Research Article

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Assessing the Role of Wooden Vessels, Basketry, and Pottery at the Early Neolithic Site of La Draga (Banyoles, Spain)

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Abstract: Organic containers are rarely preserved in archaeological contexts. As a result, the work involved in their production and their functions remains invisible unlike other containers commonly better represented, such as pottery. The early Neolithic site of La Draga (5300–4900 cal BC), located on the shore of the Lake Banyoles (Spain), has provided several containers made of wood and plant fibres besides a significant amount of ceramic remains. The aim of this study is to provide an overview of the vessels at La Draga to assess the importance of organic containers in a context where pottery technology is well known and employed for several functions. The importance of the different types of containers in the context of this farming society is assessed through the analysis of the number of remains, their sizes and shapes, and their spatial distribution. The exceptional preservation of the organic vessels allows comparisons to generate hypotheses about their function. Wooden containers are associated with consumption, while baskets may have been used to transport or store foodstuff, and ceramic vessels also for cooking. The spatial distribution of basketry remains tends to show an area that could be linked to the storage of cereals.

Keywords: functionality, wooden bowls, basketry, pottery, Early Neolithic

1 Introduction

In the context of the Early Neolithic in the Iberian Peninsula, containers made of clay were introduced during the second half of the sixth millennium BC (Gibaja & Clop, 2012), and their remains provide insights into different aspects of farming societies like subsistence, adaptation to the environment, economy, trade networking, and cultural attitudes. In contrast, the production and importance of organic containers in prehistoric sites are still underestimated because of their low durability and, therefore, their lack of preservation in most archaeological sites. Nevertheless, perishable organic materials have played an important role in artefact manufacture since the Palaeolithic related to every aspect of daily life, from cooking and consumption purposes, to hunting, agriculture, and land clearing, to clothing, construction, and symbolism. Scarce evidence

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shows the wide diversity in the organic material used to create containers. Skin, leather, bark, wood, and plant-fibres are the materials most commonly used to create organic containers. While numerous containers crafted from wood, bark, and animal skin remnants are commonly associated with the Bronze Age (Earwood, 1993a; Egg, 1992; Hafner, 2012) or the Iron Age (Buckley, Melton, & Montgomery, 2013; Coles & Coles, 1986; Earwood, 1993a), there is also evidence of wooden and basketry containers dating back to the Neolithic period (Murray et al., 2009; Mineo et al., 2023; Romero-Brugués, Piqué, & Herrero-Otal, 2021; Schlichtherle & Wahlster, 1986) or even to Mesolithic hunter-gatherer communities (Martínez-Sevilla et al., 2023; Taylor et al., 2008; Zvelebil, 1986). However, these discoveries are often scarce and dispersed through time and geographic areas, making it more difficult to understand their function and role for different populations and cultures. The cases of waterlogged or arid environments are exceptional, as several types of organic containers can be linked to a wide range of activities. In the Alps, the numerous containers discovered in middle to late Neolithic lacustrine settlements allowed researchers to create local typologies of the different ceramic and organic containers, to approach changes in the vessels' forms throughout the occupations (Bontemps, Pétrequin, & Pétrequin, 2015; Leuzinger, 2002; Matuschik, 2021; Müller-Beck, 1991; Voruz et al., 1991; Winiger, 1981; Wyss, 1994), and to assess the roles of organic containers compared to inorganic ones (Matuschik, 2021; Wyss, 1994).

In the Iberian Peninsula, the oldest evidence of basketry corresponds to the exceptional collection of desiccated baskets and wooden bowls from La Cueva de los Murciélagos in Albuñol (Alfaro, 1980; Cacho, Papí Rodes, Sánchez-Barriga, & Alonso, & Alonso, 1996; Martínez-Sevilla et al., 2023), where several baskets dated back to c. 7500 cal BC. However, most evidence pertaining to plant-based containers is found in farming contexts. This includes the previously mentioned site of Cueva de los Murciélagos, as well as examples such as the charred basket fragments from Coves del Fem (4941–4545 cal BC) in Tarragona (Herrero-Otal, Romero-Brugués, & Piqué, 2021; Romero-Brugués et al., 2021), and the collection from the waterlogged site of La Draga (5300–4900 cal BC) in Banyoles (Bosch, Chinchilla, Tarrús, & Piqué, 2006; Herrero-Otal et al., 2021; Romero-Brugués et al., 2021).

This study focuses on La Draga, one of the oldest Neolithic sites in northeast Spain, where several fragments of wooden bowls, baskets, and ceramics have been found together in the same levels and sectors. The aim of this article is to highlight the role of perishable containers within the site and to compare the use of these organic containers with non-organic ones. The first objective is to assess the representativeness of these vessels throughout the site by analysing the fragmentation and survival pattern of these materials. The second objective is to identify the different roles or uses that the early farmers gave to these vessels through indirect and direct evidence.

2 Site Background

La Draga is located in the north-eastern part of present-day Spain, on the eastern shore of Lake Banyoles, at an average altitude of 172 m asl (Figure 1). It is a settlement with architecture of wooden pile buildings which was occupied by the first agricultural societies that settled in the region (Piqué et al., 2021). The excavations began in the late 1990s and are still on going. The extension of the settlement is estimated to be about 15,000 square metres. The excavations focused on different sectors. Sector A, situated inland, features all archaeological levels located above the waterline. In contrast, Sector B/D, although currently inland, has its lowest archaeological levels situated below the water table, resulting in perpetually wet or even flooded conditions. Finally, Sector C is located under water in the lake, in close proximity to the current shoreline.

Two main phases of occupation have been documented at the site, both corresponding to the *Cardial* ceramic tradition. The oldest phase is characterised by the construction of wooden platforms, while a stone paving was built during the most recent phase. This stratigraphic sequence has been documented only in sectors B and C, where waterlogged conditions preserved the organic materials of the older phase (Palomo et al., 2014; Tarrús, 2008). Stratigraphy in the onshore sector A is more complex, as the waterlogged archaeological layer is not preserved. The preservation of wooden poles is documented in all sectors below the archaeological layers. According to dendrochronological results, they are clearly related to the first phase,

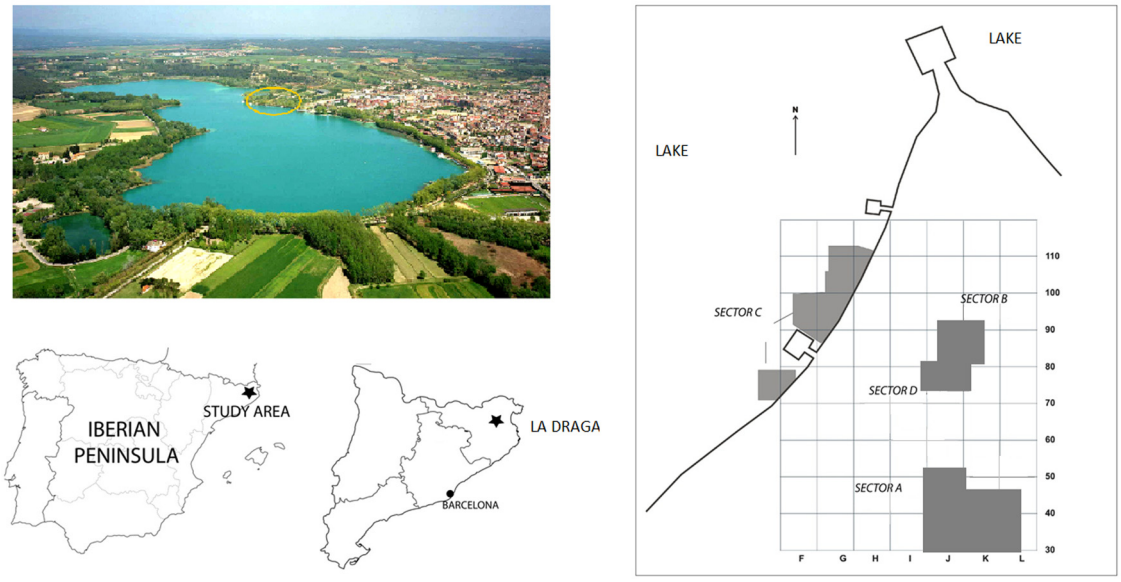

Figure 1: Location and organisation of the site.

although their relationship with later layers is not well understood. Integration of all radiocarbon dates and dendrochronology from all sectors and phases of the site by Bayesian analysis suggests that the construction of the platforms took place around 5266 BC with subsequent repairs up to 5244 BC (Andreaki et al., 2022). The occupation layers belonging to the first phase have provided more than 200 wooden artefacts (Bosch et al., 2006; López-Bultó et al., 2020), among which there is evidence of technical products barely documented at Neolithic sites in the western Mediterranean. The reconstruction of past vegetation tends to show the presence of oak woodlands and riparian vegetation around La Draga at the beginning of the occupation. The dominance of *Quercus* sp. is also documented in the pollen record (Piqué et al., 2021; Revelles, Burjachs, & van Geel, 2016; Revelles et al., 2018). A drop in the dominance of this deciduous taxon is noticed after the settlement of the first farming community around Lake Banyoles (Pèrez-Obiol & Julià, 1994; Revelles et al., 2016). The exploitation of oak timber for construction, craft manufacturing, and firewood is attested during the first phase of occupation and would have been mainly responsible for the decrease in pollen of this taxon.

In terms of craft production, the site provided direct evidence of the use of plant fibres to produce ropes and basketry (Romero-Brugués et al., 2021), indirect evidence of textile production with plant fibres (de Diego, Palomo, Piqué, Clemente, & Terradas, 2017; de Diego et al., 2019), and abundant evidence of wooden agricultural or hunting tools (López-Bultó et al., 2020; Palomo et al., 2011; Piqué et al., 2015; Terradas et al., 2017). The picture of the diversity of production processes would not be complete without mentioning the presence of objects made from bone, shell, and mineral materials. Functional studies carried out on marine bivalve shells and bone artefacts (awls and spatulas) revealed that they were used for plant fibre work (Clemente-Conte & Cuenca, 2011; de Diego et al., 2017). Regarding subsistence, the inhabitants of La Draga cultivated several species of cereals and, probably, legumes (Antolín & Buxó, 2011), in addition to the opium poppy (Salavert et al., 2020). Among the cereals, naked wheat stands out with, to a lesser extent, hulled barley, einkorn, and emmer wheat. Domestic animals represent 97% of the faunal remains. Pigs, oxen, goats, sheep, and dogs have been identified (Antolín, Buxó, Jacomet, Navarrete, & Saña, 2014; Saña, 2011). Ovicaprids represent 43% of the species on the site. The zooarchaeological information, and in particular the slaughtering pattern, obtained from tooth wear and animal size, also shows a meat and milk exploitation of Ovicaprinae, while the other species are mainly used for their meat (Antolín et al., 2014; Saña, 2011). Fishing, hunting, and gathering have also been documented and could have been an important supplement to the diet provided by domestic animals and plants at certain times of the year, as well as supplying raw materials (Antolín et al., 2014; Saña, 2011).

Post-depositional events have impacted the settlement of La Draga after its successive abandonment by the first farmers' community. The fluctuation of the phreatic level and the actual shoreline are by far the most important processes that played a major role in leading to the optimal preservation of the organic material. In the sediments that remained below the water-table organic plant remains, notably artefacts, are preserved. In contrast, in the archaeological layers that were above the groundwater table, organic plant remains are missing. The examination of the preserved organic wooden materials showed symptoms of decay and post-depositional alteration affecting the material (García, 2022). Among the most frequent alterations, we can identify holes produced by plant roots, cracks, and fissures. The latter mostly appear after conservation and restoration processes. These alterations seem to have affected the few fragments found in sector C, which is now submerged. The thick layer of peat in Sector B may have aided in the preservation of organic material in that area (García, 2022).

3 Methodology

This study presents a comparison of the distribution, morphology, size, and function of pottery, basketry remains, and wooden containers. The data used in this work include previously published and unpublished information on wooden containers (Bosch et al., 2006), pottery (Bosch, 2011; Bosch & Tarrús, 2000; 2011; 2018; Tzerpou, 2020), and basket remains (Romero-Brugués et al., 2021). Additionally, we made observations on new material, particularly for the wooden vessels and pottery, and re-examined the state of preservation of the fragments.

We conducted taxonomic identification of one wooden vessel that had not been previously analysed. To achieve this, we took a small fragment of wood from the rim for microscopic identification. The identification process followed the three sections of the wood (cross, radial, and tangential) at different magnifications using a reflective microscope. Wood anatomy atlases, such as Schweingruber (1978), were used to identify the genus and family of the taxon. New distribution maps were produced for these materials based on different criteria, including shape, size, material, and preservation.

The calculation of the MNI (Number of minimum individuals) is based on the published data on the morphometry and technology of the containers. As part of this research, the collected data were used to calculate and standardise the minimal number of individuals (MNI) for each category. In the case of basketry, the morphometry, the raw material, and the manufacturing technique were used as indicators of the MNI (Romero-Brugués et al., 2021). For the pottery, the MNI was estimated based on the revised information published. In the first published study of the pottery, only the rim was used as a criterion for estimating the MNI (Bosch, 2011; Bosch & Tarrús, 2011, 2018). In a later study, identification of large pieces of vessels that were not complete profiles and did not correspond to previously identified rims were counted (Tzerpou, 2020). In this work, we have integrated the information on large sherds/re-assemblies with the previous information on the MNI calculated from the various rims. For the wooden bowls, the MNI calculation was based on the reconstruction of profiles made during the restoration process following their discoveries between 1995 and 2005 (Bosch et al., 2006). Various small fragments of rim or base were classified as different vessels, due to their different morphological characteristics and thickness.

Fragmentation is the main limitation for determining the shape and morphology of all the containers. The original shape and size of the ceramics were only partially studied (Bosch & Tarrús, 2018). In this work, we have also determined the shape and morphology of new material through cross-sectioning and profiling, and have compared it with existing typologies for ceramic vessels of the Early Neolithic of Catalonia published by Oms Arias (2014, pp. 340–346). For the basketry, the presence or absence of vertical and horizontal curvature and the presence of preserved rims were the criteria used to establish the general morphology (Romero-Brugués et al., 2021). For the wooden vessels, thanks to the refitting, the general morphology of several vessels could be reconstructed in most cases (Bosch et al., 2006). The presence of handles was systematically recorded in all the categories of containers. However, in the case of pottery, some fragments did not match with any others, and no indication of their shape and size is possible.

The original size of containers is difficult to assess when entire profiles or vessels are not preserved. In this work, we proposed an estimation of the size of the vessels by measuring the diameter of the mouth. Four categories were defined: small when the diameter is under 10 cm, medium when it is between 11 and 20 cm, large when between 21 and 30 cm, and very large when above 31 cm. Due to the fragmentation and size of the fragments, the original size of the baskets cannot be calculated, however, a minimum diameter has been estimated, when possible, from the horizontal curvature of the bundles. Calculating the volumetric capacity of a container provides a more accurate measure of its size, but this has not been feasible due to the absence of both well-preserved height and diameter.

The reconstruction of the original size and shape has been used as an indicator of the possible functions of the different vessels. Moreover, other complementary evidence about function, such as high-temperature alterations observed on the surface of ceramic vessels and the association with carpological remains or amorphous residues, was also taken into account.

The current state of preservation of the materials differs from the state of preservation at the time of discovery. Unfortunately, for the artefacts identified in the late 1990s, systematic information about their on-site preservation is lacking. We assessed the current state of these artefacts through the macroscopical observation of their surface, which was affected by carbonisation (that is related to the object biography or its post-abandonment history), by symptoms of decay processes for organic material, such as cracks, fissures, and bulging, and by other post-depositional alterations, such as perforations by aquatic plant roots, rounding of edges or weathering of the surfaces. According to the percentage of the surface impacted by one or more of these processes, it was determined whether the preservation was poor, average, good, or excellent. In addition, in the case of the wooden remains, certain processes such as cracks and splits in the direction of the wood fibres are a possible result of the restoration with the freeze-drying process.

Maps were drawn to provide information on the spatial distribution of the different kinds of vessels and their fragmentation pattern. It must be highlighted, however, that the spatial location of a few fragments in the analysed assemblage was not recorded, and the geo-spatial position of some was registered conjointly with others (as already in the field they were determined to be elements from the same artefact).

4 Materials

This study focuses on the comparison of organic containers, mainly basketry remains and wooden bowls, with pottery. It is important to mention that only a few basketry remains are preserved, rather than the entire artefacts; therefore, it is difficult to distinguish whether they were mats or proper baskets. Regarding the organic containers, 35 fragments of baskets (31 in Sector B, 4 in Sector C) are included. These have been analysed previously in terms of their technical production and raw material (Romero-Brugués et al., 2021). In addition, 26 remains of wooden containers were found (23 in Sector B and three in Sector C). A preliminary description of the wooden vessels was previously published in a monograph (Bosch et al., 2006), but we have re-examined the collection and identified new vessels. The potsherds included in this analysis come from Sectors B and C. Out of the 480 potsherds recovered, 386 were from Sector B and 94 from Sector C. The present study focuses on the sherds for which an indication of the general morphology was available (Bosch & Tarrús, 2018; Bosch, 2011; Tzerpou, 2020).

4.1 Wooden Containers

Several bowl fragments were found (Figure 2) in the Phase I level in two sectors of the La Draga site in the first excavations dated 1995–2005. According to previous publications and our work, the wooden bowls are all made of deciduous oak (*Quercus* sp. deciduous) (Bosch et al., 2006). This raw material was mainly used in the other wooden objects identified at the site (126 objects of 281) for construction timber or platforms (López-

Figure 2: Wooden containers from La Draga.

Bultó & Piqué, 2018), and it is the dominant taxon in the charcoal assemblages for the two phases of occupation at the site (Caruso Fermé & Piqué, 2014; Piqué et al., 2022).

The orientation of the wood's rays and pores, as well as the presence of rings, is sometimes clearly observable. The arrangement of these anatomical features does not correspond to ordinary wood cross-sections, but resembles what can be seen in wood knots. This has led to the hypothesis that these objects were made from a living trunk or branch that had been naturally deformed by a knot or burr wood into this solid, partly round shape (Bosch et al., 2006). The possibility the outgrowth might have been intentionally caused by the population, using a stone or other external body, has been suggested (Bosch et al., 2006). No supportive experimental analyses or extensive microscopical studies were performed before the restoration of these artefacts, in the late 1990s to investigate further this question. Several tools have been identified at la Draga related to woodworking, among them adzes and potentially boxwood edges, scrapers, and other lithic tools (Palomo et al., 2013). Moreover, the shell fragment of *Donax* sp. was also used to process plants and incise softwood or bark (Clemente-Conte & Cuenca, 2011). However, traces of the tools used to hollow out and shape the vessels are rarely visible on the internal or external surfaces of the bowls. We can just highlight that the bark was removed on the wooden containers and that their surface might have been smoothed. Hypothesis regarding its manufacture is a one-piece carving, and in this case, the surface smoothing explains the absence of tool marks. These technological questions have not yet been explored and are not developed in this article.

The wooden vessels have been partially preserved by charring or waterlogging. The vessel fragments show varying degrees of preservation, with charring, numerous cracks and fissures, and holes bored by plant roots. These objects were restored using a freeze-drying treatment, mainly in the restoration laboratory of the Underwater Archaeology Centre of Catalonia. Surface treatment and reconstruction of missing areas using putty and gouache were also carried out. By matching the cross-sections, the fragments could be reassembled to recreate the vessels. In four cases, at least half of the wooden vessels could be reconstructed, including parts of the rim, the walls, the base, and sometimes a handle. For two vessels, only a small fragment of the rim was recovered. These rims were characteristic enough to observe that they don't match with any other wooden container. Two other vessels display the base, and one fragment of the vessel is composed of a part of the wall and a small part of the base.

4.2 Basketry

The following section presents material that has been published (Herrero-Otal et al., 2021; Romero-Brugués et al., 2021).

Basket fragments are charred or waterlogged. They display a dark or brown colour. Most of the pieces are small in size, due to the high fragmentation of the baskets, and they only display the presence of two to three bundles (Figure 3). Three other fragments are considerably larger with up to nine bundles preserved. The technique used for crafting these baskets is the sewn coiled technique, which consists in winding a bundle of fibres from the base onto itself and securing each turn with stitches (Romero-Brugués et al., 2021). All the stitches passed through a hole previously punched between the bundle and the base. To form the wall, the bundles are then superimposed to reach the desired height. The raw material to create these bundles were plant fibres (Herrero-Otal et al., 2021) corresponding to three monocotyledons (Poaceae, Cyperaceae, and Typhaceae); in addition, small branches of the hazel tree (*Corylus avellana*) were identified in one basket to reinforce of one of the bundles. The taxa used to perform the stitches are also predominantly monocotyledons, as well as lime bast fibres (*Tilia* sp.; Herrero-Otal et al., 2021).

4.3 Pottery

A preliminary morpho-technological study of a sample from the different sectors recovered during the first field seasons found very similar characteristics (Bosch, 2011). However, the assemblage from Sector B is more abundant than the one from Sector C, and it has been analysed in greater detail (Tzerpou, 2020). Hence, the

Figure 3: Basketry from La Draga.

ceramic assemblage (Figure 4) from Sector B not only corroborated existing information but also offered more comprehensive insights into pottery production and usage at La Draga.

Regarding morpho-technological aspects, nine different fabric groups were identified macroscopically, all formed by a clay matrix and different inclusions (type, size, shape, and amount of the inclusions were considered). A petrographic analysis carried out on a dozen ceramics found during the first excavation campaigns, including four from sector B, suggests that the clay was probably of local origin (Clop, Álvarez, & Reche, 2000). The only building technique identified was coiling. Both surfaces of the majority of the potsherds were smoothed and well-smoothed, and in a few cases, the exterior surface was burnished. Despite the dark colour and the fragility of the sherds, it has been possible to identify that the pots were probably fired in reductive conditions (Clop et al., 2000; Tzerpou, 2020).

The potsherds display different grades of preservation, with the exterior surface slightly better preserved than the interior. The general impression of the study is that of a fragile assemblage, which also needed to be extensively restored in order to be preserved. However, the wide use of an acrylic resin, Paraloid B-73, as a surface coating in some of the potsherds has complicated the study of aspects such as the original colour and surface or the degree of weathering. This resin consolidates the surface of potsherds but implies a modification of the external texture and the original colour of the potsherds and might complicate the acquisition of photographs by microscope as it gives brightness to the consolidated fragment.

Finally, biomolecular studies were carried out on several food remains found in several ceramic vessels from Sectors B/D (Tarifa Mateo, 2019). The studied vessels were of various shapes, including deep and closed vessels without a large volumetric capacity. The results of these lipid analyses showed the presence of dairy products in four vessels, based on the presence of triglycerides and the isotopic values of stearic and palmitic acids of a dairy product from a domestic ruminant. The collect of *Silybum marianum* and *Euphorbia helioscopia* in the surrounding of the site (Antolín, 2013) could have participated in the milk processing, amongst its other uses, as these species present properties to curdle the milk (Tarifa Mateo, 2019). For one vessel, two samples provided different results; dairy products on the inner side and domestic ruminant fat on the rim, thus illustrating the successive reuse of a vessel even if little is known about the formation of food crusts during successive reuse and the persistence of traces over time. Animal fats from ruminants and non-ruminants have also been identified, as well as fatty acids that could be of plant origin, but without plant biomarkers, the processing of plants in ceramics from La Draga isn't certain (Tarifa Mateo, 2019).

5 Results

5.1 MNI

Several wooden vessel fragments were found in Phase I in two sectors at La Draga. After restoration and reassembly of the 26 fragments, the minimum number of wooden bowls is ten. The minimal number of

Figure 4: Pottery from La Draga.

Table 1: MNI of each category of vessels according to the sector of recovery

	Sector B/D	Sector C
Wooden vessels	7	3
Basketry remains	6	2
Ceramic vessels	36	11

basketry individuals was identified by the techniques of fabrication, raw material, and the thickness of the bundles. A minimal number of eight baskets or mats were determined. A minimum number of 47 ceramic vessels have been identified by counting the different rims (thickness, decoration, surface treatment) and the refits. Most of the potsherds, basketry remains, and wooden vessels were recovered in sector B (Table 1).

5.2 Typology

5.2.1 Morphology

The 3D morphology of the baskets could not be determined in any case. Only the shape of their base could be determined as only two dimensions of the baskets are preserved. In addition, the possibility that the plant-fibre items are mats and not baskets could not be ruled out in some cases, but the presence of handles or knobs and vertical curvature in at least two cases confirms the presence of baskets in the sample. Thus, the general shape of the base of two baskets was circular and four were oval (Table 2). The other two baskets were not preserved well enough to estimate their base shape. For the baskets, four different stitch shapes (interlocking stitch, non-interlocking stitch, split stitch, and V or double stitch) have been identified (Romero-Brugués et al., 2021). They cannot help us to understand the general shape of the object, but they can be indications of the function, because of the properties they confer to the basket (solidity, ventilation, and maintenance of humidity; Romero-Brugués et al., 2021).

The wooden containers were separated into three categories (Figure 5a): open hemispherical or dome-shaped, cylindrical, and plate (Table 3). The hemispherical shape, with a large opening, has been identified in five cases. Three of these bowls have handles of different shapes. However, in one case, this could be an incorrect interpretation during the reconstruction. A single case is considered closed and cylindrical due to its depth that is larger than the expected diameter. Contrary to open vessels, a vessel is considered closed when the diameter of the mouth is smaller than the maximum diameter of the vessel. Another container might be the base of a large-based bowl or a flat-based plate. Finally, the morphology of three bowls could not be assessed because only a small fragment has been preserved.

The ceramic vessels are of four different shapes, following the classification and typology proposed by Bosch and Tarrús (2011) (Figure 5b). Two hemispherical shapes are identified: the first (hemispherical I) corresponds to deep closed vessels, with or without a neck. One vessel belongs to this category. The second category of hemispherical (II) vessels includes shallow open vessels: 12 vessels are identified in this category. Then, seven vessels are identified as spherical vessels with round/curved bases, one of them being specifically identified as a closed vessel. Eight vessels are cylindrical, which means they are deep, either open (1) or closed (7). The general shape of a further 11 vessels could not be identified but the presence of a neck makes it possible to classify them as closed vessels (Table 4).

Table 2: Identified shape of basketry remains according to the sector of recovery

Basketry remains	Circular base	Oval base	Indetermined
Sector B/D	1	4	1
Sector C	1		1

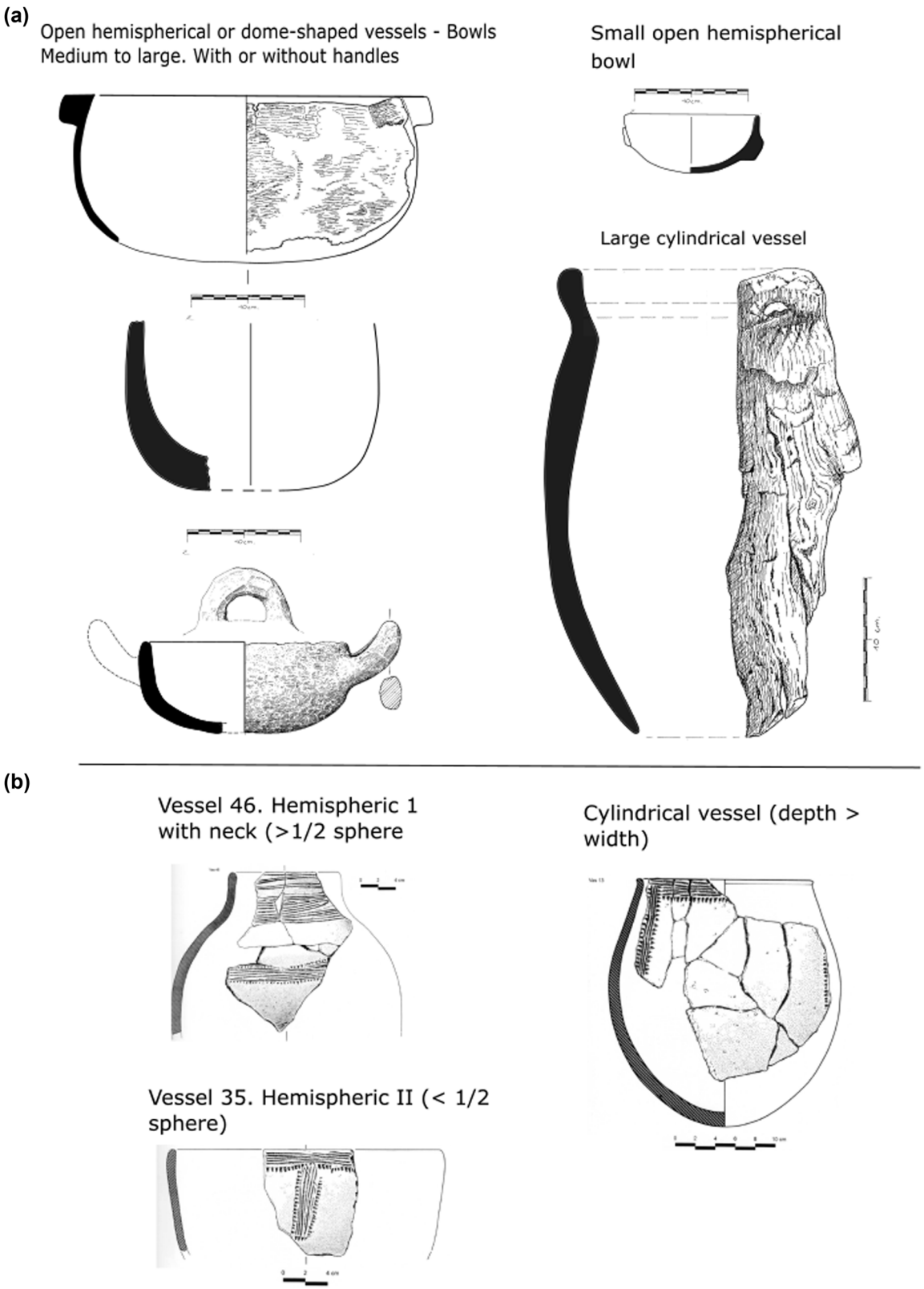

Figure 5: (a) Morphology of wooden bowls. From top left to bottom right: DG97_FH-95_1; DG03_JG-89_46; DG05_KE-86-5; DG03_JI-86_15; and DG03_JG-90_24 (taken from Bosch et al. 2006 and DAO I. Bertin). (b) Typology of ceramics from La Draga, taken from the study by Bosch & Tarrús (2011).

Table 3: Identified shape of wooden vessels according to the sector of recovery

Wooden vessels	Hemispherical/open	Cylindrical	Plate	Indetermined
Sector B/D	3	1	1	2
Sector C	2			1

Table 4: Identified shape of ceramic vessels according to the sector of recovery

Ceramic vessels	Hemispherical		Spherical	Cylindrical	Closed vessels (with a neck)
	I (closed)	II (open)			
Sector B/D	1	6	5	7	9
Sector C		6	2	1	2
Total	**13**		**7**	**8**	**11**

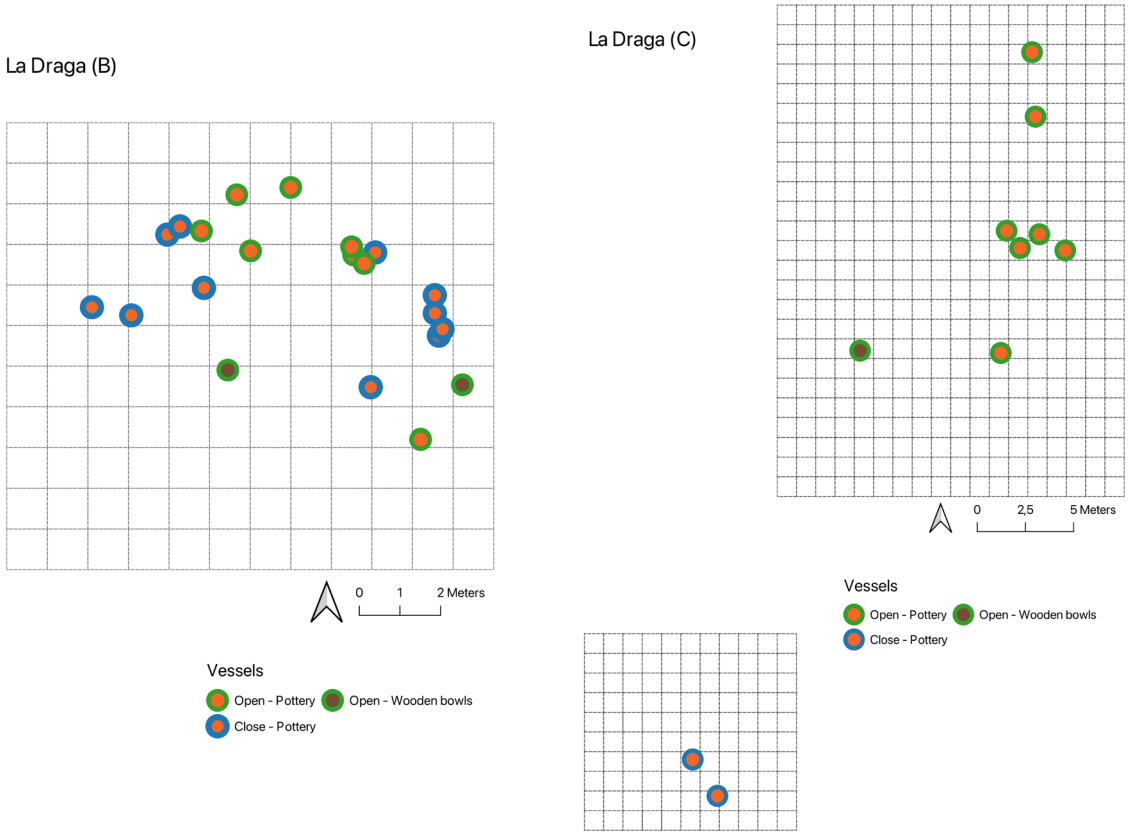

Figure 6: Distribution of containers according to their material and their shape (open/close) (DAO N. Morera).

Thus, a morphology has been proposed for seven wooden containers and 39 ceramics. Amongst these containers, 20 could be identified as open (seven wooden bowls, 13 of pottery), and 20 as closed, while six pots with a round/curved base provide no indication of their opening. The closed shapes are identified only in ceramic, notably because of the presence of necks. Open and closed vessels are found in both sectors (Figure 6). It is noticeable that there are areas where only open vessels are found, such as the northern part of Sector C, while closed pottery is grouped in the southern part of this sector and in two parts of Sector B (to the west and east).

Table 5: Size information of vessels

	Small (<10 cm)	Medium (11–20 cm)	Large (21–30 cm)	Very large (>31 cm)	Total
Basketry remains		2	2	4	6
Wooden vessels		4	2		6
Ceramic vessels	1	16	20		37

5.3 Size

Since no entire ceramic vessels were found/reconstructed from the potsherds recovered, and no profile or large part of the vessel could be reproduced, it was not possible to estimate the size accurately. However, even though information about the exact size and shape of the vessel, as well as if the vessel was open or closed, is limited, the diameter of the mouth is an important indication to allow a first-level, intra-site classification of the vessel based on its possible size. The vast majority of the vessels analysed present mouth diameters that vary between 11 and 20 cm (classified as medium-sized) and 21 and 30 cm (classified as large-sized). Only one ceramic vessel has a diameter smaller than 10 cm (Table 5).

In the case of wooden bowls, the diameter could be measured for five hemispheric containers. Three of these vessels had diameters ranging from 12.5 to 15.5 cm, while one had a diameter of 28 cm. The wooden container with a diameter of 12.5 cm is 4.2 cm deep, which implies a small volumetric capacity. The diameter of the partially preserved cylindrical vessel was calculated to be 10 cm; however, the original diameter could in reality be estimated at 20 cm. For the four other vessels, the diameter could not be estimated. One of the bases was a large relatively flat fragment measuring 17 cm × 15.5 cm × 2 cm. These dimensions of a base could be characteristic of a medium to large vessel.

For the basketry, a minimum size has been proposed from the fragments of bases preserved. The two basket bases with circular coiled foundations had diameters of 28.8 and 11 cm, respectively. Larger fragments from circular coiled bases had minimum diameters ranging from 11 to 13 cm, suggesting that they come from smaller objects, while three fragments came from bases with minimum diameters exceeding 30 cm, with the largest estimated at 42–46 cm in diameter.

To sum up, the wooden bowls are medium to large. The ceramic vessels are small to large. Regarding their typology, the cylindrical containers are mainly medium to large, while the hemispherical ones are of medium dimensions. Baskets are medium to very large. No correlation could be found between the opening of the mouth of the vessels and their size: medium and large containers are present among the typological categories of both closed and open ceramic vessels and wooden bowls. For the closed ceramic vessels, the recovery of only necks sometimes did not allow an identification of their original size.

The distribution of the containers according to their original size (Figure 7) shows the presence of medium to large vessels all over the site, in both sectors. However, the very large baskets are documented in the small area where most of the basketry remains were found, together with a large-sized ceramic vessel.

5.4 Taphonomy and Post-Depositional Processes

5.4.1 Fragmentation Pattern and Distribution

In Sector B, three areas of fragment concentration are observed (Figure 8), but not all three types of remains have been found in these areas. In Sector B, a higher density of potsherds is observed in the northern half of the sector (north-northwest concentration), while a concentration of basketry remains (green dots) is noted further south. Wooden containers are scattered throughout the site, without showing any pattern of concentration. For Sector C, the density of all kinds of materials is low compared to Sector B, with a density of less than one fragment per square metre throughout the sector.

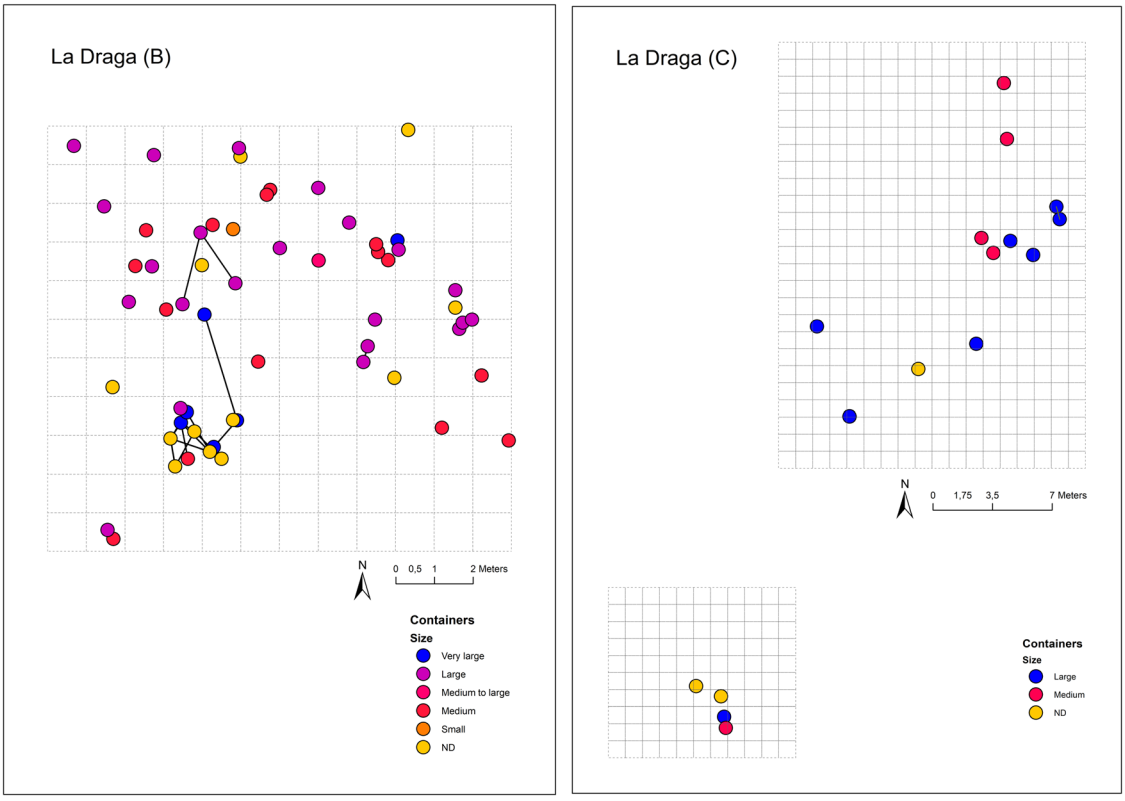

Figure 7: Distribution of containers according to their material and their size (DAO N. Morera).

The potsherds that were refitted are in the northern part of Sector B with a low dispersion pattern. In Sector C, they are located mainly in the same square metre. For the organic containers, the cross-sections are also concentrated in a small area or within the same square metre.

The potsherds mainly belong to the 5 cm × 5 cm to 10 cm × 10 cm size categories, but in Sector C, some potsherds bigger than 10 cm × 10 cm are also present. For the basketry remains, only three fragments are present in Sector C. The average size of the baskets is different between sectors (11 cm × 6.5 cm for Sector C against 6 cm × 2 cm for Sector B), owing to the presence of a few fragments and a very large one in Sector C. For the wooden bowls, the reconstruction and the lack of prior measurements did not allow a sufficiently reliable calculation to make this comparison.

5.4.2 Preservation and Taphonomic Processes

For all containers, the global state of preservation is medium to poor. The plant-based materials present detachments, loose fibres due to the decay of the plant, and perforations by aquatic roots growing into the submerged archaeological layers. Post-restoration bulges, cracks, and fissures are also documented. Carbonisation is likewise a factor that has contributed positively to the preservation of objects. In total, six bowls (75%) and seven baskets (87.5%) of the perishable containers recovered are carbonised. Unfortunately, the corresponding information for Sector C is not available to make comparisons. In Sector B, there is no dominant pattern regarding different vessel survival. Moreover, the state of preservation of all materials is highly variable even within containers made of the same material or the fragments from the same container but that were discarded in different square metres.

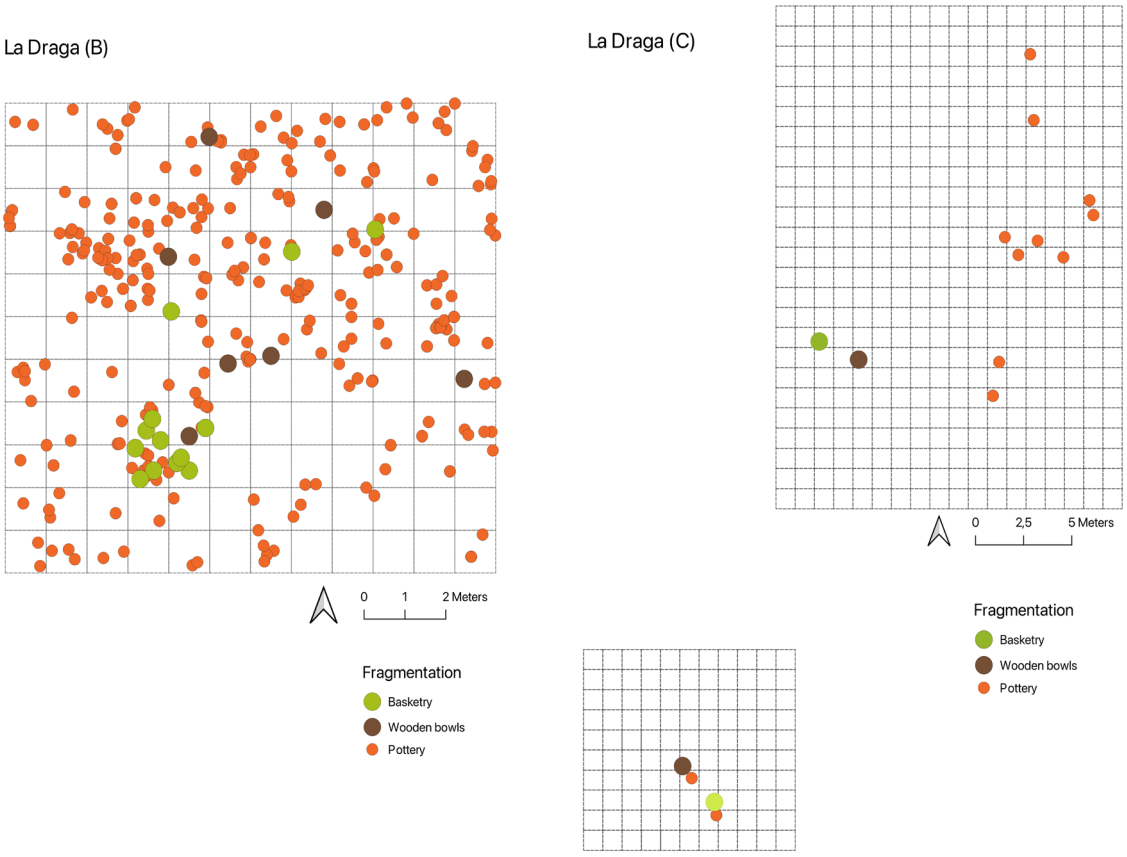

Figure 8: Distribution of the fragments of containers (DAO N. Morera).

6 Discussion

6.1 Assessment of Representativeness of the Vessels and Activity Area

According to the mapping of the spatial distribution of the pottery remains, two large concentrations of ceramic fragments were observed in Sector B, contrasting with an absence of potsherds in the south part of the sector, but no other specific pattern could be observed regarding their distribution. At the same time, the organic containers are distributed all over the two sectors where they are preserved, but a concentration zone in Sector B is evidenced. Most of the baskets and wooden bowls are fragmented, and the fragments from the same vessels were often close to each other, within the same square metre. Moreover, no significant differences in potsherd fragmentation have been documented according to the sizes of fragments. The wooden bowls are distributed all over the two sectors without any clear pattern, while the fragments of the baskets were mainly recovered from one area including the adjacent squares JG85/84 and JH84/85 (Bosch, Chinchilla, & Tarrús, 2000, p. 114). Several remains of large to very large baskets are also present in these square metres. Except for the southern part of Sector B/D, no area lacking the presence of organic fragments could be observed in Sector B. This distribution seems to be linked to the specific activities related to the use of baskets or large containers in the square meter JH84/85 (see the next section).

At La Draga, the number of potsherds is quite low compared to other contemporaneous *Cardial* sites (Gibaja & Clop, 2012). In 77 of the excavated squares, one to six sherds were recovered per square, while only 16 excavated squares yielded more than six sherds (Tzerpou, 2020).

Particular post-depositional processes (fragmentation, weathering, fluctuation of phreatic level) are suspected in the south section of sector B, because of the absence of potsherds in this area and the bad survival of

the internal and external surfaces of the few potsherds recovered nearby (Tzerpou, 2020). The lower density of fragments in the submerged Sector C affects all the categories of remains, and more research is needed to understand the processes that have led to the survival of the artefacts in this sector. In regard to the organic remains from both sectors, it appears that all of them were affected by post-depositional processes in a similar manner. The macroscopic analysis of the surface degradation of objects made of boxwood (*Buxus sempervirens*) after consolidation and restoration reveals that those recovered in Sector C exhibit a higher level of alterations. However, in the case of other taxa, variables such as the shape of the objects or the properties of the taxa also influenced the degree of surface alteration (García, 2022). The fact that organic materials are distributed across both sectors, B and C, suggests that degradation processes are not the main reason for the current distribution of the fragments, but instead, this could be related to the original places where they were discarded. Therefore, the density of remains would more likely be due to human activities or areas of abandonment than post-depositional processes. The partial or total carbonisation of 75% of the basketry remains and 87.5% of the wood remains suggest that they were discarded by the inhabitants of the settlement although we cannot rule out that carbonisation could be the cause of the abandonment of these objects.

6.2 Functions According to the Vessel

The function of the vessels was associated with indirect evidence, such as their morphology, their original dimensions, and the presence of high-temperature alteration in the case of ceramic vessels, and with certain direct evidence, when it existed, such as the identification of organic residues on certain ceramic vessels and carpological elements associated with the basketry.

The assembly of the wooden vessels showed an incredible set of carved bowls. No wooden boxes or composite vessels were retrieved. The wooden containers are mainly hemispherical or dome-shaped, with a larger diameter at the mouth than at the base, and medium to large in size. Three of the wooden bowls also had handles that could have been used to move, transport, or even hang up these vessels. The shape of the base of most of the preserved bowls is rounded. Carbonisation was observed on almost all the bowl fragments, affecting all or part of them. The bottom is not necessarily the most affected by charring, although it is not present on all the wooden containers. The charring of wooden vessels must be linked to accidental charring, and not connected to cooking activity or as a result of throwing them into the fire when broken or discarded. Organic residues are found in five bowls, both on the base fragments and on the lip, which suggests that these vessels probably contained some type of food. No information on the composition of the food product processed, transformed, or held in these containers is currently available, but this will be investigated through microbotanical (starches and phytoliths) and proteomic analyses in the future, taking into account the restoration of the material might be a limitation to these analyses. Other wooden finds that could be linked to consumption practices are also present at La Draga, such as wooden spoons, ladles, and a stirrer.

Moreover, the remaining parts of one flat wooden container that could have been used for consumption were also recovered. However, the thickness of this container is unusually large, which could also be related to it being part of the base of a large storage container designed to hold foodstuffs or other products.

Some ceramic vessels with spherical or hemispherical shapes and high-temperature alteration are also thought to have been used for cooking and processing foodstuffs. On the other hand, as in the case of wooden containers, the ceramic vessels with large handles could have been used to transport goods or been hung up.

The presence of baskets with a medium diameter with simple interlocking stitches or simple stitches would make transport easier and could be an indication of this function. In this sense, the presence of handles suggests a transport function.

There is also evidence that foodstuffs, particularly plant products, were preserved in containers for later consumption or to provide seeds for the next growing season. The large-sized ceramic vessels with necks and the large baskets could have been used for storage. The walls of the large-sized ceramic vessels with necks are also thicker, a fact that would make their transportation even more difficult. For coiled basketry, the pieces with double non-interlocking stitches appear to belong to the objects with the largest diameter. This technique

enables the production of more compact and rigid containers, well-suited for storage purposes. As a result, in many cultures, coiled basketry has served the same functions as pottery (Kuoni, 1981). These large-sized baskets with double stitches are dominant among the baskets at La Draga and may have been used as immobile objects to store grain or legumes, owing to the optimal conditions provided by the texture of the straw, which would ensure a balance between ventilation and maintenance of humidity (Romero-Brugués et al., 2021). In addition, several items of basketry were associated with cereal grains (*Triticum aestivum*/*durum*). One is a block of bark, loose fibres, and sediment with cereal grains on top, while the other is a small rim fragment associated with two grains. Numerous charred cereal grains were also collected in square metre JG-JH84/85, where a concentration of very large basket fragments was identified, suggesting the presence of a granary (Antolín & Buxó, 2011; Bosch et al., 2000), which confirm the use of baskets as storage for plant products at La Draga. Evidence of storage practices is complicated by the fact that they are poorly preserved unless the structures are excavated. Underground silos, although not found at La Draga, have been documented since the Early Neolithic in the north-east of the Iberian Peninsula and are characterised by "small" storage capacities (on average around 575 litres), mainly for the storage of cereals and associated with family units (Prats, Antolín, & Alonso, 2020). In exceptional cases, such as at La Cova del Fem, fragments of coiled baskets have been recovered directly from these silos in association with cereal grains, once again demonstrating the strong link between coiled basketry, seed processing, and storage. Baskets may also have been used to process or store other foods, as evidenced by imprints of basketry found on pieces of bread in the Early Neolithic at La Marmotta, Italy (Mineo et al., 2023).

Such a corpus of wooden containers is a rare occurrence in the Neolithic and more generally in the prehistorical period. Their perishable nature only allowed in many sites the preservation by imbibition or carbonisation of small fragments for which no indication of shapes is available (Murray et al., 2009; Powell, Oldfield, & Corcoran, 1971) or the survival of a reduced assembly with one or two vessels (Lozovskaya & Lozovski, 2016). The rare occurrence of these remains, which may be very dispersed through geographical places, and archaeological cultures, along with a wide variety of types – carved bowls from a single piece of wood, composite vessels, sewn bark boxes – makes difficult any attempt of comparison of their morphology. Thus, wooden vessels were not identified in contemporaneous early Neolithic Lake settlements, such as La Marmotta (Mineo et al., 2023). Such a repertoire of containers, ladles, spatulas and stirrers is documented in Middle Neolithic sites, from 4300 cal BC in the Egolzwil culture in north-eastern Switzerland (Wyss, 1994), from 3700 in the Pfyn and Cortaillod culture in Switzerland (Müller-Beck, 1991; Winiger, 1981; Voruz et al., 1991), in Horn culture in north-east of Germany (Matuschik, 2021; Schlichtherle, 1997) and the Middle Neolithic Bourguigon in French Jura (Bontemps et al., 2015; Pétrequin & Pétrequin, 1988). However, their overall morphology might differ from those of La Draga's artefacts.

Wooden vessels shape related to consumption and/or foodstuff processing are diverse, including large, deep, oval dishes between the fifth and fourth millennia. In the Pfyn culture, small wooden bowls present a round-bottomed shape sometimes with an oval general shape (Schlichtherle & Wahlster, 1986). In the Swiss lake-dwellings, there are notable differences between the shapes of the wooden and ceramic vessels at these sites, suggesting that the shapes and uses of the ceramic and wooden vessels complement each other, as we suggest at La Draga.

The use of wooden containers is also documented in earlier periods. At Star Carr (UK), in the late Mesolithic, two carved "platters" or "containers" were identified but their large sizes and the presence of a long straight handle on one side differ greatly from the La Draga vessels (Taylor et al., 2008). In Zamostje II, in Russia, one fragment of the plate and one flattened bowl, with a wider opening than the La Draga artefacts, were recovered from Late Mesolithic and Early Neolithic levels in association with other service objects (spoon, ladle [Lozovskaya & Lozovski, 2016]).

Characterising the function of an object only through indirect evidence, such as its shape and the size, is not sufficient to make a solid assumption about its actual use. It must be combined with direct evidence, such as the presence of archaeobotanical food crust remains, and their biomolecular characterisation. Moreover, despite the presence of organic residues on organic vessels, analytical analyses aren't often carried out on this type of material or are not always successful (Taylor et al., 2008) due to the challenges of the preservation of biomolecules, sometimes even limited by the restoration processes. These reasons don't allow us to precisely

approach the actual use(s) of these organic containers. On the other hand, biomolecular studies from Early Neolithic pottery in north-eastern Iberia display a wide range of foodstuffs, including domestic and sometimes wild animal ruminant fats, sometimes mixed with vegetal products. Dairy product, like fresh or fermented milk, was also processed in these containers. Exceptional use of beeswax is noticeable, while marine foodstuff hasn't been detected in the Neolithic pots in Western Mediterranean (Breu Barcons, 2019; Tarifa Mateo, 2019).

6.3 Role of Perishable Containers at the Neolithic Site of La Draga

The site of La Draga has revealed a rich variety of materials employed in the production of containers, including clay, plant fibres, and wood. Unfortunately, materials of animal origin have not been preserved at the site, apart from bones. This limitation does not allow us to determine if such materials were utilised to create similar products, despite the documentation of skin and leather bags in other archaeological contexts.

The minimum number of containers across the different types is 66. Among these, ceramic pots are the most abundant, as they form 71.2% of the total count. Organic containers therefore account for a significant 28.78% of the identified items. Plant-based materials face a higher risk of deterioration within an archaeological context. Not only are they subject to degradation during their use and after abandonment, but they are also easily destroyed once discarded. It is noteworthy that many baskets and wooden containers show signs of carbonisation, although they were found outside fireplaces or not surrounded by burnt remains, suggesting that they were accidentally exposed to the fires, which may have been a reason for their abandonment. The substantial percentage of organic containers, particularly wooden vessels, underscores their significant role within the farming community of La Draga, even in the presence of ceramic pots.

While the overall count of individual containers is generally low, particularly for those crafted from wood or plant fibres, certain trends are discernible. Regarding morphology, ceramic pots are more inclined towards closed shapes than wooden bowls. The creation of closed shapes is more feasible with clay than with wood, considering the technological limitations of Neolithic woodworking. A diverse set of woodworking tools has been identified at La Draga, including boxwood wedges for trunk preparation, adzes at various stages of preparation, blades, flakes, and malacological tools for the final stages of wooden artefact production (Clemente-Conte & Cuenca, 2011; Palomo et al., 2013). The wooden containers were either carved in one piece of wood already prepared and debarked, or the interior was burnt with a controlled fire, due to the absence of adapted tools to carve it. Other woodworking tools, such as chisels, knives, and axes, have not been documented at La Draga. However, they were used in Alp's pile-dwelling sites from the Middle Neolithic onwards to make wooden artefacts such as bowls and dishes (Pétrequin & Pétrequin, 1988). Thus, the fabrication of a lid, adjusted to the opening of the vessel, might be another way to make "closed vessels." At La Draga, no wooden lids were identified in the collection. They are also rarely recovered from Neolithic contexts. New technologies, such as lathe turning, enabled more advanced forms to be obtained, but its appearance is rarely attested before the Iron Age (Earwood, 1993b; Mille, 2004, p. 21; Wood, 2005, p. 51), and only from the Iron Age and later periods in the Iberian Peninsula (Martín-Seijo, 2021). Containers carved in two parts, allowing greater volumetric capacity, are not documented before the 2nd millennium BC. Composite boxes, such as sewn bark boxes, are not attested at La Draga, although they are well documented in other Neolithic regions of the Alpine lakes (Leuzinger, 2002; Voruz et al., 1991; Winiger, 1999, 1981; Wyss, 1976).

Unfortunately, none of the basketry elements provide clear information about their shape. The prevalence of closed shapes suggests that ceramic pots may have served various functions distinct from wooden vessels. For instance, the presence of spherical shape, common in the ceramic pots under study, is an efficient characteristic for cooking vessels as the rounded bottom and walls contribute to avoiding thermal shock and breakage (Arnold, 1985; Woods, 1986). Closed shapes among ceramic pots may also indicate their role in food storage, while organic containers may have served other purposes such as transport, presenting unique storage solutions or even symbolising cultural practices and traditions.

Size comparisons also reveal distinct patterns. In the medium and large categories, all types of raw materials are represented in similar percentages. However, for the small categories, only ceramic containers

have been identified, whereas basketry is predominantly found in the largest sizes. This is coherent with the use of large baskets for storage. Moreover, the more concentrated pattern of distribution of basketry remains in some squares may be related to that function. In contrast, the more mobile medium and large containers are spread out across the site.

Organic containers, including basketry and wooden containers, served specific functions and held cultural significance that complemented the more prevalent use of ceramic pots after their introduction in the Iberian Peninsula by farmers and herders. The shapes and decorations made with the shell of *Cardium* are characteristic of the Cardial culture. This introduction of ceramics was accompanied by new technological skills, in terms of choosing the clay and knowing its properties, whether to add a suitable degreasing agent, assembling, shaping into columbines and firing method. At La Draga, different categories of fabric groups were observed an indicate the "know-how" of the population concerning the properties of the local clay deposits and of the inclusions added to the matrix, depending on the properties they wanted to convey to the vessel. However, so far no direct association between any of these fabric groups with a specific use of container could be highlighted. In addition to these technological innovations, the introduction of these containers has been accompanied by a change in the way food is produced. The domestication of animal and plant species and the diversification of preparation methods, such as grinding, soaking, fermenting, roasting and boiling, expanded the composition of foods – bread, porridge, cheese, and fermented milk, to name but a few. Food and cooking practices have been impacted by the introduction of ceramics, which may have progressively led to the importance accorded to this material for its preparation, with the appearance of craftsmen holding the knowledge of ceramic making, and the development of pottery workshops in more recent periods onwards in the Iberian Peninsula (e.g. Iron Age). At La Draga, the scarcity of pottery remains compared to the other sites could be linked to a more dominant role of the containers made of organic material in the early phases of the Neolithic, which has only been revealed because of the exceptional preservation of perishable material at the site. The survival of plant crafts is part of a long tradition rooting back to the Palaeolithic, with the coexistence of ceramics reflects the adaptability of the community, as they made use of the best attributes of both organic and ceramic containers to meet their diverse needs and preferences. The choice to continue using organic containers together with ceramics could be attributed to their distinct advantages, including their light weight, flexibility, and possibly their cultural significance. The presence of this incredible collection enriches our understanding of the complex material culture of La Draga and the skills of the first farming societies during the Neolithic period.

7 Conclusions

Organic containers have survived the different post-depositional processes across the sectors and are widespread over almost the whole site. Their distribution seems to depend on where they were discarded within the site and their primary use. The comparison of the main characteristics of the vessels suggests different functions according to the material. It also demonstrates that the inhabitants of the site possessed a comprehensive knowledge of the different materials. Wooden bowls tend to be related only to consumption, while baskets may also have been used to transport or store food, and ceramic vessels to process foodstuff and cooking. Concerning the use of these artefacts, the recovery of several pieces of basketry along with cereal grains could refer to a zone of grain storage. Areas that could be linked to the manufacture of these vessels still need to be identified, and this work should be continued by including other archaeological and architectural remains.

This study is a preliminary step in the study of the function of vessels – inorganic and organic – and allows us to propose a hypothesis about the function of these different containers, which needs to be implemented by further use-wear, plant microremains, biomolecular and isotopic analyses. The presence of residues on at least five wooden bowls, six spoons, and ladles from Sectors B and C could be a lead to follow, especially since the lipid analyses already carried out on potsherds have shown that biomolecules are well preserved in levels with constant and high humidity.

The coexistence of organic containers alongside the availability of ceramic pots in the Neolithic community of La Draga highlights the enduring significance of these organic containers. While the introduction of ceramic technology offered advantages in terms of durability and ease of production, the persistence of organic containers underscores their continued relevance within the community's daily life.

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