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Research Article

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Herders and Pioneers: The Role of Pastoralism in the Neolithization of the Amblés Valley (Ávila, Central Iberia)

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Abstract: In recent years, the notion of landscape learning has been the object of increasing attention when discussing the neolithization of Europe. The landscape learning model stresses the necessity of gathering environmental information about a previously unfamiliar region. Therefore, it is particularly relevant in cases where the beginning of a farming economy is better explained in relation to the movements of peoples (colonization), rather than to the adoption of crops and livestock by pre-existing hunters and gatherers (acculturation). Unlike other Iberian regions, where the adoption of agriculture runs parallel to that of animal husbandry, the available data on the neolithization process of the Sierra de Gredos mountain range seem to suggest that raising livestock may have preceded plant cultivation. Based on an interdisciplinary and multi-proxy approach, this paper explores the idea that the adoption of a food-producing economy in the Amblés Valley (Ávila, Central Iberia) may have been connected with pastoralism. In this context, landscape learning provides a model for analyzing how Early Neolithic herders in their seasonal movements were capable of wayfinding by memorizing spatial features that functioned as visual landmarks.

Keywords: neolithization, Central Iberia, mountain environment, pastoralism, landscape learning

1 Introduction

The most widely accepted view links the neolithization process in Iberia, which started *ca*. 5700 cal BC (Alday, 2009; Baldellou Martínez, 2011; García Borja, Salazar García, Jordá Pardo, Pérez Ripoll, & Aura Tortosa, 2018; García Puchol, Diez Castillo, & Pardo-Gordó, 2018; Oms, Esteve, Mestres, Martín, & Martins,

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2014) to the arrival of agrarian communities, who most likely came from the Central Mediterranean and the Ligurian coast of Italy and southeastern France, and who also brought Impressed Ware pottery with them (Bernabeu & Martí, 2014; Bernabeu, Orozco, Díez Castillo, Gómez, & Molina, 2003; García Martínez de Lagrán, 2015; López Sáez & Cruz, 2006; López Sáez, López García, & López Merino, 2006; López Sáez, López Merino, Pérez Díaz, & Alba Sánchez, 2011; López Sáez, Pérez Díaz, & Alba, 2011; Riera Mora, López Sáez, & Argilagós, 2004). But far from being straightforward, the neolithization of Iberia was a very complex process and also involved the active participation of the late Mesolithic groups in the spread of the Neolithic package, either in terms of acceptance (Alday, 2012) or in terms of rejection (Zilhão, 2011).

From the middle of the sixth millennium cal BC, a production economy gradually established in Iberia, albeit at different rates and intensities (Drake, Blanco González, & Lillios, 2017). It is worth noting that the earliest currently known evidence of domesticates comes not from the Mediterranean coast but from inland Iberia: a *Cerealia* seed from La Paleta, in Toledo, has been radiocarbon dated to 6660 ± 60 BP (Jiménez Guijarro, Rojas Rodríguez-Malo, Garrido Resino, & Perera Rodríguez, 2008) and Peña Larga rock shelter, in Álava, has provided a fragmentary metapodial of *Ovis aries*, which has been radiocarbon dated to 6720 ± 40 BP (Rofes et al., 2013). From the outset, archaeobotanical information shows a great diversity of crops: hulled and naked wheats and barleys, legumes, flax, and poppy (López López-Doriga, 2015; Peña Chocarro, Pérez Jordà, & Morales, 2018; Zapata, Peña-Chocarro, Pérez-Jordá, & Stika, 2004). With regard to animal husbandry, sheep and goats dominate the faunal assemblages in Neolithic Iberia, followed by cattle and pigs (Saña, 2013). At Mendandia, the identification of the genetic haplotype T3, the most common in European cattle and generally considered unique (and indicative) of the domestic form (*Bos taurus*) in an auroch bone (7265 ± 70 BP) has raised the question of hybridization episodes (Alday, Carretero, Anderung, & Götherström, 2012).

When referring to the neolithization of the center of the Iberian Peninsula, that is, the north and south plateaus on both sides of the Iberian Central System, which, broadly speaking, coincides with the current administrative divisions of Castilla y León, the Community of Madrid and Castilla-La Mancha scholars use the term “Inner Neolithic” (*Neolítico Interior*). Traditionally, this process is thought to have been late and lagged behind that of the Mediterranean, since it did not go beyond the fourth millennium cal BC. It was argued that the Inner Neolithic derived from Andalusia at an advanced stage in the history of the “Cave Culture group” (*Cultura de las Cuevas*), so named because of its usual location in caves of the settlements (Fernández-Posse, 1980). However, as a result of archaeological and paleoenvironmental studies, in the last decades, the image of the Inner Neolithic has now been completely reassessed (Rojo Guerra, 2014). Therefore, a more complex reality has been emerging, involving not only cave occupations but also open-air settlements of various types (ditched enclosures, pit dwellings, etc.), the oldest of which even run parallel chronologically to those of the Mediterranean in the Early Neolithic, up to the middle of the sixth millennium cal BC. With regard to economic strategies, there is also evidence, in the interior of Iberia and from the first stages of the neolithization process, of the cultivation of cereals and legumes and the raising of animals, mainly sheep and goats, although slight regional differences have been observed.

Despite this significant increase in our knowledge concerning the Neolithic in the center of Iberia as a whole, there is still a great imbalance in information, since there are areas for which little data is available; this is the case of the Sierra de Gredos, one of the mountain ranges that make up the Iberian Central System. This article analyzes the mechanisms of the neolithization process in the Amblés Valley, an intra-mountain rift located on the northern slope of the Sierra de Gredos. From an interdisciplinary and multivariate perspective, taking the site of La Atalaya (Muñopepe, Ávila) as a reference point, the idea is defended that, unlike the trend observed in a large part of the Iberian Peninsula, where from the outset, the Neolithic was linked to a mixed economy in the Amblés Valley and surrounding landscapes, the Neolithic began only with livestock, and the role of various agents in the process is assessed.

2 The Neolithization of the Amblés Valley: A Landscape Approach

The Amblés Valley is located in the center of the province of Ávila, in the Regional Community of Castilla y León (Central Iberia). In terms of its morphostructure, this rift valley is formed by several sunken and fractured granite metamorphic base blocks of the Hesperian massif. This corresponds to blocks resulting in horst-graben tectonics at the end of Hercynian orogeny. Tertiary sediments with depths in the range between 200 and 1,000 m are supported on the rock base. This is, therefore, an intra-mountain valley (graben) extending for 42 km in the ENE–WSW direction in the Sierra de Gredos. All of its limits are tectonic, forming blocks by means of faults and giving rise to different morphostructures. The main ones are the horsts of the Sierra de Ávila (1,727 m a.s.l) to the north and La Serrota (2,294 m a.s.l) and La Paramera (2,158 m a.s.l) mountain ranges to the south, which in turn are subdivided into other smaller units (Garzón, Ubanell, & Rosales, 1981). Erosion and tectonics have created a morphology of ravines, gorges, and gullies at the edges of the rift and numerous formations on the Tertiary sediments of the basin. The morphological structure of this basin is embodied by the axis of the Adaja river (a tributary of the Douro river), which has resulted in an almost entirely flat valley, creating gentle slopes on the edges and a current minimal river bed. This river axis determines and connects the entire drainage network of the valley, up to its damming in the Las Cogotas-Mingorría Reservoir.

The whole of the region, as a result of the geological features described, forms a landscape in which two units fundamentally stand out: the valley, which belongs to the typology of basins, hollows, and depressions, and the mountain edge, which is part of the massifs and ranges of the Iberian Central System, of which the Sierra de Ávila and the La Paramera and La Serrota ranges form part (Sanz & Mata, 2003). The transition between both landscape units is represented by smaller spatial features, among which small plateaus – some of them with sloping hillsides – and granite outcrops of different shapes stand out. Among these, rocky promontories are prominent, some of them protruding like small hilltops, with granite masses that make up the escarpments of the slopes. This creates viewpoints on the slopes that overlook the depression of the valley forming a mountain ridge. There are also some mounds of granite rocks that emerge by differential erosion with orthoclinal corridors and undulations. All these elements are accompanied by landforms, such as the large balanced boulders, generally, granite blocks rounded by erosion and easily visible and recognizable; rocky outcrops of smaller blocks forming bornhardts and nubbins on some plateaus or plains and which in turn may or may not be sloping; or the accumulation of large rounded granite boulders that represent the typical granite landscape, a wide dome-shaped granite hills covered by detached rounded and angular boulders (Herrero, 1996).

For prehistoric communities, the Amblés Valley exerted an enormous attraction, with more than a hundred archaeological sites registered, mainly corresponding to the Copper and Bronze Ages (Blanco González, 2008). In the absence of data concerning the last hunter-gatherer groups of the Holocene, the introduction of a production economy has been associated with the arrival of agricultural groups (Fabián García, 2012). Documentation relating to the first production groups of the Amblés Valley is mainly based on material remains (ceramics and lithic tools) lacking context, since the few Neolithic discovered so far – the number of which, according to certain and possible evidence, does not reach 20, including both tombs and settlements – were found either during surface surveys or at disturbed levels during the excavation of more recent deposits (Fabián García, 2006).

Contrary to the Chalcolithic settlements, which are located at different altitudes, almost all of the Neolithic settlements are located at altitudes between 1,100 and 1,300 m a.s.l – and mostly around 1,200 m a.s.l, coinciding with the edges of the first foothills that separate the valley from the steepest and most rugged areas of the mountains ranges (Figure 1). Furthermore, in almost all cases, these are locations where some of the following characteristics, or a combination of several of them, converge (Fabián García, 2006): located on the very edge of the valley, serving as a viewpoint; large granite promontories that are quite visible from various points and easily recognizable (some of them have their own names in the local toponymy; Figure 2); enclaves with good visibility, overlooking the valley or a large section of it; locations in elevated or hilly areas that are clearly distinguishable from their immediate surroundings; locations in the open air between granite boulders or in

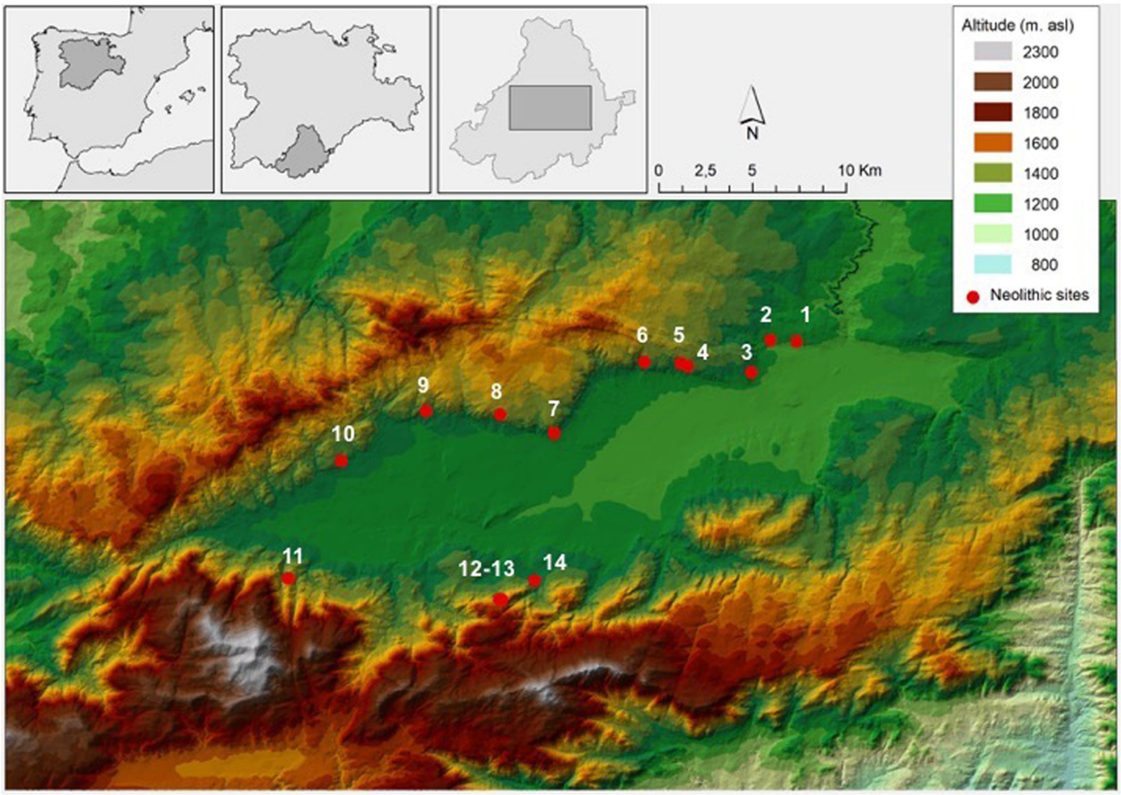

Figure 1: Map showing the location of the Neolithic settlements in the Amblés Valley: (1) Cerro de la Cabeza; (2) Cantera de las Hálagas; (3) Los Berrocales; (4) Fuente Lirio; (5) La Atalaya (Muñopepe); (6) Dehesa del Pedregal; (7) La Peña del Águila; (8) Los Itueros; (9) El Picuezo; (10) Las Zorreras; (11) Canchera Alta I; (12) Cueva de los Moros; (13) Umbría de Robledillo; and (14) La Atalaya (Solosancho).

sheltered caves resulting from the collapse of the latter; locations close to summer pastures and natural features such as gullies, ravines, or river courses that serve as the delimitation of the settlement. In all cases, they are to be found in flat areas such as small plateaus or gentle slopes, which have a good view over and from the valley, and are, generally speaking, easily accessible.

Another aspect regarding the choice of location for Neolithic settlements is the availability of water. The valley is crossed by the Adaja river, which receives water from a wide network of small rivers and streams originating on the mountain edge of the three ranges; these provide sufficient water throughout the territory, although some of the small streams may occasionally have low water levels. Consequently, the settlements are close to streams or springs, which flow either through the site itself or in the immediate vicinity, at a distance of no more than 500 m.

3 The Economic Strategies of the Earliest Neolithic Groups

In the whole of the Iberian Central System, paleoenvironmental data (López Sáez et al., 2014) show, for the western-central area (Gredos, Francia, and Béjar ranges), a wide extension of pine, birch, and oak forests on mid- and high-altitude mountains up to 4500 cal BC. Moreover, most pollen records suggest particular pastoral movements throughout these mountains. However, there has hitherto been scant accurate paleoenvironmental data for the bottom of valleys and initial mountain edges. High-resolution pollen records from peat bogs are particularly rare in the Amblés Valley. They could prove very reliable when it comes to determining over a period of time both vegetation and farming dynamics during the early stages of the Neolithic.

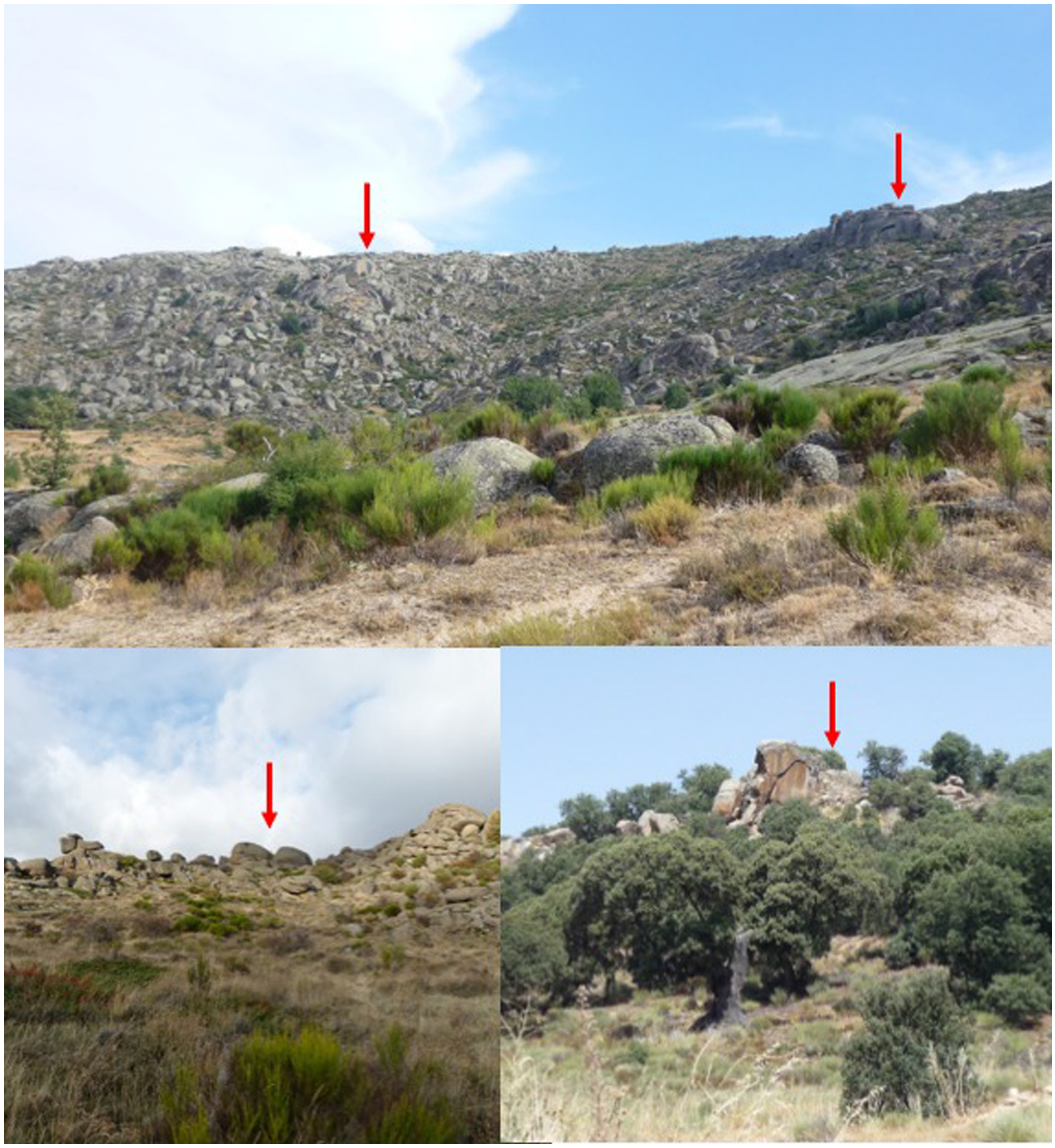

Figure 2: View of some of the Neolithic sites in the Amblés Valley: Umbría de Robledillo (top left) and Cueva de los Moros (top right), at Robledillo; bottom left, Canchera Alta I, Muñotello; bottom right, Peña del Águila, Muñogalindo.

Thanks to the Baterna peat bog pollen record, at the bottom of the valley, we know that at the beginning of the fifth millennium cal BC, the Amblés Valley was covered with arboreal vegetation and that there was a certain degree of human impact on the landscape which, in view of the abundance of anthropozoogenous herbs and coprophilous fungi, should be related to livestock activity (Dorado, 1993; López Sáez et al., 2009). This would substantiate the burial mound of the Dehesa de Río Fortes in Mironcillo. The presence of coprophilous fungi in the archaeopalynological samples from this Neolithic tomb is the proof of the existence *in situ* of a domestic hut (López Sáez, 2006; López Sáez & López Merino, 2007). In this regard, it seems appropriate to point out that a constant in the location of Neolithic settlements with respect to land uses is the presence of stony outcrops and rocks, scree or bare soil, surrounded by grasslands and scrub in patches of different sizes and arrangements, accompanied by small groups of evergreen trees (Blanco González, 2008). Therefore, it seems that suitable spaces for livestock activity are being sought.

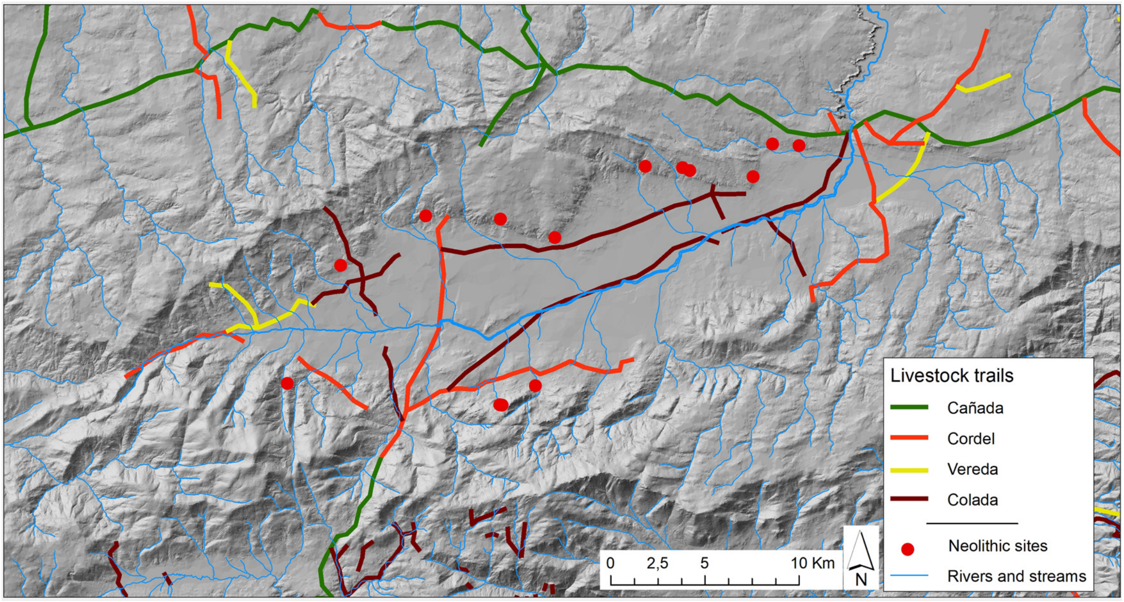

Figure 3: Map showing the existing livestock trails and the location of the Neolithic settlements in the Amblés Valley.

Another aspect that contributes to this idea is the proximity of the sites to the livestock routes that historically run through the Amblés Valley or which cross the hills of the mountain ranges for communication between the valleys (Figure 3). Although only one of the Royal Cattle Track runs through the region, namely, the *Real Leonesa Occidental*, the Amblés Valley is dotted with a wide network of livestock trails (*cañadas* <75 m wide, *cordeles* <37.5 m, *veredas* <20 m, and occasionally *coladas*), that cross it longitudinally and transversely, especially along the bottom of the valley and near the initial foothills. Although none of the Neolithic sites is located directly on these trails, the distances in a straight line range between 500 and 2,500 m, which may indicate a connection with these routes for the movement of livestock between different pasture areas throughout the year. While the sites are located in accordance with other conditions – as we have already indicated, it seems that they are also related to the proximity to these routes for when they must repeat the trip, and so as not to lose sight of the transit of people and animals of different groups throughout the valley. In short, probably many of these medieval transterminant routes were already operative in prehistoric times.

3.1 The Site of La Atalaya (Muñopepe, Ávila) as a Reference Point

For the moment, the reference point for an in-depth examination of paleoenvironmental and paleoeconomic questions in the Ambles Valley during the Neolithic is the La Atalaya site in Muñopepe. It is an open-air dwelling place among massive granite boulders, some of which are decorated with Schematic Art motifs (Fabián García, 2006). Eleven testing trenches were excavated, affecting a surface of 111 m^2. Activity at the site started in the Early Neolithic, at the end of the sixth millennium cal BC and continued intermittently until the Copper Age (for a detailed description of the sequence, see Guerra Doce et al., 2017) (Figure 4). While archaeobotanical analyses have been unable to confirm the cultivation of plants in the Amblés until the end of the fourth millennium cal BC (Fabián García, Blanco González, & López Sáez, 2006; López Sáez et al., 2003; López Sáez & López García, 2004, 2006; López Sáez, 2009), at La Atalaya, there is evidence of livestock practices from the end of the sixth millennium cal BC.

Figure 4: Above, view of La Atalaya, Muñopepe, from the south; below left, plan of the excavation testing trenches; below right, two of the Copper Age pits during their excavation.

3.1.1 Palynological Data[1]

Twenty-seven samples, taken from Neolithic and Chalcolithic levels, were the object of the palynological analysis. The pollen spectra reveal a relatively deforested landscape and low tree cover (<30%) where anthropozoogenous and anthropic-nitrophilous herb taxa (75–95%) would dominate. Gramineae (Poaceae) is the dominant morphotype among herbs, accounting for the existence of open pasture areas. These would be accompanied by Brassicaceae, Caryophyllaceae, Fabaceae, Liliaceae, etc. The scant presence (<2%) of *Artemisia*, a xerophytic element, together with a certain prominence of humid Cyperaceae pastures and other indicators such as the dominance of Pyrenean oak (*Quercus pyrenaica*) over Holm oak (*Q. ilex*) would denote the existence during the Neolithic and Chalcolithic periods of a subhumid climate, very different from the dry climate that would occur later, at the end of the Chalcolithic period (Fabián García et al., 2006; López Sáez et al., 2014). In this regard, the relative abundance of non-pollen palynomorph HdV-181 would explain these humid conditions indicating a meso-eutrophic sedimentation environment related to human impact (López Sáez, van Geel, Farbos-Texier, & Diot, 1998; López Sáez, van Geel, & Martín Sánchez, 2000). This anthropization would also be indicated by the abundance of anthropogenic and nitrophilic herbs (*Aster*, Cardueae, Cichorioideae, *Rumex acetosella*, *R. acetosa*, *Papaver rhoeas*) or others of a markedly

1 For reasons of space, we have decided not to elaborate here on the methodology and procedures applied in the palynological, carpological and faunal analyses of samples from La Atalaya, as these have been published in detail in Guerra Doce et al. (2017).

anthropozoogenic nature (Chenopodiaceae, *Plantago lanceolata*, *P. major/media*, *Urtica dioica*) (Behre, 1981; López Sáez et al., 2014), which would also account for a certain type of the pastoral influence. The best proof of the existence *in situ* of a domestic hut is the documentation in most samples of coprophilous fungi (*Cercophora*, *Sordaria*, *Sporormiella*) (López Sáez & López Merino, 2007), which has been found on the site since the Early Neolithic.

Finally, with regard to agriculture, it should be noted that in no sample, it has been possible to identify cereal pollen. On the other hand, in a sample from the filling of a Chalcolithic hole, pea pollen (*Pisum sativum*) was identified, and, generally, in all the samples, there were excessively high percentages, in terms of their zoophilic nature, of Fabaceae (*ca*. 20% in some of these). All of this leads one to think that legumes were grown in the immediate surroundings of La Atalaya at least from the time of the Copper Age; in all certainty, there were peas, which could be seasonally alternated with cereals.

3.1.2 Macrobotanical Remains

At La Atalaya, 106 samples were collected from the entire sequence for flotation, with a total of 1,650 L of sediment processed. Only 18 samples displayed traces of seeds and fruits, with a single sample providing more than one. The average density was lower than one remnant for every 10 L of floated sediment. Taxonomic diversity was also minimal, with only four different taxa; this highlights the poor carpological record of this site. All the materials are carbonized; so, we are led to believe that they are waste from different domestic activities that accidentally caused this carbonizing (Guerra Doce et al., 2017).

The only cultivated plants documented have been cereals, with naked wheat (*Triticum aestivum-durum*) and naked barley (*Hordeum vulgare* var. *nudum*) being the two taxa present. Together with these, there are several remnants whose conservation has not made it possible to identify other than at the genus level, such as those labeled as *Triticum* sp., and others that have simply been identified as cereal fragments. The remaining taxa are wild fruits. One of them is a blackthorn (*Prunus spinosa*) and two others are Rosaceae undiff., possibly belonging to the genus *Cotoneaster* or *Crataegus*. The other preserved materials are a fragment and another very poorly preserved one that cannot be defined even in terms of the family. Only *Crataegus/Cotoneaster* can definitely be associated with the Neolithic occupation. It is true that three grains of cereal were recovered in two units that have been chrono-culturally assigned to the Neolithic stage Ib, but in both cases, these are disturbing contexts. Unit 1102, at the Testing Trench 11, is an unclear context, because although most of the materials correspond to the Neolithic, it has also yielded others from the Copper Age (fragments of cheese strainers, Bell Beakers, sickle blades, and arrowheads). In this unit, one seed of *Triticum aestivum-durum* and another of *Hordeum vulgare* var. *nudum* were recovered. C-14 AMS dating of the grain of barley (Beta 302141: 4420 ± 30 BP) clearly matches Chalcolithic materials. The same situation is repeated in Unit 1202, at the Testing Trench 12. In this case, it was a grain of *Triticum aestivum-durum* that was subjected to C-14 AMS dating, with a very similar result (Beta 302142: 4460 ± 40 BP). These results are largely in keeping with those obtained for a grain of *Hordeum vulgare* var. *nudum* from the filling of a Chalcolithic pit (Beta 333529: 4330 ± 30 BP). If, in addition, we take into account that Units 1102 and 1202 are not undisturbed, it seems more likely that the presence of cereals in these responds to taphonomic processes, rather than to the cultivation of cereals during Early Neolithic times.

3.1.3 Analysis of Phytoliths on Grinding Tools

An analysis by R. M. Albert and M. Gascón, Universitat de Barcelona, was made of five grinding tools (four pestles and one saddle quern) from the Neolithic occupation to quantitatively and morphologically determine their phytolith content. At a quantitative level, the pestles have 280,000–750,000 phytoliths, while the quern has 910,000 phytoliths per gram of the sample. Regarding morphological analysis, only two samples (that corresponding to the quern, M4, and one pestle together with the sediment associated with it, M5) could be analyzed, as they displayed a minimum number of morphologically identifiable phytoliths

(>50). However, as neither of them presented a minimum of 200 phytoliths, the high margin of error regarding the interpretation, close to 40%, must be taken into account.

The results of the morphological analysis suggest a predominance of monocotyledonous plants and within these Gramineae. The most abundant morphotype in all the samples is rondels. These are short cells that form in the epidermal tissue of these plants and are generally related to the Pooideae subfamily, with a C3 photosynthetic pattern (Twiss, 1992). Other regularly identified morphotypes are crenates and trichomes, characteristic of grass leaves, and which appear to a similar extent in the M4 and the two M5 samples (pestle and sediment). Moreover, the identification of elongated morphotypes with dentate and dendritic edges indicates the inflorescence of these plants in the samples (the part surrounding and protecting the seed). Elongated dentate features have been identified to a large extent in sample M5, mainly in the pestle. Also, within the grass family, although to a lesser extent, saddles have been identified in M5; these are characteristic of type C4 Chloridoid grasses. The number of inflorescences in M5 could be related to use in grinding grain. However, in the absence of informative phytoliths at the taxonomic level (such as dendritic elongated types, papillates, or multicellular structures), the presence of cereals could not be determined. In addition, these inflorescences would be accompanied by other parts of the plant that also include leaves and stems and which also do not differ to a large degree, either percentage-wise or quantitatively, from those of the associated sediment sample. As regards short saddle cells, also associated with short bilobed cells, a very small number of them appear in this pestle, so their presence would be more related to wild grasses from around the site.

Morphotypes from dicotyledonous plants are less represented, with numbers not exceeding 7%. In particular, elongated blocky morphotypes, common in the bark, have been identified, as well as phytoliths characteristic of leaves, such as hair base, in sample M4. Spheroids with a psilated/rugulate surface also characteristic of the wood of this group of plants have been identified in sample M5. The presence of these morphotypes could be linked to the processing of trees and shrubs with woody stems.

In view of the results, there is no clear evidence of cereals in any of the samples. Phytoliths indicate the presence of grasses, although, in the absence of defining morphotypes, these could be probably wild grasses – as, in fact, they have been documented in the pollen record.

3.1.4 Zooarchaeological Data

The faunal assemblage from the prehistoric occupation of La Atalaya comprises 2,247 bone fragments. The largest sample corresponds to the Neolithic phase (NR = 2,154), although a total of 2,048 animal bones remain unidentified (95.08%) due to a high degree of fragmentation.

The archaeozoological analysis of the identified bones (NR = 106) has focused on the study of taxonomic and anatomical representation frequencies, and the identification of taphonomic processes on bone surfaces (Guerra Doce et al., 2017). By taxa, bovine remains were classified as undifferentiated bovids (*Bos* sp.) since the scant diagnostic measurements obtained could indicate either the presence of domestic cattle (*Bos taurus*) or wild auroch (*Bos primigenius*). It has not been possible to differentiate between bones of

Table 1: Taxonomic representation of animal remains recovered at the Neolithic levels of La Atalaya

Taxa	NISP	NMI
Bos sp.	23	2
Ovis/Capra	19	2
Sus sp.	11	2
Equus caballus	25	2
Cervus elaphus	16	2
Oryctolagus cuniculus	11	3
Lepus granatensis	1	1
Total	106	14

domestic ovicaprids, as there are no diagnostic areas for their classification at the taxonomic level or because these are unclear due to the high degree of bone fragmentation. As a result, they were combined into an O/C category. In the case of bone remains from suids, whose assignment to domestic pigs or wild boars was not very clear, it was decided that they should be kept in the category *Sus* sp. Wild species comprise horses, red deer, rabbits, and hares. Table 1 presents the general characteristics of the Neolithic faunal assemblage in relation to Number of Fragments (NF), Number of Identified Specimens (NISP), and Minimum Number of Individuals (MNI).

C-14 AMS dating of a tooth of *Ovis/Capra* (Beta-333528: 6220 ± 40 BP) demonstrates the exploitation of domestic animals at the site from the end of the sixth millennium cal BC, which is again representative of the antiquity of livestock in the Amblés Valley. It is difficult to interpret the undistinguished *Bos* sp. specimens that could not be attributed to either cattle or aurochs, and the same is true for the suids. The implications are extremely important since the feeding behaviors of these animals have a direct impact on the economic strategies of the human groups, but these cannot be assessed without taxonomic certainty between the species. It is for this reason that we will not further interpret these two categories. Hunting is represented by remains of wild horses, red deer, rabbits, and hares. No remains of wild goat or roe deer have been documented.

The faunal assemblage presents a high degree of fragmentation, mostly resulting from intentional fractures related to meat extraction. Also, thermal alterations that suggest intensity and/or exposure to the fire were frequently recorded. Finally, the bone surfaces show signs of carnivore activity that would indicate periods of exposure on the surface.

4 Discussion

Livestock is, without doubt, the main anthropic feature regarding landscape use in the Amblés Valley during the Early Neolithic. In view of the available data, we could situate at that time the birth of the influence of livestock in the landscapes of the Gredos mountains that characterize this area even today.

Animal husbandry has been recorded in La Atalaya since the Early Neolithic, at the end of the sixth millennium cal BC, while so far archaeobotanical data suggest that agriculture was introduced later (López Sáez, 2006, 2009; López Sáez et al., 2009). Although there are no paleoeconomic data for other Neolithic settlements, the spatial analysis clearly shows a focus on livestock. Moreover, even in the absence of further archaeobotanical analyses, a compelling argument to defend the late introduction of agriculture in the Amblés Valley has its basis in the pollen record, since crops were not reported in the valley until the fourth millennium cal BC (López Sáez et al., 2014).

We cannot rule out, in the case of La Atalaya, that the lack of cereal pollen in those samples of the Early Neolithic could be attributed to (1) taphonomic problems which prevent conservation or (2) a certain distance from the potential cropping areas to the site (López Sáez, López García, & Burjachs, 2003; López Sáez & López Merino, 2005). Nonetheless, a considerable number of palynological studies carried out in Chalcolithic sites of the Amblés Valley, with similar sedimentary and landscape backgrounds, have clearly demonstrated the existence of farming activities and, thus, the recording of cereal pollen (López Sáez & López García, 2004, 2006; López Sáez et al., 2014). The lack of palynological evidence for agriculture in La Atalaya during the Early Neolithic may, in fact, be explained by a later development of this activity in the area.

As a consequence, if the first Neolithic communities did not initially have agriculture, this would mean that at that time they did not settle permanently and on a stable basis. Certainly, activity at Neolithic settlements in the Amblés valley seems to have been discontinuous, as suggested by the absence of durable features such as floors, hearths, storage pits, or domestic huts in the sites that have been excavated so far. Also, at La Atalaya, the faunal assemblage shows signs of exposure. Considering the proximity of the sites to summer pastures and watercourses, pastoralism and livestock activities offer an explanatory model for the neolithization of the Amblés Valley. Hypothetically, this would involve small groups of herders who would seasonally abandon their settlements in search of summer pastures, which, given the average altitude of this mountainous area, poses no problem even in the hottest months. The above-mentioned palynological data for the whole of the Iberian Central System point in this direction, as records of trans-terminant grazing activities, are quite clear (López Sáez et al., 2014).

In fact, pastoralism is also starting to be documented in the Serra da Estrela, the westernmost mountain range of the Iberian Central System. There, in the Neolithic shelter of Penedo dos Mouros, this practice is linked to short human occupation events, and open spaces for grazing have been identified (Carvalho, Pereira, Duarte, & Tente, 2017; Simões, Carvalho, & Tente, 2020). This is extremely interesting since it constitutes another influential argument in support of the Neolithic relationship of the Amblés Valley with the groups in central Portugal that we have been defending, and which, ultimately, relates to the communities of Impressed ware pottery of the Portuguese Atlantic coast (Delibes de Castro, Guerra Doce, & Zapatero Magdaleno, 2021; Guerra Doce, Cruz Sánchez, Fabián García, Zapatero Magdaleno, & López Plaza, 2015).

5 Conclusions

The neolithization process in Europe presents a remarkable variability across the continent, which can be attributed to a number of joining factors that resulted in a mosaic of agricultural communities. Rather than a Neolithic Revolution, the spread of domesticated plants and animals is best thought of as a gradual transition over the course of centuries (Bogucki, 1996). Apart from the general model, low-scale intensive agriculture combined with a low-scale strategy of landscape management has been proposed for some areas (Antolín, Navarrete, Saña, Viñerta, & Gassiot, 2018; Arnold & Greenfield, 2004; Bogaard, 2004; Halstead, 1990, 1996; Jacomet et al., 2016). In a similar way to what has been observed at Serra da Estrela, in central Portugal, the neolithization of the Amblés Valley reflects a model of occupation and land use related to livestock and pastoral activities. As a result of this, knowledge would have emerged to establish appropriate practices by which greater and better uses of the valley's resources would be obtained.

From an analysis of the landscape, it seems evident that the first Neolithic groups of the Amblés Valley developed a wide knowledge of the territory from the easily recognizable relief elements, of which they took advantage and used for shelter. As in this case, colonizing new spaces requires a process of learning from the environment. In terms of recognizing the landscape, very particular elements are used, for instance, visual references, which are easily remembered and identifiable throughout the periodic cycles of visiting occupying and making use of such places (Rockman & Steele, 2003). But they also serve to provide orientation and situation in the area with regard to moving around with livestock or using pasture land. Furthermore, it does not seem fortuitous that all the examples of Schematic Rock Art located to date in the Amblés Valley have, in fact, been documented in some of these Neolithic sites. This could reveal the symbolic role of this art in the appropriation strategies of certain spaces (Zapatero & Guerra, 2021). These are, then, the roots that underlie the key to understanding the neolithization of the Amblés Valley, revolving around livestock, pastoralism, landscape learning, and visual landmarks.

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