned huts (Gharb) were archaeologically recorded. The objectives were 1) to document the diversity of charcoal burners' mobility patterns, and associated encampments; 2) to analyze the relationship that exists between different forms of temporary housing, different factors of work-related mobility, and specific technical constraints; 3) to reflect on the archaeological detection, study and interpretation of wooden open-air campsites remains.

I. "Traditional" mobility and temporary settlement patters in the Middle Atlas

1. 1. Labor organization of charcoal production

In the Middle Atlas, the forest used for charcoal production that we studied were located between 1300 and 1800 meters above sea level. These were evergreen oak forests that were managed as coppice to increase biomass production, especially logs of the same size. Charcoal burners were responsible for the entire production chain, from wood harvesting to charcoal production. Usually, the working season lasts several months, from spring to the first winter snow. The duration of each charcoal kiln pyrolysis ranged from 10 to 15 days, depending on the amount of wood to be charred. The temporary installation of the charcoal burners on the plot was necessary due to the remoteness of the forest and the duration of the activity. In some

cases, the producers can occasionally come back home, especially when they have children attending school (which are a minority) (figure 2). Weekly food supplies are bought from the nearest *souk* (weekly open-air market). Daily water supply is drawn from the nearest spring. The size, complexity and social composition of charcoal burners' encampments depended on the area of the forest plot exploited, and on the holder of the allocation (i.e., an individual or a cooperative). These factors determined the nature and the number of people involved in charcoal production. In the case of a charcoal burner working alone on a small forest plot, such as Mouha B. (Naour, 2008), the encampment consisted of a single unit. If the size of the plot was more important, it was exploited within a family group. In this case, encampments included several units belonging to the same family group (i.e. one for the father and the mother; one for each son and its wife), such as that of Mohamed Y.'s family (Naour, 2009). In the case of large-scale exploitations by charcoal cooperatives, such as the one observed in Bounoual (Zaouiatch-Cheikh) in 2009, temporary village encampments inhabited by several families were created. In this encampment, which was occupied from May to early December, a temporary wooden mosque was built during the month of Ramadan. It was served by an imam from the nearby town of El Ksiba.

2. Organization and architecture of the temporary encampments

2. 1. Single household unit

Mouha B.'s encampment (Naour, 2009) is the only encampment consisting of a single household unit that we could study (figure 2, type 1). It consisted of a 9m² rectangular hut with trusses made of rafters, built on an artificial platform excavated in the slope, and a bread oven built a few meters below. The interior space of the dwelling was divided into two main functional areas, one for food preparation, consumption and heating, and the other for resting and sometimes socializing and eating. The latter was covered with cardboard and carpets. The

rest of the floor was made of earth. Food was cooked near the fireplace on a mobile burner. The outdoor oven was used to bake bread and heat water for tea.

2.2 Family household unit

The family encampments usually consisted of a dwelling, a kitchen area with hearth/bread oven and storage facilities (e.g., Mohamed C.'s household in Bounoual, Zaouïat-ech-Cheikh, in 2009 - [figure 2 type 2](#)). Some units also included domestic animal shelters (e.g., Mohamed Y.'s household in Naour 2009 - [figure 2 type 3](#)). The most complex were composed of a dwelling, a hearth, a bread oven, an outdoor storage area, and animal shelters; the entire household unit was delimited by fences made of branches (e.g. Bacha H.'s household in Bounoual, Zaouïat-ech-Cheikh, in 2009).

We observed two types of temporary housing architectures ([figure 3](#)). The first type was a rectangular hut built on a frame made of vertical load-bearing posts, supporting a ridge beam. Several dwellings of this type were investigated in October 2009 at Bounoual (Zaouiat-ech-Cheikh). Usually, the main ridge beam was supported by two vertical posts with forked ends. Crossbeams were placed perpendicular to the ridge beam at each end of the cabin. They were supported by shorter corner posts, to form the peaked roof. Smaller diameter poles formed the wooden framework of the walls. Some dwellings were partially dug into the ground (e.g., Hassan Ch. family's hut). A trench was sometimes dug around the hut to drain rainwater (e.g., Bacha H. family's hut). The second type was a rectangular hut with rafters forming a truss, such as Mohamed Y. family's hut at Naour in 2009.

The two types of dwellings shared the same spatio-functional organization. The huts where Mohamed Y., his three sons, and his daughter-in-law lived (Naour, 2009) were representative of the several family dwellings that have been studied or just visited. The interior space of the dwelling was divided into several activity areas. The kitchen area was located to the right of the

entrance. It was equipped with a wood stove placed on a stone slab. An indoor hearth and a brasero completed the kitchen equipment. Cooking dishes, such as *tajines*, were placed on other slabs. Food was stored along the side wall. At the back of the hut, in a small apse, a wooden bench was also used for storage (both on and under it). A small bench, shaped by the excavation of the floor, was used for storing personal belongings. The living space was located in the middle of the hut. It was covered with textile carpets laid on plastic sheets placed on the floor. Woolen rugs and blankets were only brought in during the evening and removed in the morning. Thus, the spatial arrangement changes between day and night. In some family dwellings, the sleeping area was completely cleared during the day and remade at night, as in the hut of Hassan C., his wife, and his son (figure 4).

Encampments also included outdoor cooking facilities: the hearth used for cooking and boiling tea and/or the oven for baking bread. The simplest type of hearth was a circular outdoor hearth placed directly on the ground, without any structure. Many hearths were equipped with three stones, or pieces of ceramic, that were used as trivets. These elements were moved in almost every cooking event, adapting the morphology of the earth to the activity (e.g., heating water, cooking *tajines*, etc.). Some hearths were equipped with a windbreak to protect them from prevailing winds. For example, the household unit of a brother of Mohamed Y. (Naour, 2009) was equipped with an outdoor hearth placed in an excavated area below his dwelling. Already protected by its topographical position and by the excavation in the floor, this hearth was also three-quarters surrounded by a line of stones that form a wind break. All the family household units were equipped with a bread oven. A simple open outdoor bread oven was observed at Mohamed Y.'s and a sheltered one at Mohamed T.'s at Bounoual (Zaouiat-ech-Cheikh, 2009). In the family unit of Mohamed C. in Bounoual, a conical hut was used as a shelter for the bread oven and for storing firewood and cooking utensils (Zaouiat-ech-Cheikh, 2009). Unlike in single household unit, cooking was done by women. We did not observe well-delimited

disposal areas. Food waste was simply thrown away from the outdoor space between the dwelling and the hearth and/or oven, to keep it clean.

Other outdoor structures were used for food storage. In the household unit of Mohamed C., at Bounoual (Zaouïat-ech-Cheikh, 2009), vegetables were preserved in a small wooden shelter covered with jute cloth, and in the hollow of a tree, arranged with jute cloth and covered up with earth. Sometimes, vegetables were safely stored at height, to protect them from wild and domestic animals. In fact, when families settle in the forest far away from the villages, they bring animals with them, such as chickens and pack animals (i.e., donkeys or mules) to transport logs and charcoal, water, and food. Domestic animals were partially fed with food waste (e.g. peelings, bones). Shelters were built to house these animals, such as a chicken coop and a dog kennel in Bacha H.'s household unit at Bounoual (Zaouïat-ech-Cheikh, 2009). Trees were often used as a natural shelter.

II. The on-going impact of modernization on the lifestyle of charcoal burners in the Gharb region

1. The segmentation of the production chain and its impact on charcoal burners' residential strategies

Natural lowland forests of Gharb were historically dominated by native cork oak. They are now fragmented and partially replaced by eucalyptus, a fast-growing non-native species used in the pulp industry and charcoal burning. At the time of our survey, the organization of charcoal burning was being profoundly affected by the increasing modernization and industrialization of the forest management. Contrary to the situation observed in the Middle Atlas, the technical chain for charcoal burning has been divided into three categories of actors. Each category was in charge of a specific technical sequence. Wood cutters were responsible for cutting down trees and sorting the wood into lumber, pulp, and wood for charcoal. The logs to be charred were

stacked in rectangular piles. The standardized size of the piles corresponds to the cubic volume of the future charcoal kiln. A second group of workers was specialized in the construction of the charcoal kiln with the logs. A third group, which we will call here “charcoal burners”, was responsible for the charring process, from covering the wood pile with leaves and earth to performing the pyrolysis, to recovering the charcoal (figure 5).

This technical segmentation of the production had a major impact on the way of life of the workers. Because of its specific constraints, each technical sequence (i.e., harvesting wood; building the wood piles; charcoal burning) results in a particular temporary occupation of the site. It may or may not lead to a temporary settlement. On the one hand, wood harvesting is a labor-intensive phase. It can last several months depending on the area of the forest to be harvested. Loggers lived with their relatives (i.e. wives and children) in large encampments consisting of several family household units. Since the encampments we have observed were not too far away from villages, no temporary mosque was built. On the other hand, the construction of the piles of wood that make up the charcoal kilns was done exclusively by men. They were often related to each other in various ways (e.g. father and son, brothers, cousins). Since it took about half a day to build each charcoal kiln pile, these workers did not have to settle in the forest. They returned home at night, as observed in Ouled Hmid (Sidi Slimane, 2008) and Bouftifene (Sidi Yahya, 2009). During the day, they built a fire to make tea and to cook lunch. This hearth was the only tangible evidence of their temporary presence on the site. Eventually, the charcoal burners settled at the production site because of the length of the charring process (about 15 days) and the need for constant supervision to prevent the charcoal from catching fire or, on the contrary, burning out. The mobile encampments of loggers and charcoal burners followed one another on the same plot of forest (figure 5).

2. Organization and architecture of the encampments

The charcoal burners settled at the production site for a shorter period (3-4 months) than in the Middle Atlas because they did not cut the wood and did not build the charcoal kiln. Unlike in the Middle Atlas, all the charcoal burners' encampments we observed in the Gharb were exclusively male. The members of a charcoal-burning team all lived together in the same dwelling, and never in separate individual huts. The distance between the production site and the main family home determined the mobility pattern and how the charcoal burners are supplied. If the production site was close enough to their main home, the charcoal burners might travel regularly between the production site and home on condition that one of the workers remained to monitor the firing process and the charcoal stockpile. They were usually supplied by family members (i.e., wife and/or children) (Mobility pattern 1, figure 6). If the distance was too great, the charcoal burners returned home only occasionally. They went to the nearest spring for water once a day and to the nearest *souk* for food once a week (Mobility pattern 2, figure 6).

According to the mobility pattern, the encampments are more or less complex (figure 6). The simplest and most common type of household unit consisted of a temporary dwelling and an outdoor hearth (e.g., the household unit of Hassan C. and Rachid El A.'s at Bouftifene, Sidi Yahyia, in 2008 – type 1, figure 6). More complex units consisted of a dwelling, one or more outdoor hearths, and a separate structure used as kitchen (e.g. the household of Ben A. and his colleagues in Bouftifene (Sidi Yahyia) in 2008 – type 3 figure 6). Some household units were also equipped with a storage structure and/or a “hammam” (i.e. a small hut used for showering) (type 2 figure 6).

Three types of temporary dwelling architecture have been observed (figure 7). The simplest is the conical hut built with poles implanted in the ground (figure 7A). This form is not specific to the temporary dwellings of charcoal burners, as it was also observed in the camps of stump removers and woodcutters in Sidi Slimane (2008). The second type is the rectangular hut with

rafters forming a truss, such as the one observed at the camp of Ben A. and his team in Bouftifene (Sidi Yahyia, 2008 – [figure 7B](#)). In this case, although the floor plan was rectangular, the two ends were apse-shaped. The third type is the rectangular hut built on a frame made of vertical posts, supporting a ridge beam ([figure 7C](#)), which was observed in the Khemisset area (2009). The wooden frame of the roof rested on two axial posts, supporting a ridge beam. The wooden frame of the wall consisted of a series of inclined rafters set into the ground, evenly spaced, and tied to the ridge beam with string or a strip of cloth. Two posts structured the entrance.

Usually, the interior space was divided into several activity areas ([figure 8](#)). However, some areas were polyvalent. The central space consisted of a convivial area used for various activities such as drinking tea, eating, resting, talking and sleeping. The floor was covered with plant material (i.e. leaves) or synthetic carpets, which were then covered with woollen rugs. The domestic space was sometimes delineated by structural elements such as horizontal beams placed on the floor. For example, in Ben A.' dwelling (Bouftifene, 2008), which was built to accommodate three men, the living space was divided into three distinct areas by two tree trunks placed on the floor perpendicular to the side walls. The central area was the living space. The floor was first covered with a layer of eucalyptus leaf litter, then with a layer of plastic sheeting to improve insulation against moisture, and finally with woollen carpets. The occupants removed the carpets during the day, so as not to dirty them. In the evening, they put them back again in the evening and added some blankets for sleeping at night. The personal belongings of the charcoal burners were stored at the back of the living area. The space located between the entrance and the living area was used to store food, cooking utensils and dishes. The rafters and beams were used to store bread.

The most common outdoor cooking facility was the hearth. We once observed a conical post-hole hut used for cooking during bad weather and winter (e.g., Ben A.'s household unit at

Bouftifene south, Sidi Yahyia, 2008). At the time of our survey (in September), this “kitchen hut” was only used to store kitchen utensils, as cooking was done on the outdoor hearth when the weather was nice. Unlike in the Middle Atlas, the charcoal burners did not build a bread oven. Instead, they cooked bread in ceramic plates directly on the outdoor hearth.

Encampments rarely have well-defined disposal areas. We have once observed pits for the disposal of food waste (e.g., peels, carcasses and feathers) at Ben A.’s campsite at Bouftifene south (Sidi Yahyia, 2008). The pits were covered and sealed with earth after use.

III. Archaeological implications for the study of past charcoal burners’ temporary settlements

1. The impact of the intra-personal variability and agility on the architectures and organization of encampments’ sites.

The study of successive encampments built and occupied by the same team of charcoal burners (Hassan C. and Rachid El A.) in the Gharb region (2008, 2009, and 2012) has revealed the importance of intrapersonal variability over a short period of time and the agility of charcoal burners in adapting construction methods and encampments organization.

1.1. The 2008 encampment at Bouftifene North (Sidi Yahyia, Gharb)

In 2008, Hassan C. and his cousin Rachid El A. were settled on a large plot of land planted with eucalyptus trees in the north of Bouftifene. Their first dwelling was a 12m² conical hut, built in late September (figure 7A.) The wooden frame consisted of a series of seventeen rafters. The rafters, made of raw eucalyptus wood, were set into the ground at a steep angle so that they could be tied together in the center of the hut with a piece of plastic sheeting. The hut was 1.70 m high in the center. The entrance was 0.90 m wide. The roof consisted of a layer of eucalyptus leaves and branches covered with plastic sheeting. Outside, a cordon of earth covered the

bottom of the plastic sheeting to secure it to the ground. This soil was excavated from the area immediately surrounding the hut.

This dwelling was built to accommodate Hassan, and occasionally Rachid. Rachid, who was a young father at the time, usually traveled by bicycle from home to the production site every day. The interior space was divided into several activity areas (figure 8). In the center of the dwelling, the living area was used for resting and socializing. Its floor was covered with overlapping carpets and pillows. This area was converted into a sleeping area after dinner. When Rachid stayed for overnight, this area was divided into two parts, one for each person. Personal belongings were kept in the back, while kitchen utensils and supplies were stored near the entrance. As in every dwelling observed in the Gharb, there was no hearth or stove in the dwelling for heating. Cooking was always done on the outdoor hearth. A few weeks later, this dwelling was dismantled and rebuilt on another part of the site, closer to the nearest charcoal kilns to be charred. The oral interview conducted in 2012 revealed that this encampment was unusual because of the short distance between the site and the charcoal burners' house. That is why the charcoal burners did not build any additional structures, such as a "hammam", that year.

1.2 The 2009 encampment at Sidi Chouari Ain el Kenabe (Gharb)

In the fall and winter of 2009, Hassan C. and Rachid El A. worked on a plot of eucalyptus forest in Sidi Chouari Ain el Kenabe. Mustafa L., Hassan's cousin, had purchased the right to produce charcoal on this plot. This year, they were joined by Mustapha B., who was married to a niece of Hassan C.. Mustapha B. came from a family of shepherds. It was the first time he worked as a charcoal burner for the first time to supplement his income. Hassan C. was responsible for his training. The team settled on the plot on September 26th. The construction of the temporary dwelling was supervised by Hassan C., assisted by Rachid El. A., and to a lesser extent by Mustapha B.. The construction phase has been thoroughly recorded and studied (Burri and Durand 2016). The encampment was a simple household unit consisting of a dwelling and a

hearth, located about 5 m in front of the hut entrance (figure 9A-B). The dwelling consisted of a rectangular cross-framed hut. The size of the team (3 men in 2009 versus 1-2 in 2008) had little effect on the size of the hut: 13 m² *versus* 12m² the year before (but the actual living space in 2008 was smaller because of the conical shape of the hut).

Despite the change in plan and construction techniques (i.e., from conical to rectangular plan), the same spatio-functional organization was observed (fig. 9C). The division of the space into two areas was again achieved by using different floor coverings. The living area in the middle had a plastic floor covered by several layers of woollen rugs, while the rest of the floor was used for storage. The small awning was used to store food (mainly flour and olive oil) and dishes. Fresh vegetables and meat were delivered once a week. The personal belongings were stored along the east-west wall. Some of the clothes and other personal belongings were hung directly on the wooden frame (fig. 9D-E). The living area was structured with rugs and cushions. During the day, most of the cushions and blankets were stacked along the northeast wall, forming a kind of bench that was used as a backrest when sitting. This area was used for preparing food (especially bread making), eating (breakfast and dinner), drinking tea, smoking, and talking. At night, the area was swept and divided into three separate sleeping areas (four when Mustafa L. occasionally stayed overnight) marked out on the floor by the carpets. A hole in the plastic sheeting was used for ventilation. Sometimes the northeast side was also opened for a few hours for ventilation by removing the plastic sheeting and the layer of leaves. As in 2008, the hut was not equipped with a stove, although the charcoal burners lived there until December and the cooking area was outside. About ten days after our survey, they built a “hammam”.

1.3. The 2012 encampment at Oulage (Dlaha, Gharb)

On October 4 2012, Hassan C. and Rachid El A. set up their encampment in a eucalyptus forest at Oulage (Dlaha, Gharb), along the access road. They were responsible for the charring of 52

charcoal kilns. They were occasionally assisted by Medhi El A., Rachid's nephew. Their encampment consisted of a dwelling, a hearth, a hammam, and a light shelter called a "nouella" (figure 10). As in 2008, the dwelling was a conical hut, made of poles planted in the ground and tied together in the middle. The wooden frame was covered first with plastic sheeting and then with a layer of eucalyptus branches and leaves. But, unlike the 2008 hut, the bottom of the plastic sheeting was not covered with a cordon of earth to secure it to the ground, because, this time, the sheeting was long enough. The functional organization of the hut was the same as in 2008. To the right of the entrance there was a food storage area, while to the left was the kitchen equipment. The floor of the hut was covered with carpets and used as living space (figure 10B). At night, this area was divided into two, one for each charcoal burner to sleep in. Personal belongings were stored in the back. Some of their clothes were hung from the rafters. As in previous years, there was no stove. Only a small gas lamp was used for lighting, instead of the candles used in 2008 and 2009. Cooking was done outside on a hearth with three stones used as trivets.

A hammam was built at the rear of the dwelling (figure 10C). It was a rectangular structure made up of load-bearing posts supporting a cross-beam assembly that formed the roof structure. The entire structure was covered only with plastic sheeting. Inside, a plastic sheet was placed on the floor of the shower area. A wooden log was used as a seat and a bucket for water. Soap and shampoo were stored on the floor, to the left of the entrance. Because of the warm weather, the charcoal burners built a sunshade made of a wooden frame on a eucalyptus stump (nouella). This cooler area, with carpets and cushions on the floor, was used for resting and drinking tea during the day (figure 10D). Another light structure, consisting of a pole supported by two posts planted in the ground, was used as a clothesline to dry clothes after washing. It was set up and taken down for each wash. This encampment was designed to be dismantled and rebuilt elsewhere. When the charring of each group of charcoal kilns was completed, it was rebuilt

near to the next group of charcoal kilns, using the same construction materials, including the rafters, plastic sheeting and even the stones used for the hearths, which were scarce in this type of sandy soil.

2. The importance of natural and anthropogenic post-depositional processes in site formation

In order to consider what kind of archaeological traces these temporary settlements might leave, two sites were surveyed once during their occupation and a second time about a year after their abandonment. The first site was occupied by Hassan C. and Rachid El. A. in 2008 (i.e., a 12m² conical hut and an outdoor hearth area about 5 meters away, see above for details). One year after its abandonment, its traces were very faint (figure 11). The sprouts from the eucalyptus stumps that framed the site in 2008 were over 2 meters high. The remains of the hut consisted of a circular ring of earth surrounding a slight depression, and a series of excavations. The ring of earth was the negative trace of the earth that had been placed at the base of the structure to secure the plastic sheeting used to insulate it. This remain is not usual, as they excavated earth only because the plastic sheeting was too short that year. Nothing remained of the wooden structure, which had been dismantled to be moved and rebuilt as they progressed through the plot. The holes where the rafters had been planted were no longer visible. This lack of evidence was undoubtedly due to the intentional removal of the rafters, but also to the sandy soil. A charcoal lens was recorded inside the former interior living area. Since the floor of the living area was completely covered during the life of the structure, this charcoal lens was probably the remains of a fireplace lit by shepherds after the structure was abandoned. This hypothesis is supported by the location of this lens in relation to the former sloping cover, which consisted of dry, highly flammable leaves. The remains of the outdoor hearth were still visible. The three stones used to support the dishes during cooking remained in place. The ash and charcoal had been partially washed away by rain and the trampling of livestock (this area was grazed by

sheep in 2009). The ash and charcoal spread was 1.80 m wide and about 2.40 m long along the slight natural slope. The eucalyptus shoots destroyed a part of the hearth. A few artifacts still bear witness to the domestic life of the ancient settlement (e.g., tea glasses, lighters, cigarette packets, fragments of jute sacks).

The second case study was the encampment of Mouha B. in Naour (Middle Atlas), which was occupied in 2009. Located halfway up a mountain slope (1400 m asl), this site was particularly exposed to erosion ([figure 12](#)). The erosive activity was exacerbated by the cultivation of a cleared plot of land immediately above the charcoal production site. Eleven months after the site was abandoned, erosion has created two main channels that carry water from upstream. Most of the charcoal burning platforms located in these channels had almost completely disappeared. The supporting walls of the platforms had been completely destroyed. Sometimes only a few shreds of charcoal remained. This is in addition to the erosion caused by the flooding of the stream at the lower edge of the plot, which washed away a large portion of these cultivated fields during the heavy storms of September 2010. Erosion was not the only process that had altered the formation of archaeological remains at this site. The charcoal burner placed some of his charcoal kilns on an agricultural field. This field was plowed and cultivated after the charcoal production was finished. Thus, the plowing destroyed the traces of the charcoal kilns. On the rest of the site, the evergreen oak coppice had begun to regenerate, partially threatening the preservation of the remains.

The process of site formation was also driven by anthropogenic factors, such as the dismantling of the hut structure and the recovery of building materials. As the charcoal burner told us during the oral interview in 2008, he completely dismantled his hut at the end of the working season, taking away the wooden frame (beams and rafters) and the plastic sheets. In 2009, there was practically no material left from the temporary dwelling. The removal of the building materials had favored erosion. The trace of the excavated platform on which the hut was built, although

eroded, was still visible. Two small posts that supported the platform remained. The bread oven had lost its roof due to the recovery of a plastic sheet, and the earthen walls had begun to melt. Given the rapid disappearance of the remains, we wanted to know if this type of short-term occupation could leave chemical traces in the soils as observed in permanent settlements. We sampled the interior floor of the former hut (following a grid of 0.50x0.50m) and the exterior, including the bread oven area (larger grid of 1x1m). The samples were analyzed by spot tests to detect the presence of phosphates, fatty acids, and protein residues (please see Pecci et al. 2016 for methodological details). Phosphates, which are indicators of organic matter decomposition, were distributed over almost the entire study area. However, their distribution is partly related to that of ash and of food preparation and consumption. Fatty acids found in animal and vegetable oils and fats, were detected throughout the study area. However, some concentrations were observed both inside the hut close to the place where the mobile burner was used for cooking. Protein residues, which can result from food preparation activities, cooking, and consumption of food, were also present on most of the surfaces. Fats and proteins were also found in the sleeping area at lower levels than in the rest of the hut. This could be explained by the multifunctionality of the area (i.e. sleeping and eating). There were also two outdoor concentrations of fats and proteins: one in front of the entrance, corresponding to the hearth disposal area, and the other is located around the bread oven. Mouha B. explained in 2009 that he used to eat outside when the weather was nice and that he liked to eat bread with olive oil. In addition, this area was used as a waste disposal area. All these factors could explain the presence of fats in this area.

3. The problem of associating the archaeological remains of temporary dwellings to a specific production activity

To determine whether it is archaeologically possible to distinguish between dwellings associated with different activities on the same site, we conducted a blind survey of abandoned encampments. We then collected oral information about them when it was possible. A first example is the abandoned encampment studied at Bouftifene north (Sidi Yahyia, Gharb) in 2008. It consisted of a temporary dwelling, an outdoor cooking area with two hearths and a small conical shelter. The structure of the temporary dwelling was severely degraded, but its construction materials were not removed during or after abandonment. It was a rectangular hut built on a frame made of vertical posts, supporting a ridge beam, of which only the ridge beam, supporting posts and a few rafters remain. The structure was covered with long branches with foliage, probably green at the time of construction. Since its abandonment, the old foliage has covered a large area around the structure and has been carried south by the wind. The entrance would be located on the north side. The outdoor hearth area consisted of two charcoal concentrations, marking the location of either a double hearth (one for cooking and one for tea) or two successive hearths. About 4 m east of the hearth area, a small conical shelter with small rafters was built. Its shape suggests a small kitchen shelter, but no trace of a fire was found inside. It could have been a shelter used as warehouse or a hammam. There are no architectural elements or artifacts to indicate what activity the encampment was associated with. According to the testimony of Hassan C., it was built and occupied by a woodcutter team in the spring 2008. Thus, the site was archaeologically recorded at most 6 months after its abandonment. Hassan C. did not know the identity of the inhabitants, their number, or the exact duration of the occupation.

Two other encampments were investigated in Sidi Chouari ain el-Kenabe in 2009 (figure 13). The first was a simple encampment consisting of a temporary dwelling and an outdoor hearth area 5 m apart. Very few architectural elements have been preserved: three pieces of rafters and fabric ties. The boundaries of the former dwelling were delineated by a crown of foliage from

the plant cover. Some of the leaves were raked and used to cover a charcoal kiln built next door. Three postholes were still visible. Two post holes were aligned with what would have been the entrance to the dwelling, opposite the outdoor hearth area. Their large diameter (c. 25 cm) argues for two vertical support posts. The role of a third post hole, of smaller diameter (c. 10 cm), is unknown. The outdoor hearth area consisted of a hearth and an outwash, which would be a disposal area. The hearth was formerly equipped with three pebbles for setting dishes on fire. Only one of these pebbles was still in place, but the negatives of the other two were still visible. The concentration of charcoal was highest in the area between the pebbles. The outwash consisted of two layers distinguished by their differential charcoal concentration. The oral interview conducted with Hassan C.'s team revealed that this encampment was occupied by Saïd L., a relative of Mustapha L.. He had been hired by Mustapha L. to cut the wood in the spring that had been charred in the fall. He lived alone in this dwelling alone for about 2-3 months.

The second site studied was also a simple encampment consisting of a dwelling and an outdoor cooking area. The similarities between the archaeological traces left by this occupation and the previous one are striking. The remains of the rectangular dwelling consisted of two postholes, the axis of which was marked by a wreath of foliage. The outdoor cooking area was located about 11 m from the dwelling. It consisted of two very different hearths: a lenticular hearth and a hearth with three pebbles, two of which were preserved. Again, from the only archaeological remains, there was no way of knowing whether this occupation was related to charcoal burning or wood cutting. The oral interview confirmed that it was occupied by a woodcutter during the previous spring. However, since the woodcutter was not a relative, Mustafa L. did not remember his identity. He told us that some woodcutters also lived on the same forest plot with their families, such as Abdelilah, his brother-in-law, and his wife Fatima. The poor preservation of the remains of these huts after 6 to 8 months of abandonment suggests that most of the building

materials were removed and taken away either at the end of the occupation or after abandonment. Since we followed the installation and construction of the charcoal makers' hut, we are certain that these materials were not reused in the charcoal team's hut.

Conclusion

Based on the results of our ethnoarchaeological investigation, we proposed a first description of the types of seasonal temporary encampments and dwellings of contemporary Moroccan charcoal burners in terms of functional organization, working conditions, and the nature and number of inhabitants (teams of workers *versus* family groups). The complexity of the composition of the encampments depended mainly on the nature of their inhabitants, i.e. the number of persons and the social composition of the group (men, women, children). The most complex sites were always family encampments. On the contrary, the simplest ones were those of male individuals working alone or duets of male producers. The distance of the production site from the producers' permanent residence also influenced the composition of the encampments. All the dwellings were built entirely of perishable materials (wood, leaves, jute or woollen canvas), except for the recent use of plastic sheetings. The variety of plans, construction techniques, and similarities in size and construction techniques between, for example, conical dwellings and conical kitchen/storage shelters increases the difficulty of correctly interpreting their potential archaeological remains. The study of the internal spatio-functional organization of the dwellings revealed their polyvalence and plasticity in the use of domestic space. The organization and furniture were adapted to different domestic and convivial activities, and to the presence of occasional guests. This polyvalence was observed in all types of dwellings, regardless of their size, layout, and construction techniques, in both the Gharb and the Middle Atlas.

In addition to this description, one of the important results of this study is to record the strong impact of the modernization of work organization on mobility and settlement strategies. Contrary to the Middle Atlas, where charcoal burners continued to work in a traditional way by controlling the entire operational chain, the fragmentation of the technical operating chain in the Gharb changed the way charcoal burners practiced their work and their lifestyle. This in turn changed the traces left by this activity in the archaeological record. On the same forest plot, two types of mobile and temporary encampments were set up 2-3 months apart: those of woodcutters, who usually lived with their relatives, with some exceptions, and those of male charcoal burners teams. The short duration of these occupations (3-4 months at most), the paucity of material culture left behind, the construction of the same types of huts, the same organization of the encampments, their mobility within the forest plot, and the short time between the departure of the woodcutters' teams (late spring) and the arrival of the charcoal burners' teams (early autumn) pose a great challenge to the archaeologist who wants to distinguish between the two types of settlements and reconstruct the exact chronology of the work on the site. The remains of the succession of woodcutters and charcoal burners encampments, in addition to the hearths of the charcoal kiln builders, on the same forest plot may be misinterpreted by archaeologists as a charcoal burners' village encampments similar to those of Middle Atlas. Moreover, the study of abandoned loggers' camps suggests that it is not possible to distinguish between loggers' and charcoal burners' encampments based on the archaeological remains and material culture alone, at least in the Gharb. It is also impossible to estimate the short duration of occupation of the dwellings.

Similarly, the study of the successive encampments of the same team of charcoal burners cautions archaeologists against the overinterpretation of the shapes and sizes of the dwellings. Differences may be related to intra-personal variability and the agility of charcoal burners to adapt the architecture and the organization of their encampments to different conditions from

one year to the next. However, although their dwellings varied in plan and method of construction, we have observed a certain regularity in the organization and use of both interior and exterior spaces.

Ultimately, the study of natural and anthropogenic post-depositional processes on site formation and preservation has highlighted the significant impact of two anthropogenic factors: the mobility of the dwellings on the same site, and the removability of building materials at the end of the working season. Soil chemical analysis conducted at Mouha B.'s encampment site showed that chemical contamination of soils from human activities may be the final trace of such temporary occupation. Chemical analysis could also be useful to characterize the functions of different structures within the same campsite (e.g., conical huts used as dwellings, as kitchens, as storage or animal shelter). However, the chemical detection of activity areas within a same structure may be limited by the multifunctionality of spaces. An important question for further research is to know to what extent and under what conditions such chemical traces can be preserved over time.

Our results do not allow for definitive conclusions, which must be based on more quantitative data. It is, however, a milestone for further research into the relationship between mobility and temporary settlement patterns. It also contributes to the global reflection on the past itinerant lifestyle of charcoal burners and forest workers by inviting archaeologists and historians to explore temporary settlement from social perspectives (e.g. individual, collective, male or family, etc.). More generally, it provides new insights into seasonal mobile open-air settlements, built entirely of wood, which are still poorly documented in the archaeological and ethnographic literature in Europe and the Mediterranean.

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Figure captions

Figure 1: Location of the investigated forest areas.

Figure 2: Mobility patterns and encampment organization in the Middle Atlas.

Figure 3: Architecture of the temporary dwellings (Middle Atlas).

Figure 4: Spatio-functional organization of Hassan C.'s dwelling at Bounoual (Zaouiat-ech-Cheikh, 06/10/2009)

Figure 1 : Mobility and succession of the woodcutters' and charcoal burners' encampments on the same forest plot

Figure 2 : Mobility patterns and encampment organization in the Gharb

Figure 7: Architecture of the temporary dwellings (Gharb)

Figure 8: Spatio-functional organization of the dwelling in 2008

Figure 9: Spatio-functional organization of the encampment and dwelling in 2009

Figure 10: The encampment organization in 2012.

Figure 11: The remains of the 2008 dwelling a year after abandonment (Sidi Yahyia, Gharb)).

Figure 12: Natural and anthropogenic post-depositional processes at Naour (2009).