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ABSTRACT

The Fortified Chalcolithic Settlement of Outeiro Redondo (Sesimbra, Portugal). An Account of the Excavations Conducted between 2005 and 2016

João Luís Cardoso

This paper presents a synthesis of the results obtained during the eight archaeological field seasons conducted at the prehistoric fortified settlement of Outeiro Redondo (Sesimbra) between 2005 and 2016.

According to the results of the radiocarbon analyses, the occupation of the site can be dated to between 2600 and 2100 cal BC. During these ca. 500 years of human presence on that rocky hill, dominating the bay of Sesimbra, a mighty defensive system was built, using large blocks of locally available hard limestones, with an ellipsoidal plan and surrounding the highest part of the hill. This walled line defended an area occupied by several circular or ellipsoidal habitational structures, accompanied by several combustion structures, in some cases used for copper metallurgy, a very well documented economic activity at this site.

The joint analysis of the absolute chronology, the stratigraphic sequence, the typology of the recovered archaeological assemblages and the construction sequence of both habitational and defensive structures, supports the following correlations:

First cultural phase – Early Chalcolithic (2600–2500 cal BC): scarce metallurgical evidence; ceramic production with fluted decoration; absence of defensive structures; habitational structures represented by sub-circular huts and structured hearths.

Short occupation hiatus (which might be only partial), perhaps of one or two decades, following a major fire that destroyed the most densely populated part of the settlement, corresponding to the platform located on its eastern side.

Second cultural phase – Full/Final Chalcolithic (2440–2110 cal BC): strong evidence of copper metallurgy; ceramics with ›acacia leaf‹ and ›cruciferae‹ decorative patterns; defensive structures built during a single construction phase; ellipsoidal huts and structured hearths.

KEYWORDS

Chalcolithic, fortified settlement, archaeological excavation, material study

JOÃO LUÍS CARDOSO

The Fortified Chalcolithic Settlement of Outeiro Redondo (Sesimbra, Portugal)

An Account of the Excavations Conducted between 2005 and 2016

1 Introduction

1 This paper summarizes the results of the excavations carried out under the scientific direction of the author at the Chalcolithic fortified settlement of Outeiro Redondo (municipality of Sesimbra, District of Setúbal, Portugal). This work was undertaken within the scope of two research projects: The first was approved by the former ›Instituto Português de Arqueologia‹, the second by the ›Direção Geral do Património Cultural‹. The archaeological excavations took place between 2005 and 2016, over eight yearly field seasons.

2 The knowledge obtained from the study of the remains, the stratigraphy, and the archaeological structures added to the results of a systematic study of the materials recovered and enabled us to gain essential information on the occupation periods and to identify the construction phases as well as their absolute chronology and cultural significance. This paper aims to present a comprehensive appraisal of the main conclusions drawn from the still ongoing work, preceding the final and systematic publication of the results.

2 Historiography

3 The fortified Chalcolithic settlement of Outeiro Redondo was identified by Gustavo Marques in 1966, who shortly afterward made it known[1]. In the following years, the same author continued his investigations, with the collection of surface materials and through the opening of small trenches, of which, however, no record is known. The materials then obtained were the subject of a short mention[2], and thus remained unpublished until a systematic review of them was carried out[3] within the scope of a research project, which was approved and financed by the Portuguese Institute of

1 Marques 1967.
2 Martín Socas 1975/1976.
3 Cardoso 2009a.

Archeology and the Calouste Gulbenkian Foundation between 2004 and 2008. This project continued into another Research Project, approved by the Directorate General for Cultural Heritage, which was carried out between 2013 and 2016 with the logistical and financial support from the City Council of Sesimbra. This fieldwork has resulted in a large number of publications[4].

4 The present work corresponds to a synthesis of the archaeological results obtained and already published partially or comprehensively. Its presentation is justified given the great diversity and richness of the information collected, with comparative interest to other Chalcolithic sites of a residential nature in the southwest of the Iberian Peninsula occupied throughout the second half of the third millennium BC.

5 It was possible to relate the evolution of the construction system of the defensive and housing structures with the chronostratigraphic sequence and the predominant domestic productions of this period of time. Following the general excavation method in open area the location of the archaeological remains was recorded in relation to the identified domestic and housing structures. The excavation, progressing in depth according to horizontal planes related to the topography of the ground, allowed us to observe all the variations in the successive deposits, which were systematically registered throughout the high number of stratigraphic cuts. Their correlation made it possible to establish a general sequence valid for the entire excavated area.

6 No vegetal remains were identified, partly perhaps due to the remarkable circulation of water in the subsoil, favored by the steep incline of the slope.

7 This article does not reproduce the results of specialized studies already published, concerning, for example, the malacological fauna[5], or the copper alloys collected between 2005 and 2008[6]. Other specialized works, currently in progress, will offer more evidence for the primitive metallurgy developed at the site, just as the study of a remarkable decorated gold leaf, which is presented here for the first time.

3 Geographical Location and the Geological and Geomorphological Setting

8 The archaeological site is located around the rocky summit of an elevation consisting of whitish hard limestone from the Upper Jurassic (»Calcários de Azóia«), reaching an altitude of 210 m, which, together with the hill of Moinho da Forca and the castle of Sesimbra, forms a line of relief with northeast-southwestern orientation. Its name (»Outeiro Redondo«) results from the shape of its summit, which, seen from a distance, appears rounded.

9 Only the south-facing slope was suitable for the construction of defensive and housing structures: most of the archaeological work carried out was concentrated there, which continued progressing over the years to a platform located on the northeast side of the village (Fig. 1). On the east side, the steep slope ends on a regular platform, which was occupied by housing structures delimited by a walled line, while on the north side there is a large escarpment over 20 m high that made this side practically inaccessible. The only access to the village at that time would have been provided by the same footpath along the northwest-facing slope still in use today.

10 The top of the elevation may have been occupied at the time. From there came the materials that accumulated further downhill, along the inner side of the wall that

4 The most important of these publications are: Cardoso 2010; Cardoso 2013; Cardoso 2019a; Cardoso 2019b.

5 Coelho – Cardoso 2010/2011.

6 Pereira et al. 2013.

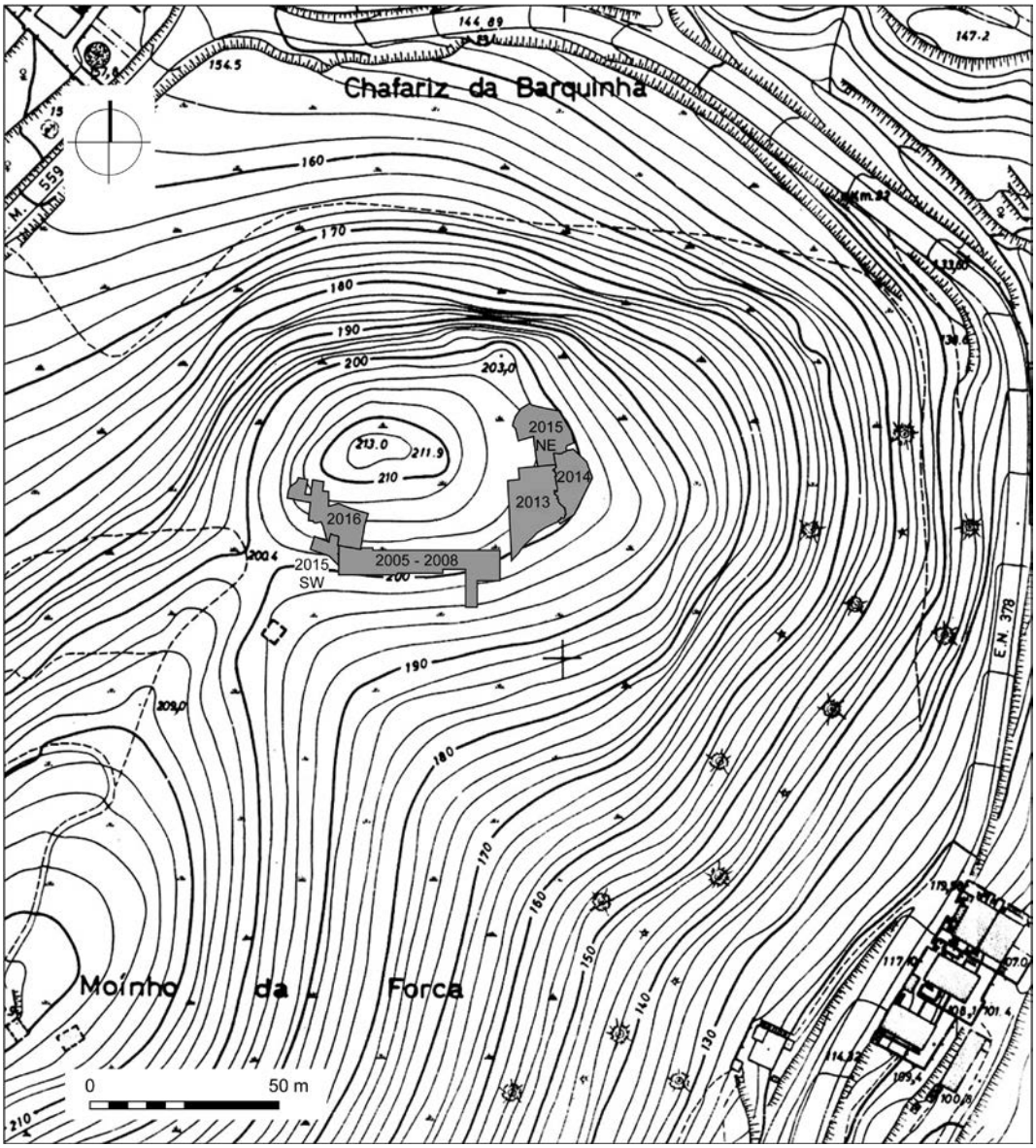

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Fig. 1 Outeiro Redondo. Location of the areas excavated between 2005 and 2016.

surrounds the entire elevation. The coordinates of the summit are as follows: 38º 27´ 16´´ lat. N; 9º 06´ 02´´ long. W Greenwich (Fig. 2).

11 From the hilltop, you can oversee a vast territory to the north, as far as Almada; towards the east, the view extends to the Risco anticline, which can be seen in the distance; the castle can be seen to the west; to the south, the view extends across the sea. Overlooking the entire bay of Sesimbra, the site thus constitutes an excellent location for the visual control of the adjacent coastline, the only stretch favorable for landing and berthing, since, both to the east and to west of Sesimbra bay, the coast is rocky and rugged.

12 For those coming from the sea, the village would have been a visible and monumental landmark, embodied by the presence of the fortified enclosure, which featured the most massive constructions on the south side, implanted at the top of the elevation already isolated and highlighted (Fig. 3, above), extending to the east, through a wall made up of large stone blocks easily identified before the excavations (Fig. 3, below). Interestingly, this kind of evidence was not recorded by Gustavo Marques. It was noted by Octávio da Veiga Ferreira, however, who wrote it down in his field notebook in 1966, the same year the site was identified.

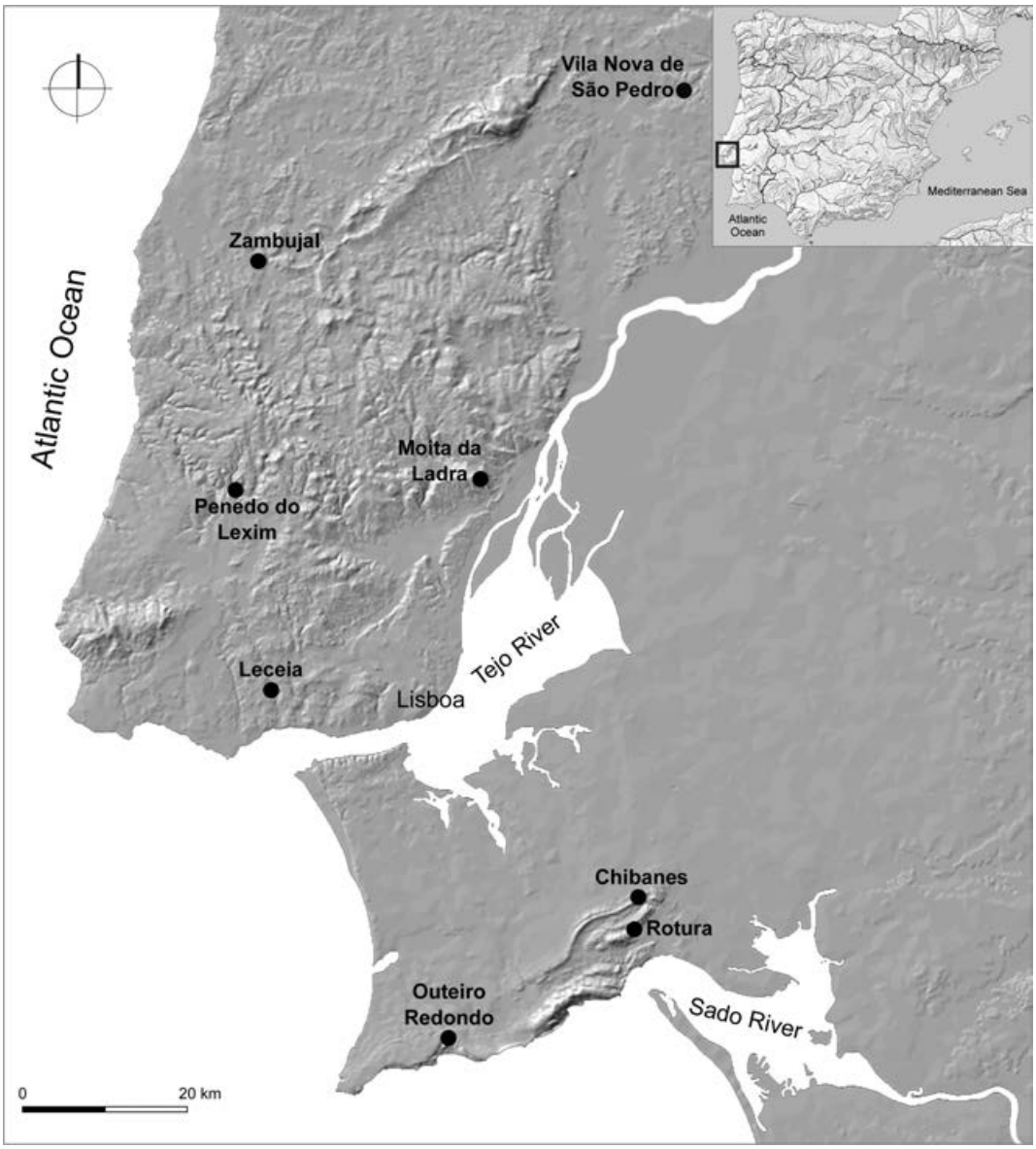

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Fig. 2 Outeiro Redondo. Location of the site in the Lower Estremadura, its geographical relation with the most important fortified Chalcolithic settlements in the same region.

13 The importance of a wide prospect is fully confirmed by the locations of the main Chalcolithic settlements in the region. The same can be noted for the fortified village of Moita da Ladra, Vila Franca de Xira[7]: As in Outeiro Redondo, the view here extends over the vast interior estuary of the Tagus, overseeing the river traffic, in particular the movement of vessels from the left bank of the estuary. In the villages of Penha Verde, Sintra[8], Penedo do Lexim, Mafra[9] and Leceia[10], there is the same concern about the control of then existing land routes in the already densely populated Baixa Península de Lisboa. In the case of Penedo do Lexim, it was the visual control of the Cheleiros stream that seemed important, while in the case of Leceia, the concern about controlling the valley of the Barcarena stream was evident.

7 Cardoso 2014a.
8 Cardoso 2010/2011.
9 Sousa 2010.
10 Cardoso 1997.

3

Fig. 3 Outeiro Redondo. Above: southeast general view of the elevation and the archaeological work carried out. Below: partial view of Wall G, evidenced by the alignment of large blocks that were in sight before the excavations began.

4 Stratigraphy and Cultural Phases of Occupation

14 Based on data gathered from various stratigraphic sections between 2005 and 2015 (Fig. 4), it was possible to define a detailed stratigraphic sequence, which, from top to bottom, can be described as follows:

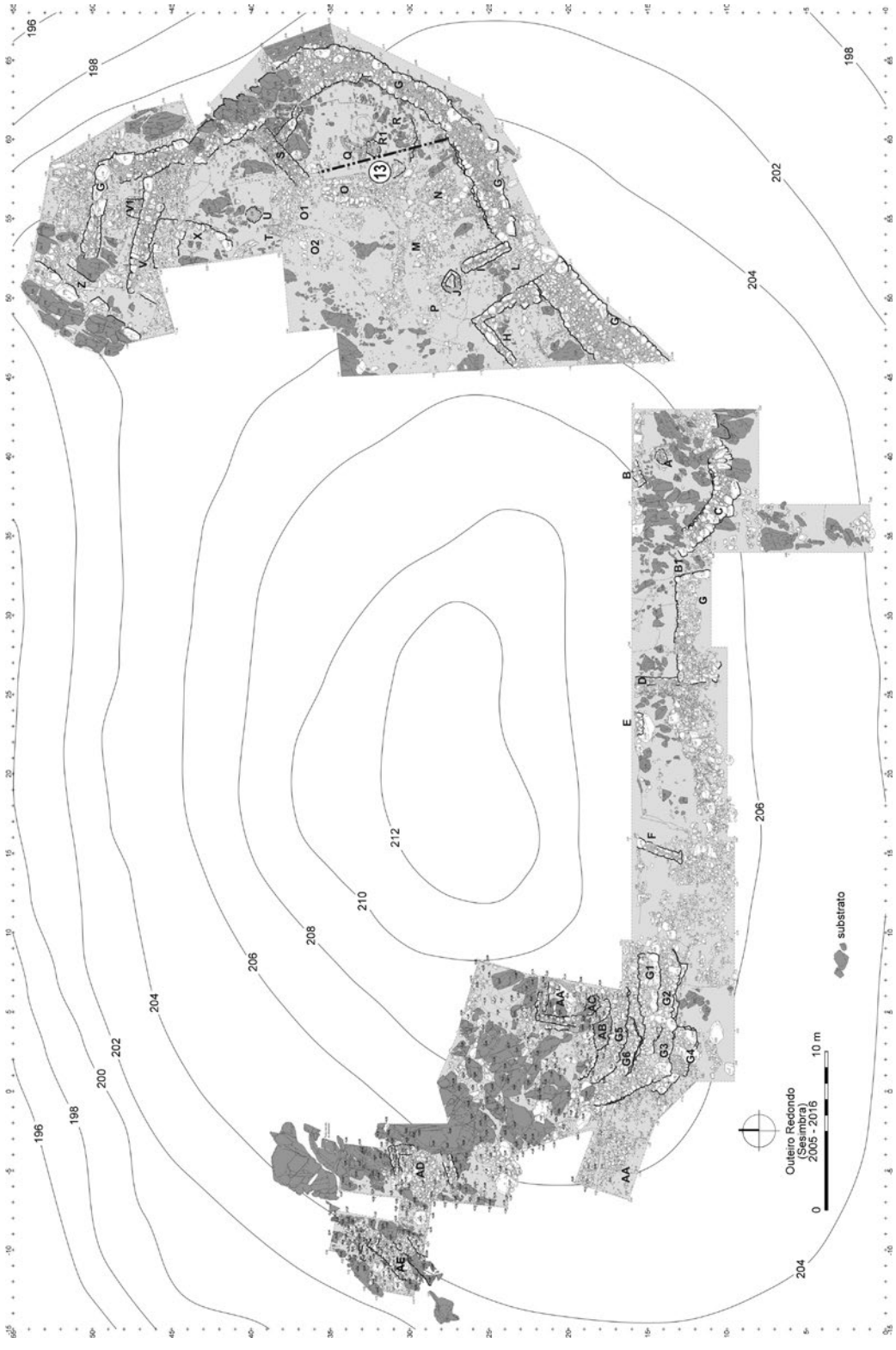

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Fig. 4 Outeiro Redondo. General plan of the defensive and housing structures identified.

Layer 1: chocolate-brown, slightly compacted vegetable earth, with very abundant limestone clasts. Archaeological materials ascribable to various phases of the Early and Full/Final Chalcolithic, including some very scarce Bell Beaker fragments. This combination of archaeological materials is explained by the transport of the pieces, originating from the highest part of the site, currently occupied by a rocky outcrop, and the consequent mixing of the materials. This layer reaches a maximum thickness of 0.10 m. Note that only prehistoric materials were found, an indication that the site

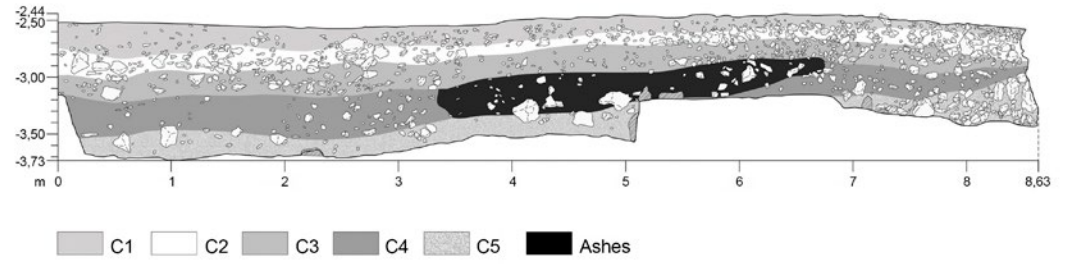

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Fig. 5 Outeiro Redondo. Stratigraphic cut 13 (2013) made in the accumulated deposits above Hut R (Early Chalcolithic) and up to the external side of Cabana O (Full/Final Chalcolithic), visible in the background on the left. Note the important layer of ash, corresponding to the fire that hit Hut R and the adjacent structures (see Fig. 4).

was not occupied afterwards, at least not in ways likely to leave any traces. This fact is essential for confirming that no anthropic major disturbance occurred after the prehistoric occupation of the site.

Layer 2: earthy layer, lighter and more compact than the previous one due to a higher percentage of clay, with sparse clasts, rarer and, in general, smaller than the previous ones. This layer yielded ceramic materials that, according to their typology and decoration, are almost exclusively related to the so-called Full/Final Chalcolithic of Estremadura; the thickness of this layer is between 0.10 and 0.60 m.

Layer 3: light brownish layer, clay-marly, generally below a depth of 0.60 m, with small limestone clasts and numerous dispersed carbonaceous particles, and ceramic materials without any products from the ›acacia/cruciferae leaf‹ group, characteristic of the Full/Final Chalcolithic of Estremadura. This layer has a lateral equivalent, represented by a thick yellow-grey ash deposit, which corresponds to a widespread fire that burned the hut or huts located in the areas excavated in 2014 and, partially, in 2015, which is an extension of the former. It is, therefore, a deposit corresponding to the destruction by fire of the habitational structures installed in the eastern platform during the final phase of the Early Chalcolithic (Fig. 5). Full/Final Chalcolithic

remains may occur atop this ash deposit, albeit exceptionally; their penetration is easily explained by their soft and porous consistency. This layer reaches a maximum depth of 0.40 to 0.50 m.

The foundations of the defensive structures are invariably situated in this layer, or in the lower part of the previous layer, thus belonging, without exception, to the Full/Final Chalcolithic, even to a relatively late period of this chrono-cultural phase.

Layer 4: reddish-brown, with abundant small blocks. This layer has an average depth of 0.20 m, sometimes reaching 0.30 m, due to the filling of rocky cavities in the geological substrate. Partly owing to the chemical and mechanical disaggregation of this basement, this layer is almost devoid of archaeological remains, being exclusively related to the Early Chalcolithic. It corresponds to the first human occupation of the site, prior to the construction of the defensive structures. This layer contains the bases of the huts and of the combustion structures assigned to the oldest archaeological occupation.

Altogether, it reaches a maximum depth of 0.20 m, and the associated archaeological finds are chronologically diagnostic (ceramics with fluted patterns, dating exclusively to the Early Chalcolithic).

Layer 5: bedrock, very irregular, that constituted the surface at the time of the first archaeologically tracable occupation. It is composed of hard, white Upper Jurassic limestones (›Azóia Limestones‹) with incipient ›lapias‹ whose cavities are occasionally and partially filled by a reddish sandy-clay deposit.

15 The oldest dates obtained for Outeiro Redondo, corresponding to the material recovered at depths of more than 1.0 m, in Layer 4, indicate late moments within the Early Chalcolithic, about 2600/2500 BC. Therefore, the first occupation can be generally related to Layer 3; however, the beginning of its occupation was registered in Layer 4.

16 The Full/Final Chalcolithic phase, which corresponds to the majority of the materials recovered in Layer 2, would have lasted, at this archaeological site, roughly until 2100 BC, with a 95 % confidence level.

5 Absolute Chronology

17 Through a research program, led by António Manuel Monge Soares, at the Instituto de Tecnologia Nuclear (Nuclear Technology Institute/IST), ca. 30 samples were dated, taken from the marine biosphere, namely shells of *Patella* sp., *Pecten maximus*, *Ruditapes decussatus* and *Cerastoderma edule*; and from the terrestrial biosphere, i. e. mammalian fauna that constituted part of the prehistoric populations diet.

18 The conventional results obtained (Fig. 6)[11], led to the following conclusions: the sum of the probability distributions of the various calibrated dates in each ›phase‹ supported the definition of two main sets: (i) the oldest, between 2540–2480 cal BC (1 σ) or 2610–2460 cal BC (2 σ), corresponding to the end of the Early Chalcolithic; and (ii) the most recent, between 2340–2180 cal BC (1 σ) or 2440–2110 cal BC (2 σ) for the Full/Final Chalcolithic occupation.

11 Cardoso et al. 2010/2011.

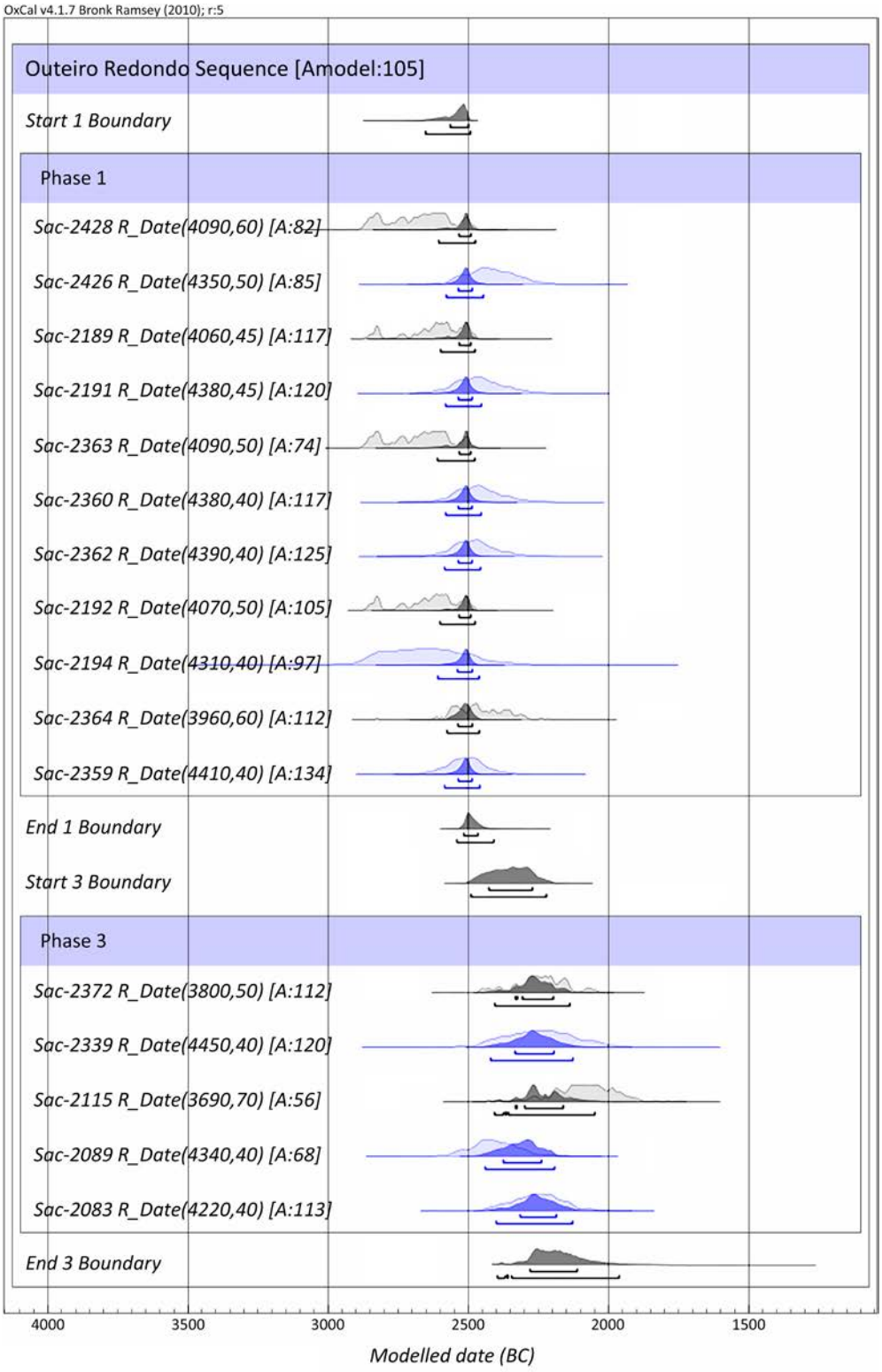

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Fig. 6 Graphical probability distributions of the Outeiro Redondo radiocarbon dates, using the IntCal09 and Marine09 curves (Reimer et al. 2009) and the OxCal 4.1.3 software (Bronk Ramsey 2009); dates obtained from samples of the terrestrial and the marine biospheres (Cardoso et al. 2010/2011).

19 These chronometric results were compared, in the above-mentioned study, with results from other inhabited sites of Estremadura dated to the third millennium BC, including some highly relevant informations, published in the meanwhile, and related to the fortified settlements of Moita da Ladra (Vila Franca de Xira)[12] and Leceia[13].

12 Cardoso et al. 2013b.

13 Cardoso – Soares 1996.

Fig. 7 Outeiro Redondo. Partial view of the plateau located on the eastern side of the rocky outcrop, where several Early and Full/Final Chalcolithic huts were installed, delimited by Wall G, interrupted by a large door (Entrance L, see Fig. 4), considered over-dimensioned for only practical purposes.

7

Fig. 8 Outeiro Redondo. Detail of the western side of Wall G, corresponding to the longitudinal overlap of several stretches, forming parapets along the steep slope.

8

6 Defensive and Domestic Structures

6.1 Defensive Structures

20 The excavations resulted in the identification of several defensive structures. The most important structure is a defensive wall surrounding the entire rocky outcrop

9

Fig. 9 Outeiro Redondo. Partial view of Wall G, surrounding the settlement. Note the construction technology, defined by wall facings made of large blocks, with an internal filling of smaller blocks, fitted together.

10

Fig. 10 Outeiro Redondo. Partial view of Barbican C, built on the external side of Wall G (see Fig. 4).

(Fig. 4). Much of the area enclosed by this walled structure, especially a large plateau located on the eastern side of the hill, has adequate conditions for human occupation (Fig. 7). The characteristics of this defensive structure may vary according to the topography of the terrain.

Fig. 11 Outeiro Redondo. Above: northern side of the defensive enclosure; in the first plane the large blocks belonging to Wall G; in the second plane, Wall V, forming together a wide and closed space with the function of a barbican. Below: Wall V; in the left, the inner space formed by this wall and Wall G, corresponding to the floor of the barbican.

11

21 Thus, in the eastern sector of the hill, where the steepest slope is situated, this structure is constituted of successive, longitudinally juxtaposed massive walls, like large, tidily arranged blocks of modern support walls (gabions) (Fig. 8). In fact, its main function was to ensure, by its own weight, the stability of the platform situated above, where habitational structures would have been located. Thus, in the occidental sector of the settlement, this structure was not exactly a wall, in the traditional sense of the term, but rather a rocky ›parapet‹ with a single face, oriented towards the slope.

22 By contrast, along the other sectors of the defensive circuit, where the slope is less pronounced, it was possible to build upward, following the contour lines.

23 The construction technology shows great differences, since the objectives to be achieved were also different. Thus, while in the eastern sector one observes the simple placement of large, coarsely aligned blocks in successive, longitudinally arranged walls, in the central and western sectors, the technology used to build the wall followed the procedures usually adopted in the construction of similar Chalcolithic structures. These consisted in the prior definition of the outer and inner walls, using large, roughly aligned blocks, and the filling of the interior space thus defined using smaller blocks fitted together (Fig. 9).

24 In 2015, the possible existence of a second defensive line was investigated. If it existed, it would have been built in front of and parallel to the already known defensive line, on its southern side. This possibility, however, was not confirmed.

25 Therefore, the main defensive structure consists of a simple linear structure, which would have surrounded the hill, except perhaps on the north-facing sector, where the abrupt slope did not enable the preservation of any remains of such a wall. It is more likely, however, that the defence of that sector was composed of wooden abutments, dominating the rocky cliff.

12

Fig. 12 Outeiro Redondo. View of Wall G on the sector adjacent to Entrance B, visible in the foreground.

26 The architectural simplicity of this defensive wall is only broken, on the southern side, by the existence of a structure with a sub-circular plan. This structure was already identified during first excavation season in 2005. It protrudes in relation to the adjacent entrance in the wall, being thus able to perform the function of a barbican (Fig. 10). Another structure that would have had the same purpose, although showing a completely different set of features, was identified in 2015 in the northern sector of the wall. It consists of an external wall parallel to the main wall, both defining an elongated, closed and empty space (Fig. 11).

27 Access to the enclosed space was assured by several entrances, with different architectural features. The first identified entrance is associated with the protruding semi-circular barbican mentioned above (Fig. 12).

28 Another, more complex entrance, identified in 2013, is related to the internal arrangement of the enclosed space, which was delimited, on both sides, by rectilinear, parallel walls, one of them with an orthogonal lateral extension (Fig. 13). This arrangement, built during the last construction phase of the settlement, confers a degree of monumentality to an entrance whose excessive width reinforces its lack of functionality, from a defensive perspective. The foundations of the orthogonal walls situated on the inner side of this entrance were unearthed from an archaeological layer that yielded Full/Final Chalcolithic materials, unlike the wall itself, whose foundations were built directly onto the bedrock or on a residual layer with Early Chalcolithic remains. A clear expression of this fact is the existence of a structured hearth underlying the orthogonal walls of this monumental entrance belonging to the Early Chalcolithic.

29 A third entrance leading into the defensive structure was identified in 2015, facing north. It is a simple structure, with the particularity of taking advantage of one side of the natural alignment of the geological outcrop. Large blocks placed on either side also contributed to the definition of this entrance.

30 The chronology of this single defensive structure built around the hill can be entirely ascribed to the Full/Final Chalcolithic, regardless of the foundations being situated in Layer 2, or in Layer 3. Its relative young age is interesting, since, until the

13

Fig. 13 Outeiro Redondo. In the foreground, section of Wall G, adjacent to Entrance L, in the background, defined by two rectilinear and parallel walls, from a very late period within the defined construction sequence (end of the Full/Final Chalcolithic).

excavation of Leceia, it was thought that the majority of the defensive structures of Estremadura had their peak before the first half of the third millennium BC.

31 However, the results from Outeiro Redondo match the conclusions of the excavations conducted at the fortified settlement of Moita da Ladra (Vila Franca de Xira)[14], which indicate the continuous construction of large defensive structures throughout the second half of the third millennium[15], as already indicated by the results obtained at Zambujal, where important defensive structures continued to be built[16].

32 The study of the defensive wall's foundations also led to interesting conclusions. This structure was either built directly onto the geological substrate, especially in the sectors with a steeper slope, or into Layer 4, corresponding to the Early Chalcolithic; it was also based in some cases in Layer 3, and even in the lower part of Layer 2. It can be concluded that its construction is relatively late in the overall sequence of the settlement, corresponding to an advanced phase of the Full/Final Chalcolithic, although the beginning of the site's occupation dates back to Early Chalcolithic.

6.2 Domestic Structures

33 The most important sector was completely excavated between 2013–2015. It is situated on a plateau at the eastern side of the settlement (Fig. 7), with remains of habitational structures and important evidence of daily activities, particularly copper metallurgy.

34 The oldest dwelling structure is represented by a sub-circular hut, incorporated in Layer 4 of the stratigraphic sequence (Early Chalcolithic), with a structured hearth, also sub-circular, made up of small blocks, over the geological substrate (Fig. 14). A few

14 Cardoso 2014a.

15 Cardoso et al. 2013b; Cardoso 2014a.

16 Kunst 1987; Kunst 1996; Kunst – Lutz 2010/2011.

14

Fig. 14 Outeiro Redondo. In the foreground, view to the south over Hut R (Early Chalcolithic), with a combustion structure inside. In the background, Wall G (Full/Final Chalcolithic).

fragments of fluted vessels were recovered, which leaves no doubt as to the cultural integration of this structure in the Early Chalcolithic. This hut was completely destroyed by a fire, which created a thick ash layer, the lateral equivalent of Layer 3.

35 It was, therefore, a destructive episode that was at the origin of the first abandonment of at least this part of the settlement by the middle of the third millennium BC. Indeed, if the reconstruction had followed immediately, one would expect this thick deposit of ashes to have been removed, which did not happen.

36 Actually, the archaeological layer that rests upon it (Layer 2) is dated to the Full/Final Chalcolithic. The very abundant materials, particularly the ceramic products with ›acacia leaf‹ and ›cruciferae‹ decorations support this dating. These decorations were applied especially to large globular vessels, which were used for storing provisions. It was on this layer that one ellipsoidal hut was built, above the previous one, as evidenced by some alignments of small blocks. Similar structures have been observed in Leceia, in the two Beaker huts built in the area outside the walls[17], and also in some large huts that were identified in the inner part of the fortification.

37 Several structured sub-circular hearths of this late phase of occupation were identified. One of them, excavated in 2015, was associated with copper metallurgy, as concluded by the prill and furnace residues recovered from its contents. The existence of these huts, in the intramural area, could justify the coeval fortification of the settlement, given the important economic activities developed here, especially metallurgy.

38 It can thus be concluded that the occupation of the site features two distinct chrono-cultural phases: the end of the Early Chalcolithic of Estremadura, around 2600–2500 BC; and the Full/Final Chalcolithic, which extended roughly until the end of the third millennium BC. The latter phase corresponds to the fortification of the site by means of a single, surrounding defensive wall. There may have been a period of

17 Cardoso 1997/1998.

15

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Fig. 15 Outeiro Redondo. Example of an orthogonal housing unit: Hut AA, from the end of the Full/Final Chalcolithic.

Fig. 16 Outeiro Redondo. Possible grain storage silo, taking advantage of the outer face of Wall G (Full/Final Chalcolithic), subsequently filled with sediments.

abandonment of the settlement between the two occupations, which might not have been total, that is, it might not have occurred over the entire inhabited area.

39 One of the most interesting architectural features and hitherto unknown in the domestic architecture of the Chalcolithic in Portugal was identified in the first excavation campaign and confirmed conclusively in 2016[18]. These are orthogonal plan huts, made up of straight walls, dated to the end of the occupation of the site (Fig. 15). They have parallels in the Chalcolithic of the peninsular Southeast, in Los Millares, where archaeologists identified a hut dedicated to the practice of metallurgy with the same characteristics.

40 Another structure, located like the previous one in the western sector of the village and also excavated in 2016, appears to have been designated for storage – although it is unknown for which product; it takes advantage of the external face of a pre-existing wall on one side, subsequently naturally filled, as illustrated by the stratigraphic sequence registered (Fig. 16).

7 Archaeological Remains

41 An exhaustive study of all the archaeological remains recovered between 2005 and 2016 has already been published[19]. The results obtained support the following general conclusions.

7.1 Polished Stone Tools

42 The assemblage of polished stone tools made of hard rocks, recovered from stratified contexts of the Outeiro Redondo settlement, is abundant and includes various types, represented by 86 items, distributed as follows:

- Layer 3 (end of Early Chalcolithic): 18 items;
- Layer 2 (Full/Final Chalcolithic): 68 items.

43 Noteworthy is the relative scarcity of polished stone artefacts in Layer 3, particularly in the westernmost area of this prehistoric settlement, a situation which can be easily explained by the fact that Layer 3 is covered by Layer 2, including various archaeological structures that obviously could not be removed. On the other hand, it is quite clear that the area initially occupied was much smaller than the area of the more recent occupation, during which there was a considerable increase of domestic structures, associated with abundant remains.

44 **Axes:** The cutting edges of the axes are shaped like symmetrical, converging double bevels. They can be divided into three distinct formal groups, also according to their considerable heterometry, which emphasises the various specific functions they were intended for, related to wood cutting and working:

a) totally polished axes with rectangular sections, in some cases with a flattened tendency, evoking the shape of the coeval metallic artefacts;
b) massive axes with sub-quadrangular to sub-rectangular sections, generally well-polished, which constitute the most numerous set (Fig. 17, 3. 8);
c) small cylindroid to fusiform axes, with ellipsoidal to sub-circular sections, polished only on the edge and with pecked butt ends, traditionally ascribed to Neolithic

18 Cardoso 2019a.
19 Cardoso 2019b.

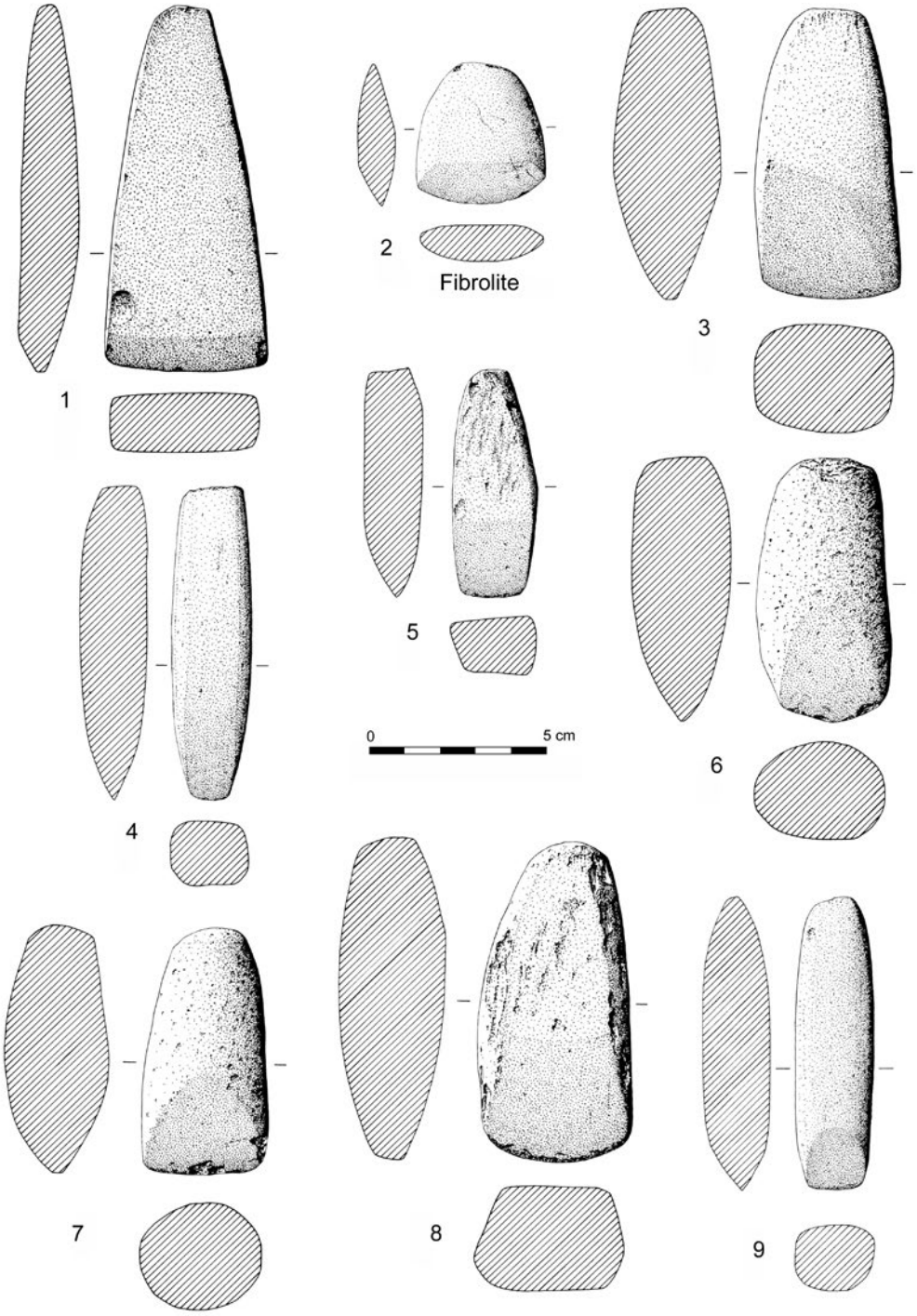

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Fig. 17 Outeiro Redondo. Polished stone artifacts from Layer 2. Axes, adzes and chisels. Note the presence of a small fibrolite artefact of a ritual/votive nature (2).

productions but which, in the present case, were recovered exclusively from the Full/Final Chalcolithic occupation (Fig. 17, 5–7). These features probably reflect the nature of the raw material of which these tools were made. In fact, all these axes were made of basic rocks of dolerite type, locally available in the vicinity of the site, related to the Sesimbra diapir. This suggests local procurement by a community that used this type of rock at the same time as the best quality rocks of amphibolite type originating from Alto and Baixo Alentejo and supplied through transregional trading. The other possibility is the reuse of older artefacts recovered in the vicinity, ultimately as relics, from Early to Late Neolithic sites, especially funerary caves.

45 In fact, at this site no significant presence was recognized that could be related to any of these older periods, so, discarding the possibility that such archaic types continued to be produced until the end of the Chalcolithic, there is only one explanation for their occurrence.

46 The axes recovered from Layers 3 and 2 are mainly made of amphibolite. This is a good example of the intense transregional circulation of the raw materials necessary for the daily life of these populations, originating from several primary sources located in the Hercynian massif. Actually, this situation has already been duly described at other Chalcolithic sites of the same region, particularly at Leceia[20], where the economic intensification that occurred throughout the third millennium BC has been demonstrated, based on the increasing presence of amphibolite artefacts in the archaeological record. Broadly speaking, axes occur in the same proportions as adzes, without considering the pieces that were reused as hammerstones.

47 **Adzes/hoes:** These are artefacts with bevelled and asymmetrical section cutting edges. The overall shape is generally flattened, sometimes arching, contrasting with what is usually seen in axes with carefully polished surfaces. Besides amphibolite, as represented by the example (Fig. 17, 1), the majority of these tools are made of blackish micro-crystalline or aphanitic rocks, with a lighter surface coloration, due to alteration. The origin of these rocks, of meta-volcanic nature, may correspond to Palaeozoic basic tuffs, and can be found in the South-Portuguese Zone (SPZ). But only a petrographic analysis could clarify this attribution, as already mentioned in another paper[21]. In any case, as far as Outeiro Redondo is concerned, the closest known sources for this type of rocks are located in the Alcácer do Sal/Grândola region.

48 Two small adzes were classified as objects of a ritual, non-functional nature. One specimen is apparently made of a greyish-green metasedimentary rock, with schistosity and low hardness; the edge bears slight traces of use. The other piece, made of a milky-coloured fibrolite (fibrous sillimanite) with dark grey streaks, is considered to be a ritual object not only due to the raw material, but also on account of its small size (Fig. 17, 2). Indeed, both axes and adzes, due to the important tasks with which they were associated, would easily have acquired a symbolic meaning of their own in the context of the Neolithic and Chalcolithic agrarian societies[22].

49 These connotations are illustrated throughout the Mediterranean basin by abundant and expressive testimonies. A small milky fibrolite pendant was recovered at the Late Neolithic settlement of Carrascal (Oeiras); it is shaped like an adze, with a suspension hole[23], clearly embodying the symbolic function of axes and adzes.

50 **Hammerstones:** These are reused polished stone artefacts, which for nonobvious reasons went out of use. The vast majority are amphibolite axes, bearing extensive percussion marks, sometimes over their entire surface. The reason for abandoning the primary use of these pieces is unknown, but one thing is clear: these are amphibolite artefacts and therefore valuable items, due to their costly nature. The difficulty in understanding the choice of reusing them is even greater considering that other rocks, such

20 Cardoso – Carvalhosa 1995; Cardoso 2004.

21 Cardoso 2014c.

22 Lillios 1997 and Lillios 2000 evaluates the presence in Estremadura of amphibolite tools to underline the symbolic use of this rock in this region. In our opinion, the symbolic role of axes and adzes are independent of their material (except in cases of exotic rocks, such as fibrolite), since they are essentially the result of the economic importance of the activities associated with their use (see Cardoso – Gonçalves 2020). In the case of amphibolites, their presence in the Portuguese Estremadura, where they were systematically used for the manufacture of axes, can be explained by their exceptional mechanical characteristics of hardness and resistance.

23 Cardoso 2011a, 50 fig. 23; Cardoso et al. 2015, 220 fig. 83, 2; 221 fig. 84.

as quartzite or quartz cobbles, could be easily obtained locally and could have been used with identical results. Thus, there seems to be a contradiction without a plausible explanation between the intrinsic value of the raw material and its ultimate purpose, in this case quite undifferentiated.

51 **Transverse hammers:** This designation includes a number of items that could easily be classified as axes or adzes if it weren't for the fact that their distal ends are shaped like narrow polished surfaces instead of cutting edges. This particularity suggests that such tools would have been used for hammering more or less narrow surfaces, requiring precision work. It has been previously hypothesised that they could be related to the manufacture of copper objects. Similar artefacts have repeatedly been found at some Chalcolithic settlements in the region[24]. However, the fact that one of these items, rather small and made of a greenish rock, was recovered at Leceia, from a Late Neolithic context[25], requires us to consider other specialised uses, so far unknown. In order to clarify this matter, a traceological study was carried out on the working surfaces of the eight exemplars recovered at Outeiro Redondo[26], but the results didn't reveal any adhering copper remains. The fact that this type of tool was only found in the northeast area of the settlement[27], exactly where the metallurgical structures were located, reinforces the conclusion that they were directly related to that activity, i. e., to the plastic deformation of metals by hammering. On the other hand, the recorded spatial distribution may indicate that this activity was restricted to only a part of the population, as the spatial segregation in the distribution of this type of artefacts is comparable to what has been observed concerning other metallurgical evidence at some other Chalcolithic settlements, such as Cabezo Juré, Huelva (Spain)[28].

52 **Chisels:** As in other important Chalcolithic settlements of Estremadura, the polished stone tool kit includes a limited number of certain specialized artefacts, such as those included in this functional category. These tools are generally elongated, with a sub-quadrangular section and carefully polished, and can be used as they are, or hafted in bone, wood or antler handles (Fig. 17, 4. 5. 9).

7.2 Roughstone Implements

53 **Fishing net sinkers:** Four examples were recovered, made of different rocks, all of local origin, with longitudinal or transversal grooves, always executed by pecking (Fig. 18, 2. 4. 5). The use of longitudinal grooves was probably intended to prevent these parts from hindering the free movement of the nets to which they were attached.

54 Their use as fishing net sinkers was discussed in a previous paper, which compiled the examples known until then[29]. In the meantime, similar artefacts were recovered at settlements located close to the coast, such as the single example from the Final Neolithic and Chalcolithic settlement of Travessa das Dores, in Lisbon[30]. It is interesting to note that they appear, albeit exceptionally, in graves, e. g. a piece with a longitudinal groove, found in one of the artificial caves of Palmela[31], and another one in

24 See Cardoso et al. 2013a, covering all cases.
25 Cardoso 1989, 105 fig. 102, 3.
26 Cardoso et al. 2018b.
27 Cardoso – Martins 2018, 220 fig. 7.
28 Nocete Calvo et al. 2004.
29 Cardoso 1996.
30 Neto et al. 2015, 249 fig. 20, 1; 252 fig. 22, 3.
31 Cruz 1906, pl. 7, 61.

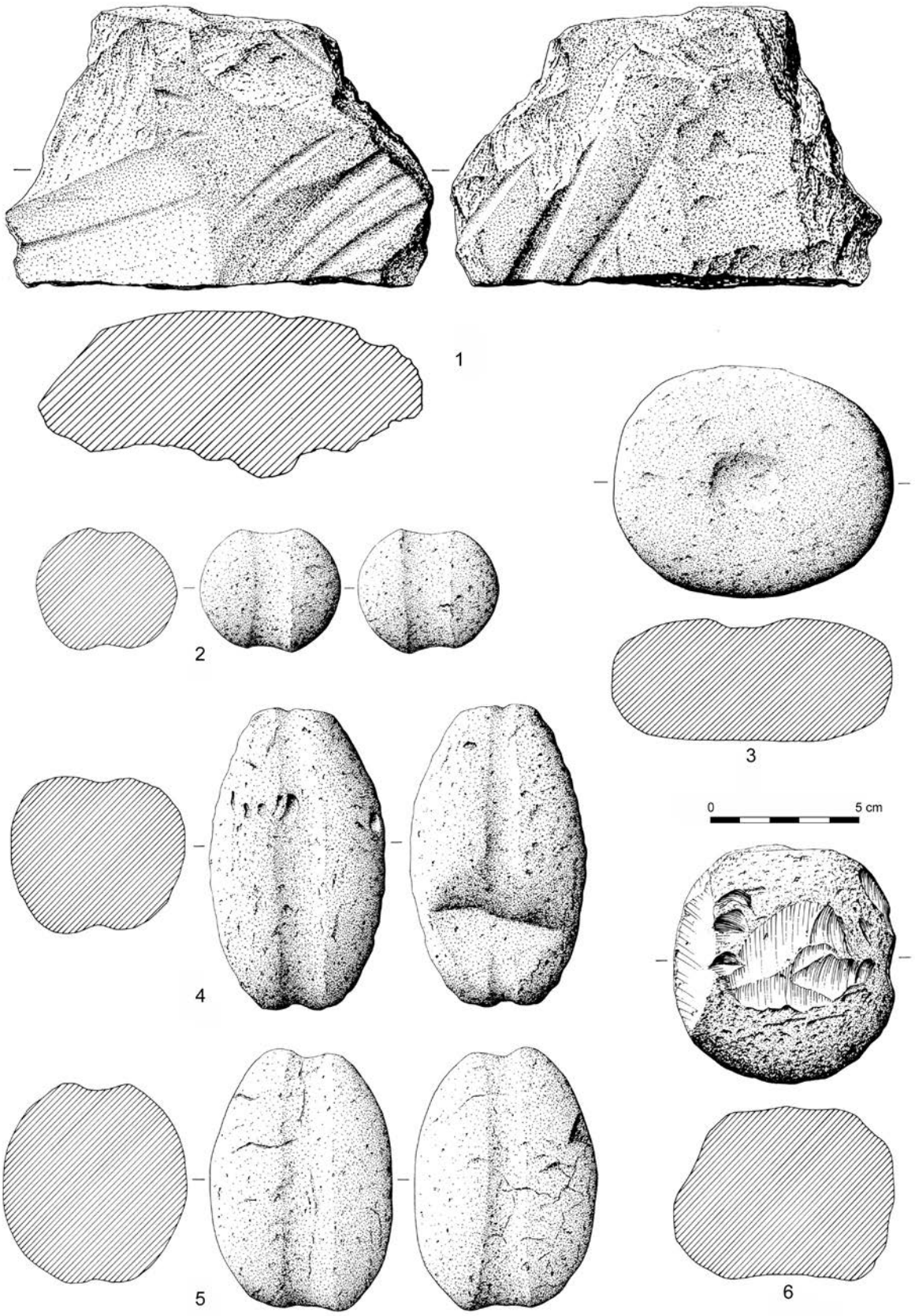

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Fig. 18 Outeiro Redondo. Roughstone implements. Sandstone polisher, net weights, anvil and flint striker. Layer 2 (1–4) and Layer 3 (5. 6).

the collective tomb of Bolóres, Torres Vedras[32]. The fact that they are almost exclusively related to habitational contexts reinforces their functional character.

32 Lillios 2015, fig. 5.20.

55 It is important to stress the significant differences in sizes and production quality, undoubtedly as a result of their different purposes. Thus, while the larger exemplars would probably have been used in vertical fishing nets, the smaller one could very well have served as an angling sinker. Actually, angling is quite well documented at Outeiro Redondo by the presence of copper hooks, which shall be addressed further on.

56 **Sandstone sharpeners:** Several sandstone blocks were collected in the outcrops of the Lower Cretaceous, with deep grooves resulting from the affection of bone tips (Fig. 18, 1). Similar pieces were identified in the fortified settlement of Leceia, Oeiras[33].

57 **Anvils/dormant sandstone strikers:** Certain artifacts have a central depression (Fig. 18, 3), resulting from continued and localized percussion that can be related to the production of chipped stone artifacts. But another possibility is to admit their use as hand mill movers, such a depression would then have been intended to allow better adherence of the grains during the operation. It should be noted however that the movers identified have larger dimensions, sporting a convex face perfectly adjustable to the concave face of the respective dormant, made of arenites of close origin.

58 **Strikers:** It is worth mentioning the abundant occurrence of flint strikers (Fig. 18, 6) of spheroidal shape and with extensively striked surfaces. The fact that they are produced in flint attests to the ease with which this rock was obtained, in this case from the Cretaceous outcrops of the Lisbon region, as evidenced by the gray coloration of the collected specimens.

7.3 Knapped Stone

59 Flint artefacts dominate by far, with 122 identified artefacts in Layer 3 and 450 in Layer 2; their prevailing petrographic characteristics indicate that the main origin of the flint was the Lisbon region, about 30 km to the north. Near the former right bank of the Tagus estuary, on the upper Cenomanian reef limestone outcrops of the Alcântara valley, there are large masses of predominantly grey flint, in the form of nodules, sometimes of large dimensions. This does not rule out the hypothesis of more distant origins for the examples with more pinkish or even reddish colourations, which may, quite likely, originate from the Rio Maior region. At Leceia, Oeiras, situated ›over‹ the flint cretaceous sources, the same situation was observed[34].

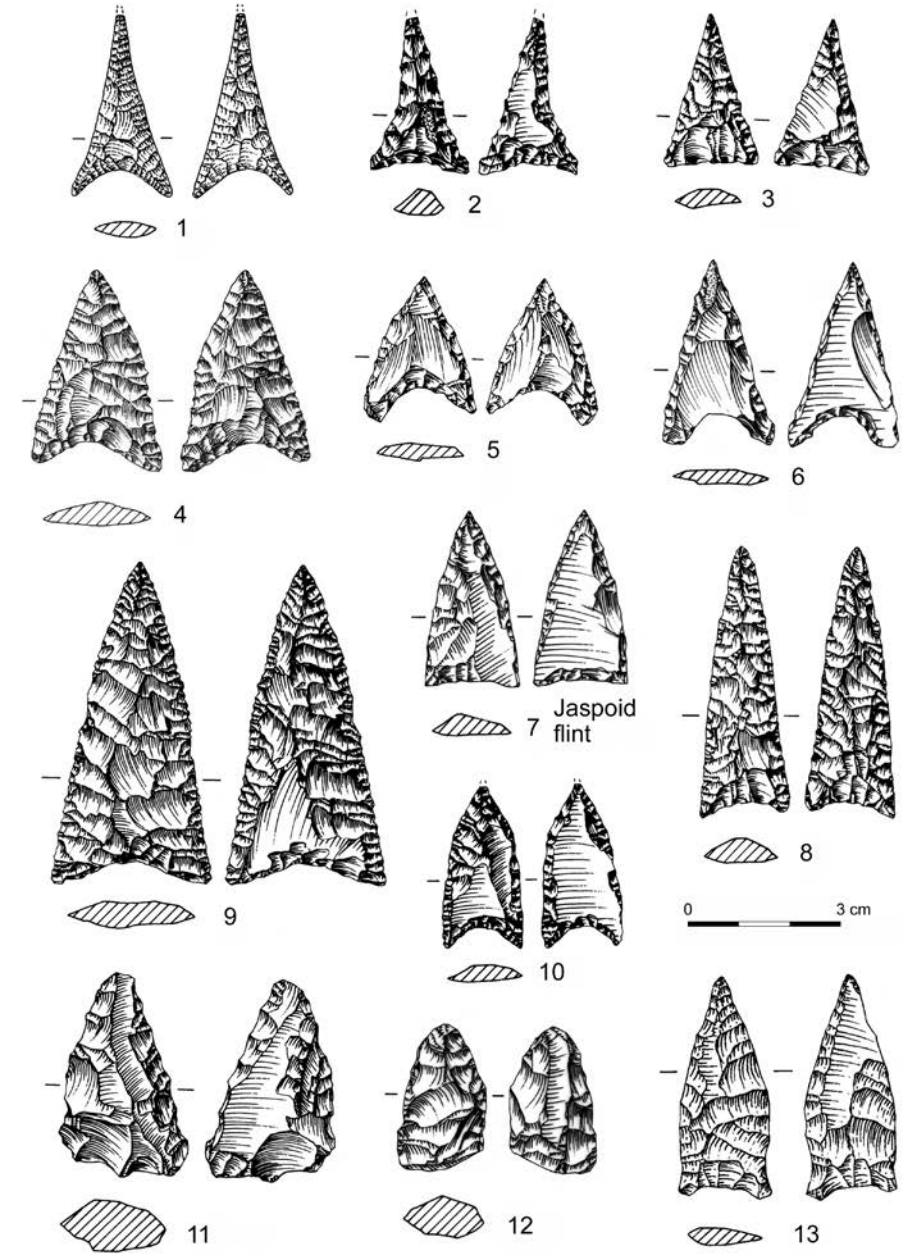
60 **Arrowheads** (Fig. 19): These are the most abundant group of artefacts in the settlement, although their presence in Layer 3 does not exceed 17.2 %, rising to 24.4 % in Layer 2.

61 There is a significant amount of arrowheads in both layers, both inside the settlement and next to the defensive wall. Most examples were found in the central area of the settlement, in Layer 3 (42.9 %), while in Layer 2, in the northeast sector of the settlement, they are clearly predominant at 57.3 %. This may partly be the result of possible conflict situations, with projectiles being concentrated in the most vulnerable areas of the defensive system. One of these locations is undoubtedly the northeast sector of the settlement, as it would have been most exposed to a surprise attack, given the lack of visibility due to the considerable slope existing on that side of the settlement.

62 The recovered arrowheads are mostly complete, the most numerous type being the concave base type with straight edges. There is an increase in the variety of arrowheads in Layer 2, which yielded the flat base and ›Eiffel Tower‹ flint types (Fig. 19, 1. 2), which do not exist in Layer 3.

33 Cardoso 1989, 108 fig. 104.

34 Cardoso – Martins 2013.



19

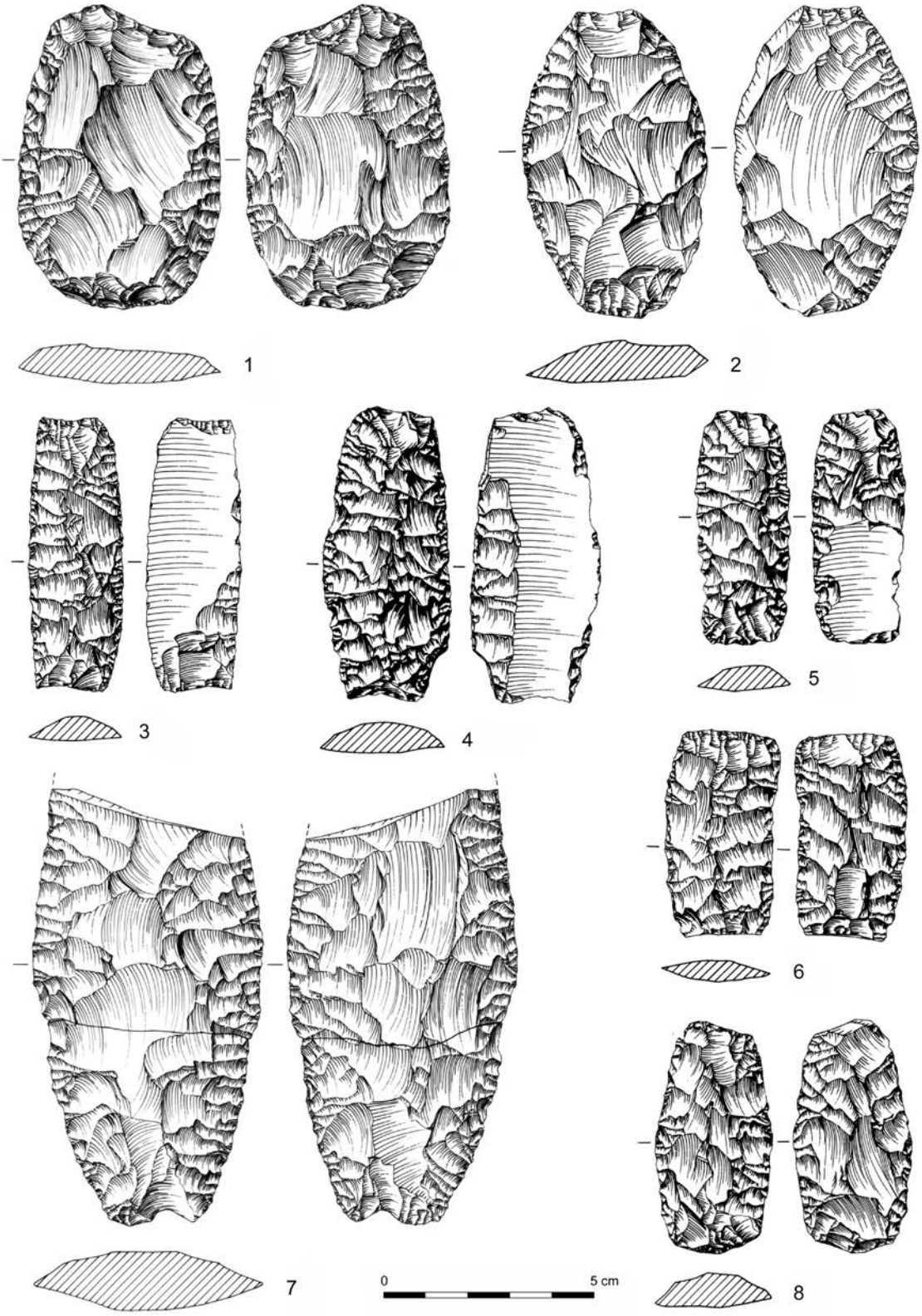
Fig. 19 Outeiro Redondo. Arrowheads. No. 7 is of jaspoid flint. Layer 2. Nos. 11 and 12 are sketches.

63 The presence of eleven examples made of jaspoid schist (Fig. 19, 7), all recovered from Layer 2, is also noteworthy. This type of artefact, completely finished, with no traces of knapping by-products at the settlement, indicates commercial relations with the Alentejo territory, encouraged at that time by the increased demand for amphibolites and the full establishment of copper metallurgy at Outeiro Redondo, using ores from Alentejo. It is very likely that these examples may have belonged to the paraphernalia of one or several travellers coming from this region.

64 The abundance and variety of arrowheads recorded at the site shows the importance that this settlement must have had in terms of hunting and/or warfare.

65 It is interesting to note that there was an activity of finishing arrowheads in the village, as indicated by the presence of some workpieces, unfinished exemplars (Fig. 19, 11. 12).

66 Two concentrations of arrowheads stand out in Layer 2, in the northeast sector of the settlement: the first one, around hearth U, with nine pieces, which may correspond to a storage area, and the second one between the walls G and V (see Fig. 4),

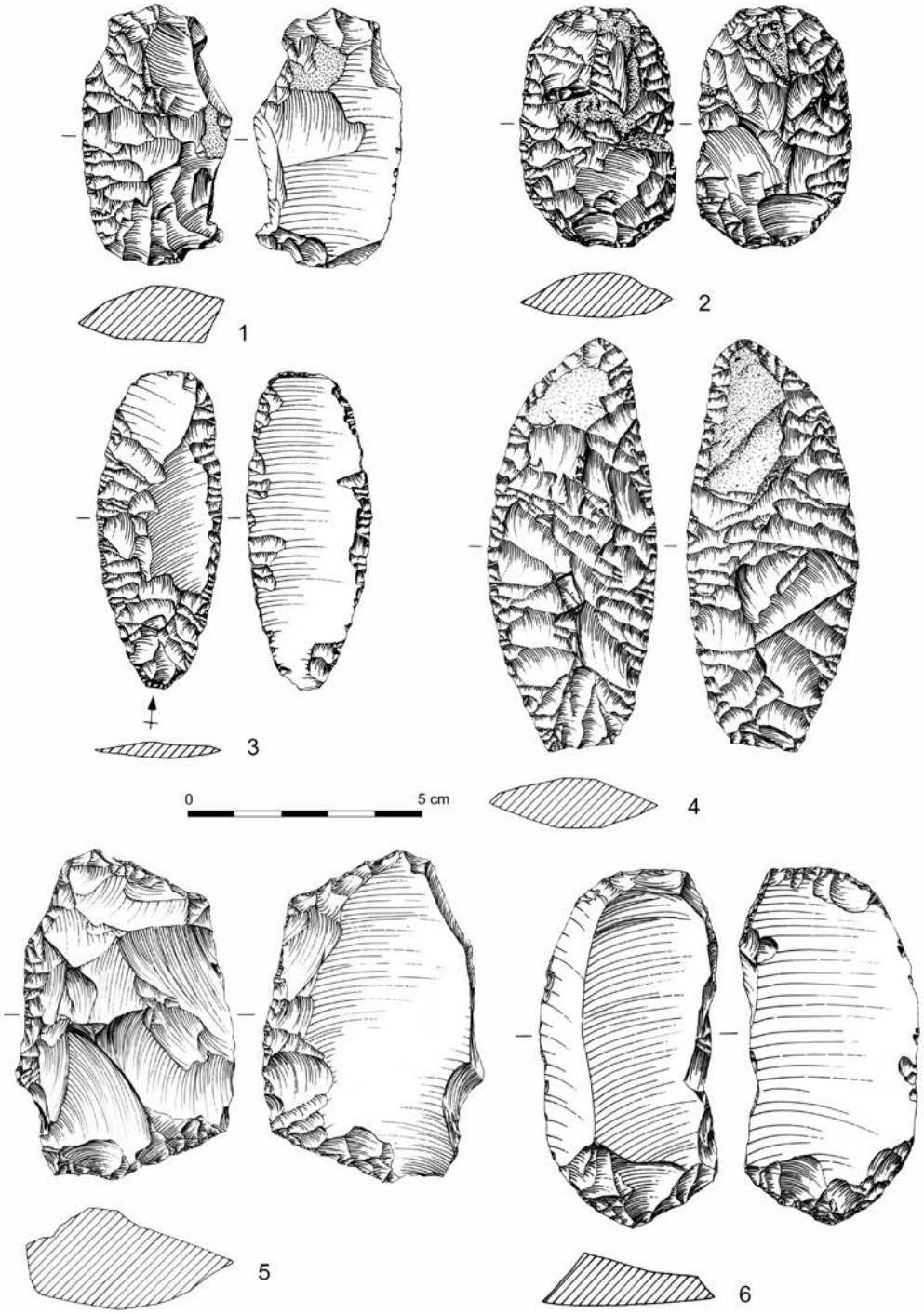


20

Fig. 20 Outeiro Redondo. Leaf blades. Layer 2.

with four examples, possibly related to an area with defensive functions (possibly a barbican, as mentioned above).

67 **Foliate blades** (Fig. 20. 21): The second most numerous group of tools are the leaf blades, which amount to 19.7 % of all lithic tools in Layer 3, decreasing slightly in Layer 2, at only 18 %. However, it is important to stress that, in absolute terms, only 24 exemplars were recovered from Layer 3, in contrast to the 81 specimens from Lay-



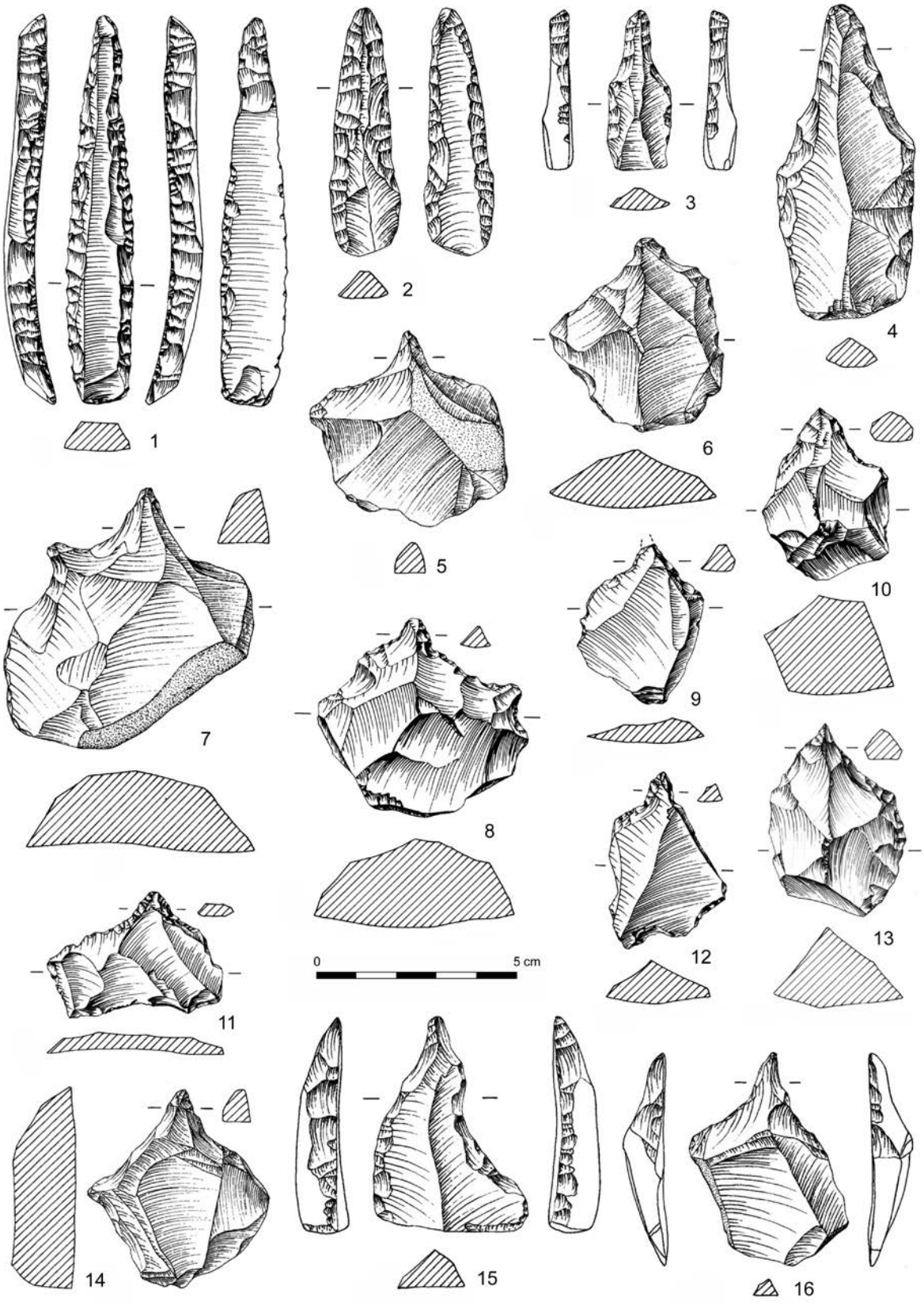
21

Fig. 21 Outeiro Redondo. Leaf blades. Layer 3.

er 2, where blades with an ellipsoidal contour predominate (at 34.3 %), featuring bifacial covering retouch and covering flaking/retouch on one face and invasive/marginal retouch on the other. The typological diversity of foliate blades also increases, as one would expect, in Layer 2, with ›D‹ shaped, lunate, sub-rectangular and sub-trapezoidal foliate blades, which are absent from Layer 3. The number of rejuvenated foliate blades also rises in Layer 2, but this may simply be due to the larger number of samples.

68 It is also worth mentioning the large number of fractured pieces in the settlement, in both layers. Breakage possibly took place during knapping or already during use.

69 As observed for the arrowheads, the local production of these pieces was verified, given the occurrence of unfinished specimens (Fig. 21, 1. 5. 6).



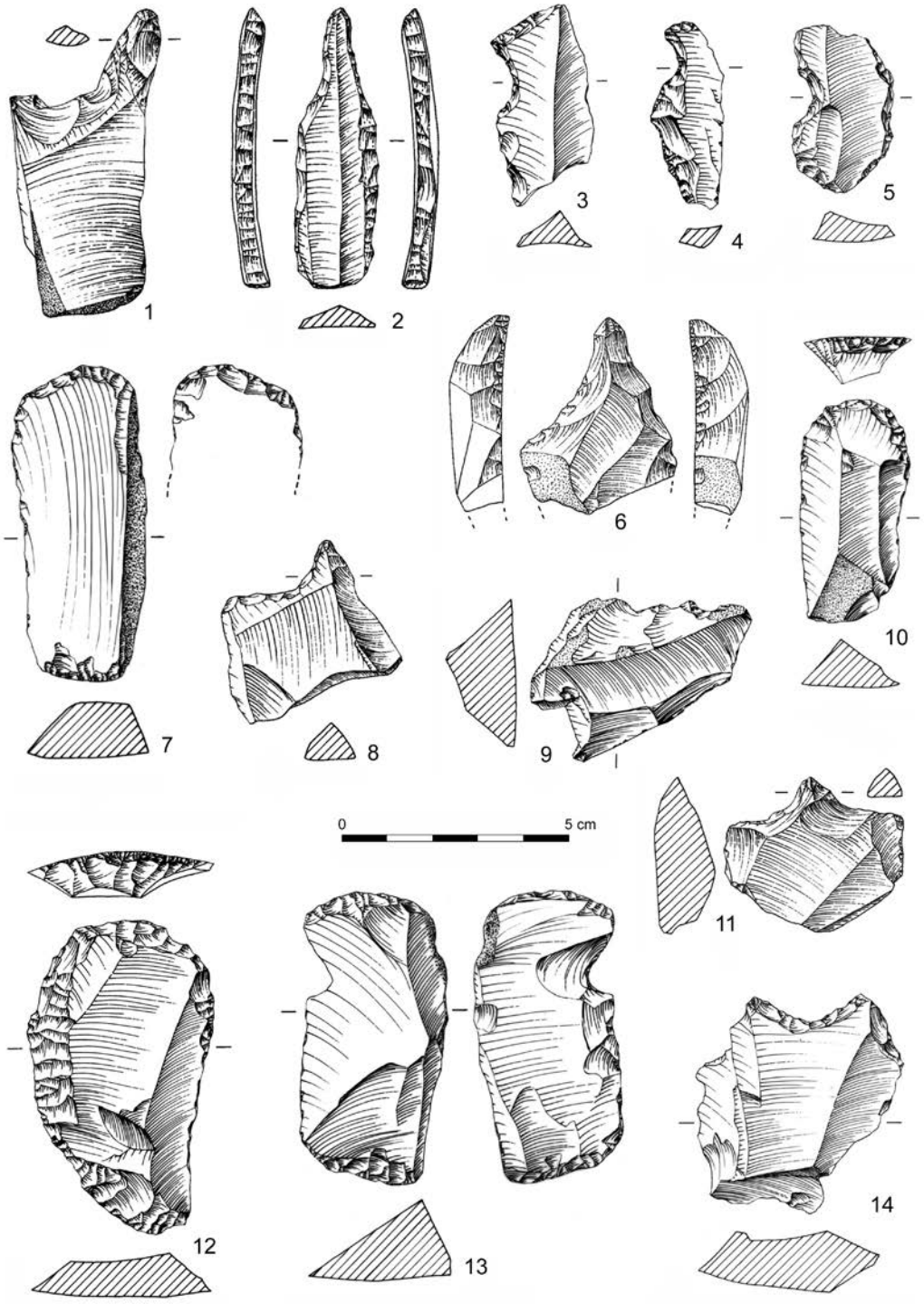
22

70

Fig. 22 Outeiro Redondo. Punchers. Layer 2 (2–16) and Layer 3 (1).

A recent study based on the traceology of similar specimens from the prehistoric settlement of Leceia, Oeiras, reinforces the hypothesis that these specimens were mainly used as parts of sickles[35]. They would have been embedded in curved wooden handles,

35 Cardoso – Gibaja 2019.



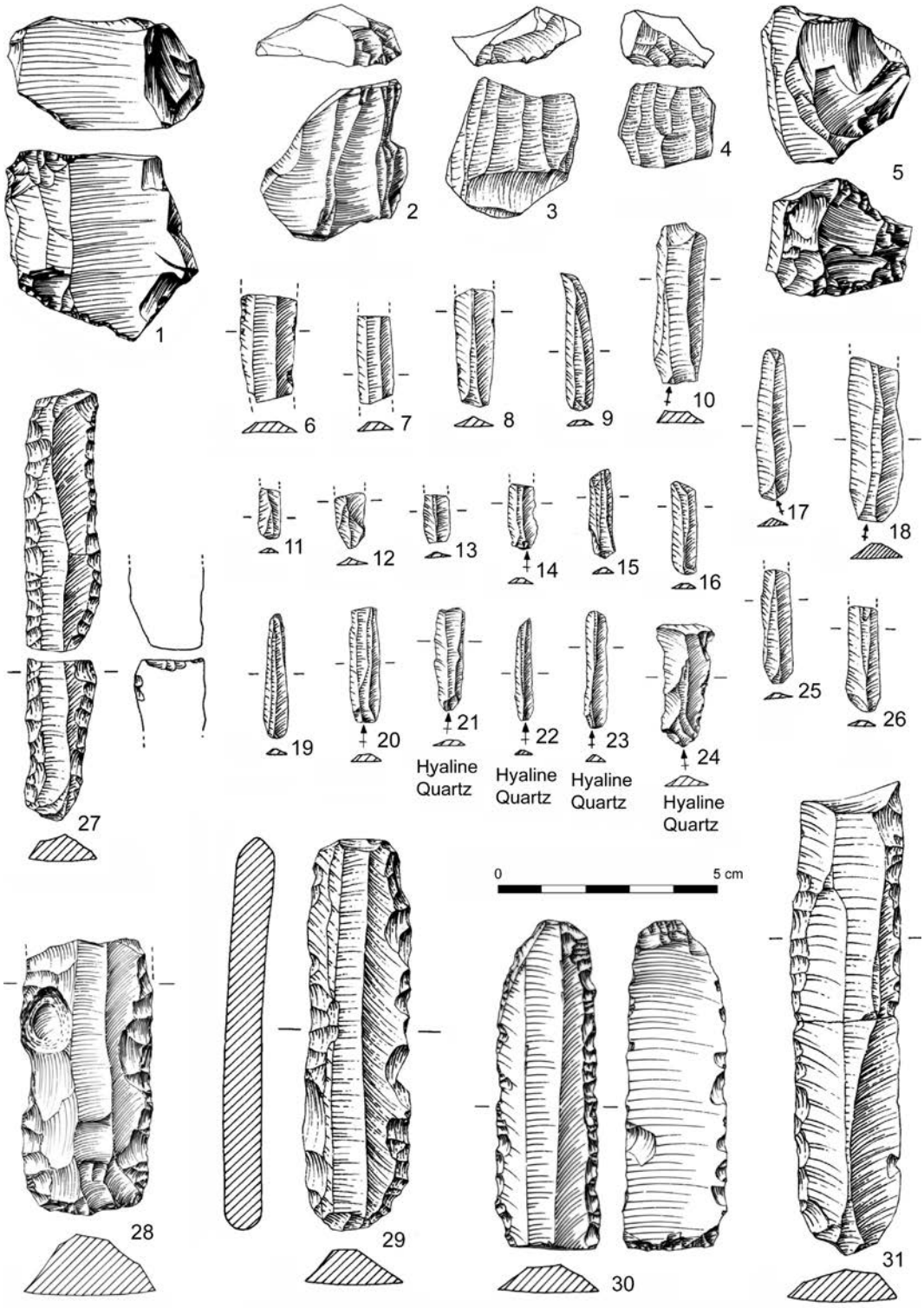
23

Fig. 23 Outeiro Redondo. Drills, endscrapers, denticulates and notches. Layer 2 (1. 2. 4–8. 10–14) and Layer 3 (3. 9).

an hypothesis already put forward in the 1940s, based on the specimens collected in the prehistoric settlement of Vila Nova de S. Pedro, Azambuja[36].

71 **Borers** (Fig. 22; 23, 1. 2. 6. 8. 11): The third most represented group within the lithic assemblage are borers, at 13.8 % of the total, decreasing from 28.7 % in Layer 3 to 13.8 % in Layer 2. This group, unusually abundant at this site, mostly features flake blanks, in both layers, with high percentage values (80.4 %), followed by blade blanks, at 19.6 %.

36 Jalhay – Paço 1945; Paço 1964.



24

Fig. 24 Outeiro Redondo. Blade and bladelet cores; retouched blades and coverslips. The bladelets 21 to 24 are made of hyaline quartz; blades 24 and 28 are made of oolitic flint; blades 30 and 31 are made of chert. Layer 2 (1. 3–5. 8–13. 15. 16. 19. 25–29. 31) and Layer 3 (2. 6. 7. 14. 17. 18. 20–24. 30).

72 Thick borers are predominant in Layer 3, at 54.3 %, when compared to thin borers, at 45.7 %, as opposed to Layer 2, where there is a slight dominance of the latter: thick borers at 48.3 % and thin borers at 51.7 %. In both layers, the combination of two contiguous lateral notches is the dominant strategy for obtaining a borer-tip, with high percentage values: 85.7 % in Layer 3 and 77.4 % in Layer 2.

73 **Endscrapers** (Fig. 23, 7. 10. 12. 13): Scarcely represented in Layer 3, at 6.6 %, their number increases slightly in Layer 2 reaching 7.3 % of the total lithic assemblage. The most used blank in both layers are flakes, at 75 % in Layer 3, and 66.6 % in Layer 2.

74 **Denticulates and notches** (Fig. 23, 3. 4. 5. 9. 14): These two artefact types are considered together. They represent a residual group in the context of chipped stone production in Outeiro Redondo, with two specimens identified in Layer 3 (1.6 % of the tools in this layer), and nine specimens in Layer 2 (corresponding to 2.0 % of the tools of this layer).

75 **Blades and bladelets** (Fig. 24, 6–31): In broad terms, blades and bladelets constitute the fourth most abundant lithic tool group, with a slight predominance of bladelets over blades, the presence of both types increasing in Layer 2. Bladelets reach 9 % in Layer 3, rising to 15.1 % in Layer 2, while blades increase from 11.5 % to 14 %, respectively.

76 The presence of six hyaline quartz bladelets, four recovered from Layer 3 and two from Layer 2, is noteworthy (Fig. 24, 21–24).

77 Other exogenous raw materials were identified as well: One specimen in Layer 3 (Fig. 24, 30) and three pieces in Layer 2 specimens are made of oolitic flint (Fig. 24, 28). The material probably originates from the Betic mountain ranges[37] and probably belonged to the personal objects of travellers from this region, which would explain the presence of such objects at the site. Three blades are made of rhyolite (Fig. 24, 30. 31), a material associated with acid Palaeozoic rocks of the South Portuguese Zone (SPZ).

78 Unretouched bladelets are predominant while blades are dominated by exemplars featuring continuous or discontinuous marginal retouch on both lateral edges.

79 **Blade and bladelet cores** (Fig. 24, 1–5): Cores are residual in both layers. In total, only eight bladelet cores and two blade cores were identified, all flint, greyish and brownish coloured, except for one example made of a whitish translucent chalcedony, a bladelet core recovered from Layer 2.

80 The low presence of cores suitable for obtaining blades and bladelets suggests that these were not produced in the dwelling area. Nevertheless, local manufacture of other types of artefacts is clearly demonstrated by the presence of flakes and medium-sized blocks of raw flint, as well as by the unfinished pieces like arrow points and foliate blades mentioned above.

7.4 Bone Industry

81 Bone tools (Fig. 25) are particularly abundant due to the favourable geochemical conditions of the site, which have enabled the preservation of the pieces in good condition. A total of 236 bone tools were identified, 61 of which originated from Layer 3 and 175 from Layer 2.

82 Layer 3 features a large amount of bones made of the diaphysis of long bones, usually sectioned at one or both ends, commonly interpreted as handles (thirty-two items, 52.5 % of the total assemblage), as well as a significant number of borers (eleven items, 18 %) (Fig. 25, 1–4).

83 It is commonly assumed that these pieces were intended for hafting small copper borers, based on a few complete examples found at various Chalcolithic settlements of Estremadura and previously inventoried[38], to which we can add a few more finds from the settlement of Vila Nova de São Pedro, Azambuja[39].

37 Cardoso et al. 2018a.

38 Cardoso 1980.

39 Paço 1960, 108 fig. 2, 5. 6.

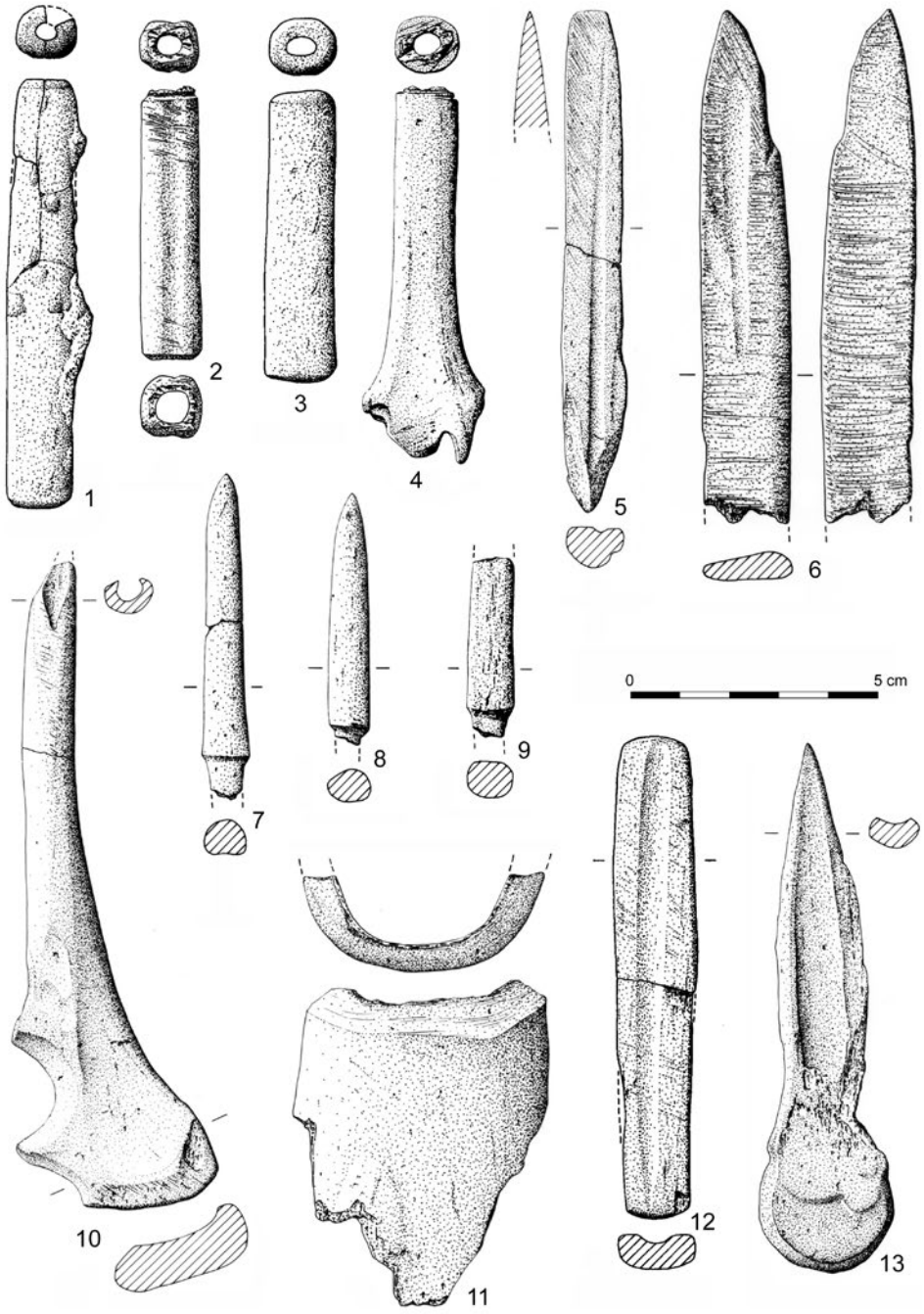


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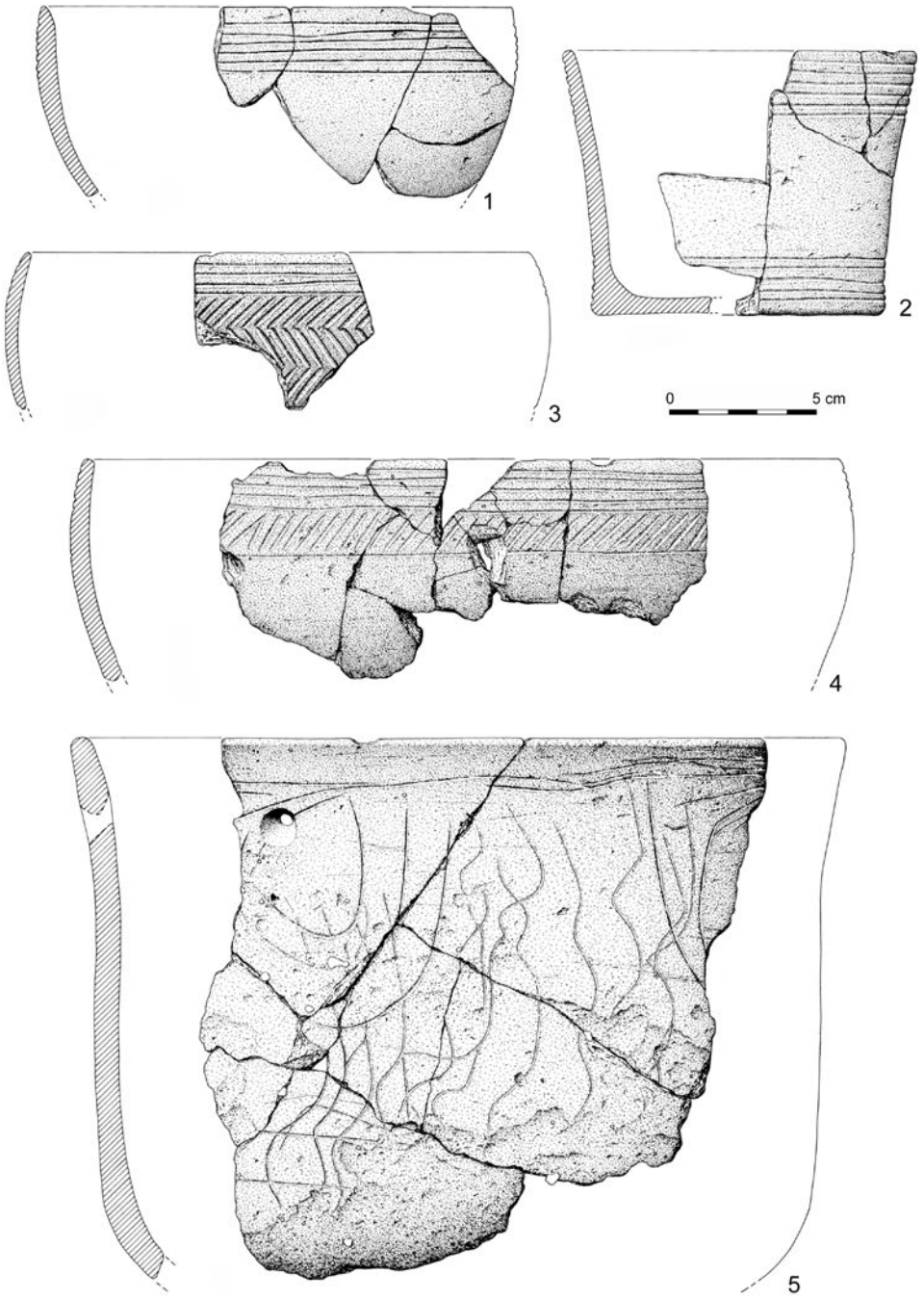
Fig. 25 Outeiro Redondo. Bone industry. Cables, holes, chisels, arrowheads and a box fragment. Layer 2 (1–5. 7–10. 12. 13) and Layer 3 (6. 11).

84 However, similar findings in the layer corresponding to the Neolithic occupation of the Leceia settlement indicate that they could also have had other uses[40]. In Layer 2, out of 175 recovered tools, 105 are handles, which reflects an increase in relative terms, compared to the situation previously described (60 % and 52.5 %, respectively).

85 The second most representative group are needles/awls (Fig. 25, 6. 10. 13) with 33 exemplars (17.1 % in Layer 2, 11.5 % in Layer 3). However, the borer group decreases from 18 % in Layer 3 to 9.1 % in Layer 2, with 16 pieces only.

86 Some artefacts recovered from Layer 2 deserve a more detailed analysis. These are the arrowheads, represented by six items (Fig. 25, 7–9), a larger number than

40 Cardoso 2003a.



26

Fig. 26 Outeiro Redondo. Decorated vessels. Layer 3.

the four items recovered at Moita da Ladra, Vila Franca de Xira[41]. These are robust pieces, with a circular cross-section, fusiform body, thoroughly worked, the lower part being shaped like a tang, equally conical but narrower than the body, for hafting purposes. Although always scarce, this type of tool is known from several Chalcolithic sites of Estremadura[42].

87 Other, rarer artefacts that must be mentioned are endscrapers or chisels (Fig. 25, 5. 12) and small boxes made of the diaphysis of large bones (Fig. 25, 11). Both groups are also represented in Leceia, Oeiras[43].

41 Cardoso 2014a, 271 fig. 32, 15–18.

42 Cardoso 2014a.

43 Salvado – Cardoso 2001/2002; Cardoso 2003a.

88 Another noteworthy item, also from Layer 2, is a bi-pointed piece, completely polished, of small dimensions, which can be classified as a needle/awl, just like the example recovered from the Poço Velho caves, in Cascais[44].

89 The artefacts referred to above clearly demonstrate the richness and variety of the bone industry of Outeiro Redondo, which shows no major differences, from a typological point of view, to other Chalcolithic stratigraphic contexts of the Portuguese Estremadura, such as the prehistoric settlement of Leceia[45].

7.5 Ceramic Vessels

90 **Non-decorated vases:** In the three main areas considered within the settlement, i. e. the western, central (facing south) and eastern (facing northeast) part, there is little variation in the typology of undecorated ceramics. In all three areas, open forms are more abundant than closed forms, both in Early Chalcolithic and Full/Final Chalcolithic contexts. It is important to mention the greater abundance of non-decorated containers in the northeast area of the settlement, as compared to the number of fragments recovered in the other two areas, which probably results from the greater intensity of its occupation.

91 It is also important to address the plentitude of undecorated vessels in comparison to the decorated ones. Thus, both ceramic groups were quantified, by area (the three main areas of the settlement mentioned above) and by layers, i. e. the two main archaeological layers identified at these areas.

92 Overall, from Layer 3 there are 3.439 undecorated fragments corresponding to edges allowing the graphic reconstruction of the containers, while the decorated fragments amount to only 185 pieces. In comparison, in Layer 2, a much higher number of edges were collected, reaching 6.542 specimens, including 454 decorated fragments.

93 In view of the results obtained, it can be broadly stated that the numerical ratio between the decorated and undecorated ceramics is the following: 1 to 18.6 in Layer 3 and 1 to 14.4 in Layer 2. This indicates an increase in the number of decorated vessels over time, between the Early and the Full/Final Chalcolithic.

94 **Decorated vases:** The decorated assemblage includes a total of 639 fragments with the following stratigraphic distribution:

- Layer 3: 185 fragments (of which 153 are edges);
- Layer 2: 454 fragments (of which 251 are edges).

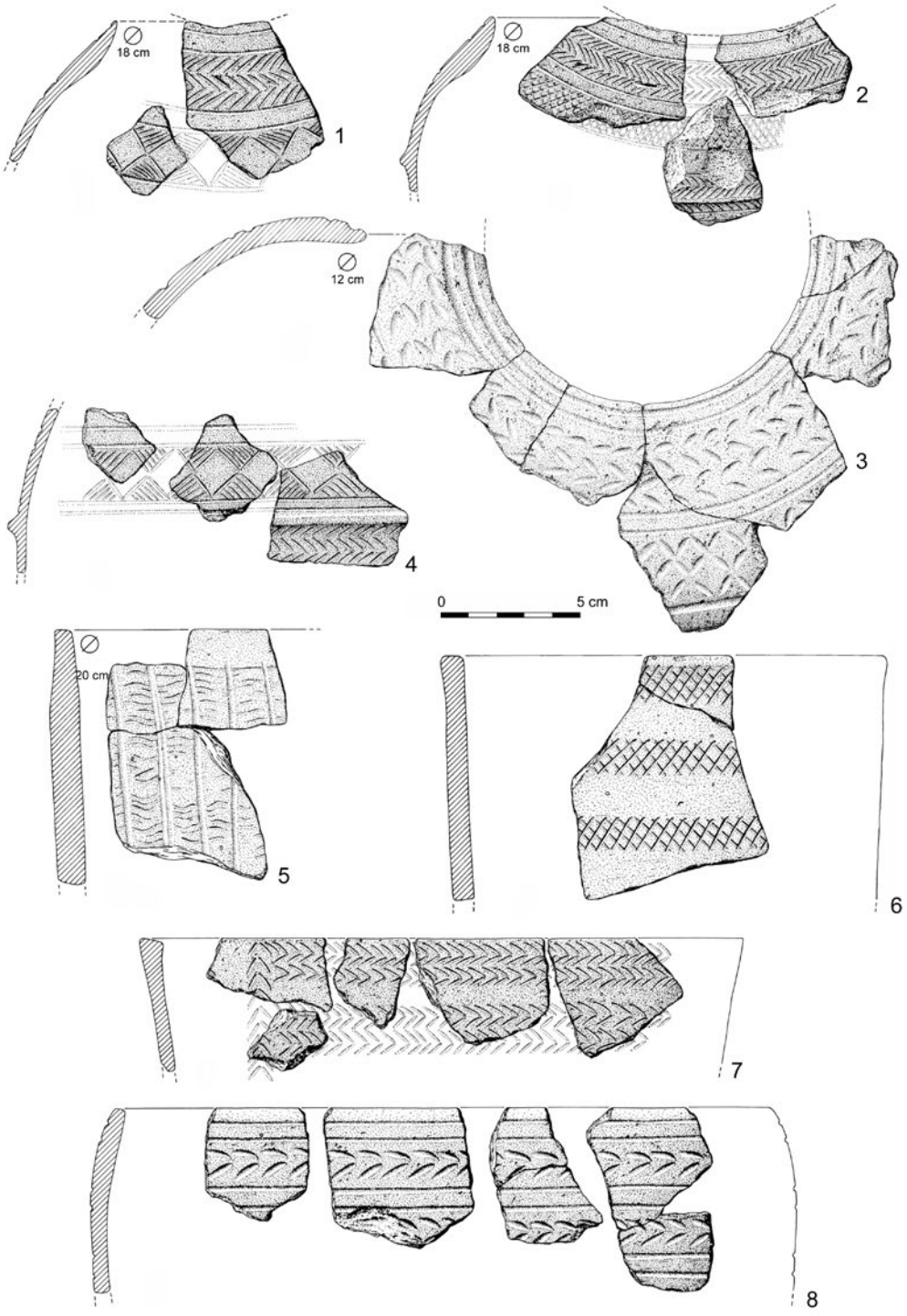
95 The analysis of this assemblage focused on the characteristics of the predominant vessel types in both layers, in terms of the variety of decorated forms, techniques and decorative patterns.

96 Six vessel types were identified, in addition to a group of indeterminate forms. The sequence was ordered from closed to open shapes, as follows:

- Form 1: Large spherical vessels (›storage vessels‹) (Fig. 27, 3);
- Form 2: Medium-sized spherical vessels (Fig. 27, 1. 2. 4);
- Form 3: Cylindrical vessels (›copos‹) (Fig. 26, 2. 5; 27, 5–7);
- Form 4: Spherical and hemispherical bowls (Fig. 26, 1. 3. 4; 27, 8; 28, 2);
- Form 5: Low bowls with thickened rim, with internal decoration (Fig. 28, 1);
- Form 6: Bell Beaker productions (Fig. 29);
- Form 7: Others; indeterminate.

44 Paço 1941, pl. XXI a–c. e.

45 Cardoso 2003a.



27

Fig. 27 Outeiro Redondo. Decorated vessels. Layer 2.

97 There are some changes in the use of decorated ceramic vessels between Layer 3 and Layer 2.

98 In Layer 3 (see Fig. 26) the open forms are predominant, with cylindrical vessels, the so-called copos, reaching 33 % of the analysed assemblage, followed by hemispherical bowls, at 25.9 %. The third most represented ceramic group are the low bowls with thickened rim and internal decoration, at 18.9 %. The decorations of this assemblage consist mainly of smooth flutes made on the sun-dried surface by means of a blunt tip, probably made of wood or bone, giving rise to parallel flutes in the cups and bowls and geometric decorations on the inner surfaces of the bowls. These fea-

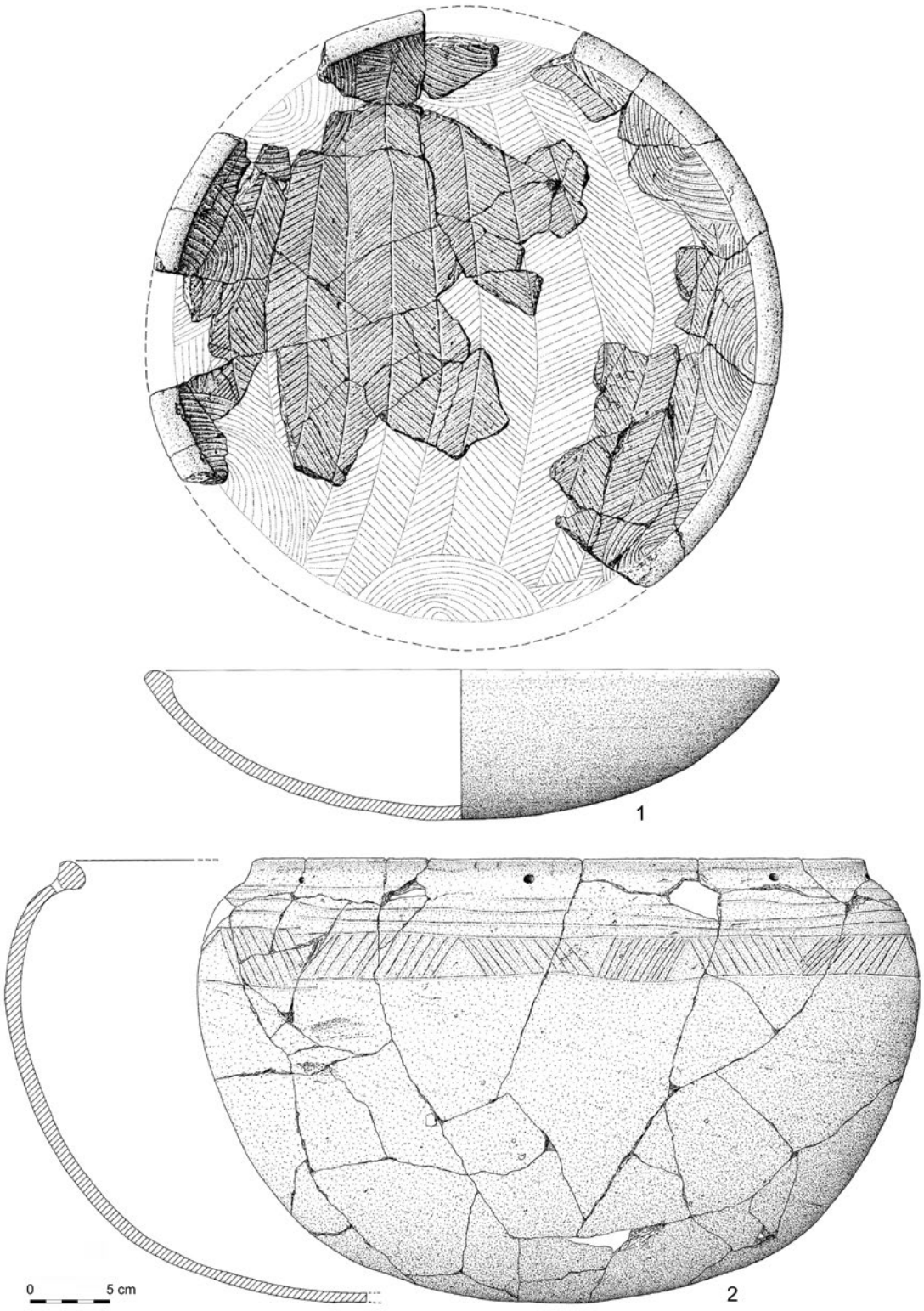


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Fig. 28 Outeiro Redondo. Two vessels decorated with the fluted technique, deposited ritually with the opening downwards, in the western sector of the settlement, embodying an abandonment ceremony of the local population. Layer 2.

tures – shapes, decorative patterns and techniques are typical of the Early Chalcolithic assemblages of the Portuguese Estremadura[46].

99 In Layer 2 (see Fig. 27) there is a clear dominance of the large spherical vessels (›storage vessels‹), at 36.8 % of the total assemblage. The second most abundant form is the cylindrical vessel, at 27.8 %, followed by the hemispherical bowls at 12.8 %. The

46 Cardoso 2006.

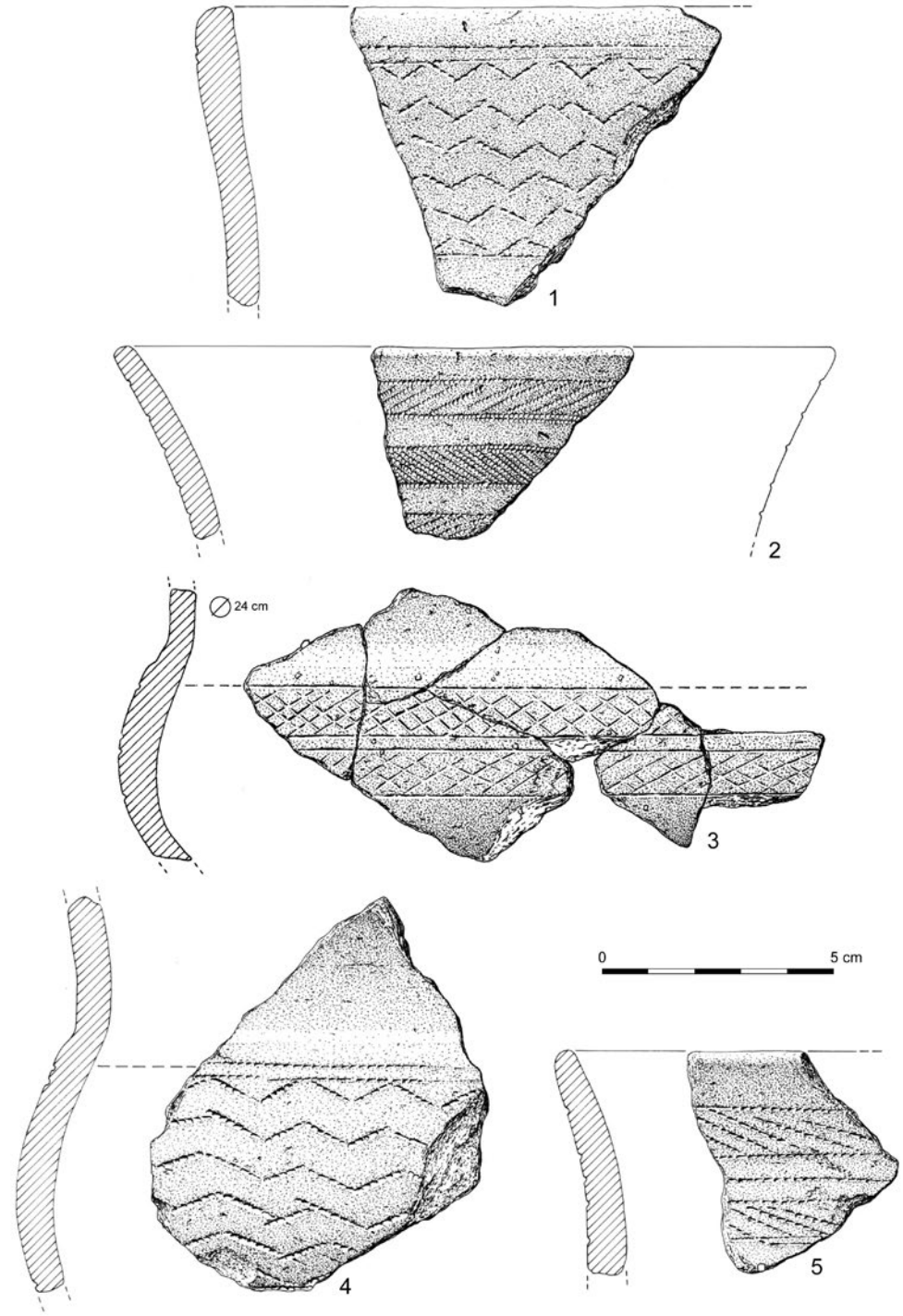

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Fig. 29 Outeiro Redondo. Bell-Beaker ceramics. Layer 2.

characteristic decorations of the large spherical vases correspond to the ›acacia leaf‹ pattern and associated motifs, typical of the Full/Final Chalcolithic of the Portuguese Estremadura, which is also observed in the ›cups‹ and in the hemispherical or spherical cups, where they substitute the typical fluted decorations of the Early Chalcolithic.

100 A small set of carefully manufactured spherical vessels was identified, the fine incised decorations apparently executed by a blade or a metallic tip associated with raised cords (Fig. 27, 1. 2. 4), which are also present in Leceia[47].

47 Cardoso 2006.

101 The Bell Beaker group stands out due to its importance, being concentrated in the western sector, but only amounting to 5.5 % of the decorated ceramics. The sporadic presence probably corresponds to a single habitational unit existing in the periphery of the fortification, as observed at Leceia[48].

102 The choice of the vessels' forms essentially depended on their practical use. In Layer 3, the ›copos‹ would have been used preferably for the consumption of liquids, while the hemispherical/spherical bowls could have been used both for drinking and the individual consumption of solid foodstuffs. And the large bowls with thickened rims would have been used both for the preparation of foods (such as ›migas‹ [fried bread crumbs] or cereal dishes, for example) and for its consumption.

103 In Layer 2, drinking vessels continued to be represented by ›copos‹, less carefully manufactured than those from Layer 3, and, above all, by hemispherical bowls; at the same time, there is a noticeable increase in the number of large vessels, which would have served to store liquids, including water, and foodstuffs, such as cereals, or dried legumes like peas and beans. The increased presence of storage vessels may be related to economic intensification, leading to the accumulation of surpluses, which in turn would have been indispensable for a population undergoing a continuous demographic growth.

104 When comparing the presence of the same forms among decorated and undecorated vessels, there is always a noticeable decrease of the latter. In Layer 3, the undecorated ›copos‹ only reach 1.7 %, contrasting with the large amount of decorated exemplars, at 33 %.

105 In Layer 2, the spherical forms of large dimensions dominate the decorated items, at 36.8 %, contrasting with the scarcity of undecorated pieces, at only 2.1 %. This is an interesting observation, since it contravenes the ›law of least effort‹, suggesting that the high degree of decoration in certain forms and not in others was related to their contents or functionalities, not resulting, in any case, from the free will of the potter.

106 The fact that all forms, either decorated or not, are in general represented in both stratigraphic layers, albeit in different quantities, reinforces the idea not of sudden material ruptures, but rather of a continuous replacement of forms, highlighted in previous works, such as the one dedicated to the prehistoric settlement of Leceia[49]. In fact, it is essentially the change of decorative techniques and patterns over time, which enables a better characterization of the two phases of the Chalcolithic at Outeiro Redondo.

107 The presence of Bell Beaker ceramics is particularly relevant (Fig. 27). Only 26 fragments were recovered, of which only a single, isolated small fragment was recovered from Layer 3, in the central sector of the settlement. The remaining 25 fragments were found in Layer 2 (5.5 % of all decorated ceramics selected from this layer), albeit only in the central sector and the western sector of the settlement; no Bell Beaker fragments at all were found in the northeastern sector, the most intensely inhabited part of the settlement. Among these 25 fragments, dotted decoration is predominant (twenty-one items), the remainder showing incised decoration (four items).

108 ›Maritime‹ vessels are predominant (Fig. 29, 2. 5), followed by fragments of ›caçoilas‹ with smooth shoulders, decorated with dotted horizontal zigzag bands (Fig. 29, 1. 4) or reticulates, a decorative motif also present in the local no-Beaker productions related to the ›acacia-leaf‹ pattern (Fig. 29, 3), challenging the traditional phasing of the Bell Beaker ›phenomenon‹ in the Lower Estremadura[50], as it was defined in the 1970s[51].

48 Cardoso 1997/1998.

49 Cardoso 2006.

50 Cardoso 2014d; Cardoso 2014/2015; Cardoso 2017.

51 Soares – Silva 1975.

109 Thus, it can be admitted that the scarcity of Bell Beaker products at Outeiro Redondo, including the near absence of Palmela bowls, is one of the most interesting aspects for the discussion of the status and occurrence of such ceramics in the Lower Estremadura.

110 Seventeen Beaker fragments were recovered from a circumscribed area in the settlement's western sector, all belonging to productions associated with the ›maritime‹ style. These findings suggest the sporadic presence at the site of bearers of this type of vessels, perhaps only one family group that built their hut at a peripheral location of the settlement, just like at Leceia, as mentioned above. In any case, this is indicative of an extremely low preference for this type of ceramics on the part of the site's occupants.

111 Considering the hypothesis that these ceramic types were associated with a certain community with well-defined cultural connotations, represented in the region of the Lower Estremadura by small groups scattered throughout the territory, one must assume that the inhabitants of Outeiro Redondo did not keep permanent contact with these groups. This would necessarily have been deliberate, given that the region where the site is located features one of the most intense occurences of Bell Beaker productions in the whole of Europe, its peak coinciding precisely with the occupation of the Outeiro Redondo settlement. This was also observed at another Chalcolithic fortified settlement of the Lower Estremadura, the Penedo do Lexim site, in Mafra[52], but Bell Beaker vessels are also frequent in the surrounding regions of these two sites[53].

112 Thus, the non-homogenous distribution of Bell Beaker productions across the region's fortified settlements attests to the different choices the respective inhabitants made in regard to the appropriation of Beaker ceramics for their daily use, as a result of the interactions established with the original Beaker bearers. In this regard, it is also important to bear in mind, as previously demonstrated[54], the fact that the production of the ›international group‹, featuring a large number of ›maritime‹ vessels, are broadly coeval with the types belonging to the other two groups present in the Lower Portuguese Estremadura[55], particularly the ›incised group‹, since the ›Palmela group‹ has a more circumscribed regional distribution, as its name implies.

113 This conclusion is underlined by the frequent coexistence of typical productions of the said groups, throughout the second half of the third millennium BC, in short-lived structures, such as habitational units like the FM hut of Leceia[56].

114 Furthermore, in this region, the finer Beaker productions, represented by the ›international group‹, are more frequently found in the hill settlements, often fortified, while the generally coarser productions, associated with the ›incised group‹, are typical of the smaller, open and rural settlements. Thus, as the Chalcolithic corresponds to the emergence of a complex society, the highest and better defended locations would have been occupied by an embryonic social elite, thus explaining the presence of the finer Bell Beaker productions, while the adjacent sites would correspond to the segment of the community dedicated to agro-pastoral productive activities, with limited social relevance[57].

7.6 Industrial Ceramics

115 This section will address ceramics related to the production of various goods, involving industrial activities of an artisanal and domestic nature.

52 Sousa 2010.
53 Cardoso – Carreira 1996; Sousa 2013; Sousa 2017.
54 Cardoso 2014d.
55 Soares – Silva 1974–1977.
56 Cardoso 1997/1998; Cardoso 2017.
57 Cardoso 2014d; Cardoso 2017.

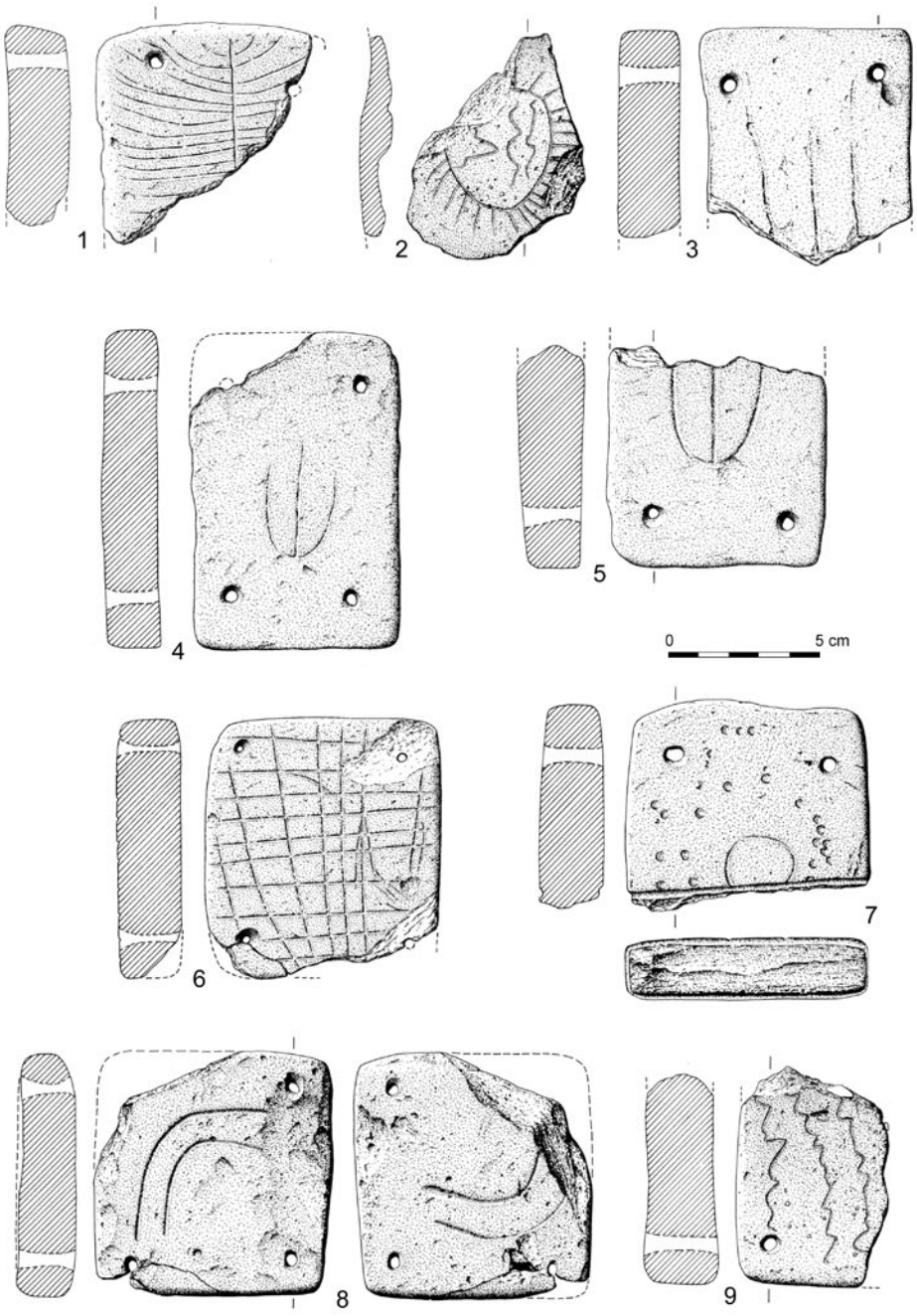

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Fig. 30 Outeiro Redondo. Loom weights. Layer 2 (1. 2. 8. 9) and Layer 3 (3–7).

116 **Loom weights** (Fig. 30): The Outeiro Redondo site yielded a considerable number of loom weights. Their functionality was previously discussed in papers dealing with the assemblage recovered at this site[58]. They are sub-rectangular to sub-quadrangular clay slabs with perforations near the vertices.

117 The assemblage includes a total of 101 items, 27 of which were complete, the remainder being fragmented, with the following stratigraphic distribution:

- Layer 3: 40 items, 15 of which are decorated;
- Layer 2: 61 items, 18 of which are decorated.

58 Cardoso 2013; Cardoso – Martins 2016/2017.

118 Thus, the majority of the loom weights were recovered from the Full/Final Chalcolithic contexts, but the number of items recovered from the Early Chalcolithic contexts is nevertheless remarkable; weaving was a very significant activity, carried out in the intramural space, mainly in the flattest area of the settlement, i. e. the northeast sector, where the largest number of exemplars was recovered.

119 This conclusion contrasts with that from other sites, such as Leceia, Oeiras, where, despite the much larger size of the settlement, only eight specimens, almost always very incomplete were collected in Layer 3 (Initial Chalcolithic) and five, less fragmented, in Layer 2[59].

120 Regarding Layer 3, two concentrations of weights were recorded in the northeast sector of the settlement (see Fig. 4), including a noteworthy set of eight loom weights found inside hut R, in contact with the bedrock; another set of five weights was also found near structure S, at a depth of between 80 and 120 cm. It is very likely that the presence of these two sets in two circumscribed areas with an overall high densitiy of such finds corresponds to the location of two looms.

121 As for Layer 2, no such concentrations were identified. The dispersion of the weights recovered from this layer reflects the phenomena of transportation and redeposition of materials, ultimately more intense than the processes that affected the underlying Layer 3.

122 According to their morphology and wear, the weights would have been suspended from only two holes at a time, as already mentioned in recent papers[60]; the other two holes might have kept left in reserve. This is proven by an exemplar from Layer 3, which was sawn transversally from both sides, approximately along the middle of the original piece, and therefore had only two holes, which would still be sufficient to ensure its functionality as a weight (Fig. 30, 7). As the function of these pieces depended solely on their weight, the reasons for sawing this particular item apart may be related to the need for less tension in the yarns, which required a less heavy piece. It is important to point out that this situation is not unique: In the Chalcolithic settlement of Outeiro de São Mamede (Bombarral) three loom weights with similar features were also recorded[61]. Indeed, Roman looms used weights of different sizes, depending on the type of fabrics to be manufactured. In fact, only two holes would be used at a time, as suggested by the wear traces observed near each pair of holes.

123 Thirty-three decorated weights were recorded, most of them fragmented: fifteen items on Layer 3 and eighteen items on Layer 2. Most pieces show decorations on one side only; only five pieces (16.1 %) are decorated on both sides.

124 The majority of these decorations were made in incised technique; only seven items show the use of a denticulate stamp to impress the soft unfired paste. Interestingly enough, loom weights bearing this type of decoration may occur both in Bell Beaker and in similar contexts. Pieces bearing zigzag patterns and wavy lines are the most abundant in both layers: 20 % in Layer 3 and 22.2 % in Layer 2.

125 The meaning of these decorations, clearly distinct from the usual decoration of other coeval ceramic types and, on the other hand, their hasty, even apparently careless execution, underlines their symbolic character, enhancing the meaning rather than the formal quality (Fig. 30, 9). The fact that a number of pieces repeatedly display the same motives in the manner of a symbolic code suggests that these motifs had an explicit meaning understood by all, and did not result merely from the potter's whim or will. It is likely that the wavy lines evoke running water, in which the flax was washed, then cultivated as evidenced, among others, by the remains collected in Vila Nova de

59 Cardoso 2006.

60 Cardoso 2013; Cardoso – Martins 2016/2017.

61 Cardoso – Carreira 2003, 218 fig. 62, 1, 2; 226 fig. 70, 1.

São Pedro, Azambuja[62]. Let us recall that this association of wavy lines with water and flax was proposed long ago[63], and, more recently, regarding an exemplar recovered at Leceia[64].

126 Besides Vila Nova de São Pedro, undoubtedly the site where the largest assemblage of weight looms has been recovered, other examples can be mentioned, without being exhaustive, e. g. the Chalcolithic fortified settlements of Pedra de Ouro[65] and Moita da Ladra[66].

127 The reticulates are another symbolic representation, probably related to the warp and weft of the loom (Fig. 30, 6). Observed on two examples from Outeiro Redondo, they can be also ultimately associated with ploughed fields; strong parallels are found in Vila Nova de São Pedro[67].

128 Astral representations may be related to the sun, a source of energy that was at the origin of the growth of flax and other vegetables used in weaving (Fig. 30, 2. 7). This motif bears three wavy lines inside the circle. Identical representations have often been observed on exemplars from Vila Nova de São Pedro[68], but also at other important Chalcolithic fortified settlements, such as Pedra de Ouro[69], in addition to their presence on the outer or inner surfaces of vessels, usually hemispheric bowls. The interesting thing about the Outeiro Redondo exemplar is that the sun is associated with wavy lines, perhaps representing running water, two essential elements of life.

129 Besides the most common motifs, there are others whose specific symbology is more obvious: this is the case of three items discovered in Layer 3, bearing representations suggestive of vulvae (Figs. 30, 3–5), very similar to those engraved on the lips of two bowls (›taças‹) recovered from the Early Chalcolithic contexts of Leceia[70], in turn comparable to the representation engraved on a small limestone cylinder from the same site[71]. There is no need to go back any further in time, to the Palaeolithic pictograms studied by André Leroi-Gourhan, but let us mention here that part of a loom from Vila Nova de São Pedro, bearing an identical representation, has been known for a long time[72].

130 Some pieces bear two parallel curved lines, which could represent the Moon in one of its phases (Fig. 30, 8). At Vila Nova de São Pedro, Alfonso do Paço associated circular incised motifs with the Moon. The circle is surrounded by impressed circular crowns, executed with a small hollow stem. This is a peculiar decorative technique, although it has been observed on other items from Pedra de Ouro[73] and Vila Nova de São Pedro[74].

131 These motifs, along with deer and sun-like representations, embody a schematic figurative group of evident symbolic nature[75]. In fact, the first representation of this type, decorating a loom element, was identified by Vergílio Correia on an exemplar from the settlement of Outeiro de São Mamede, Óbidos, who described it as »a stone

62 Paço – Arthur 1953; Paço 1954.
63 Paço 1964, 144.
64 Cardoso 1981.
65 Gomes – Domingos 2005, 119.
66 Cardoso 2014a, 287 fig. 48, 2; 288 fig. 49, 2, 4.
67 Jalhay – Paço 1945, 71 fig. 9, 4–9.
68 Paço 1940, 239 fig. 1, 8–18; Jalhay – Paço 1945, 75 fig. 11, 4–6.
69 Gomes – Domingos 2005, 119.
70 Cardoso 2009c, 78.
71 Cardoso 1995c, 255 fig. 2; 257 fig. 3, 1.
72 Jalhay – Paço 1945, fig. 11, 7, inverted.
73 Gomes – Domingos 2005, 119.
74 Jalhay – Paço 1945, 73 fig. 10, 7.
75 Paço 1940.

axe, hafted, complete, drawn in simple lines«[76]. This piece, redrawn afterwards[77], was also considered a representation of an axe by Leite de Vasconcelos[78], who highlighted the symbolic connotation of the axe to everyday tasks.

132 Thus, and in agreement with José Morais Arnaud[79], it can be accepted that these pieces, while having an obvious practical purpose, in this case weaving, would also have a communicational aspect, by means of the symbols or ideograms inscribed on them. These symbols were naturally understood and valued by their users, and could, at least in some cases, be associated with the artefacts' functions.

133 **›Cheese moulds‹** (Fig. 31, 1–3): ›Cheese moulds‹ are represented by only nine exemplars, contrasting with the abundance of loom weights. These are bottomless vessels, with densely perforated walls that formally evoke associations with such a function, although biochemical studies on their true use have not yet reached definitive conclusions (work in progress at the University of Évora). Their stratigraphic distribution is restricted to Layer 2, ascribed to the Full/Final Chalcolithic, in accordance with the data recorded at Leceia, where such pieces were found in the same chrono-cultural phase[80].

134 The small number of these items indicates that the production of milk-derived substances, like cheese, was not a significant activity at this settlement, a conclusion corroborated by the limited importance of sheep and goats, based on the recovered faunal remains.

135 In comparison with other settlements, reference should be made to the 25 examples (21 of which are rims) recovered at Leceia, the 23 pieces, with rims, from Moita da Ladra[81], and the 132 fragments (33 of which are rims) from the Penedo do Lexim settlement[82].

136 These data illustrate what has already been said, based on the differentiated presence of loom weights in the most important settlements of the region, i. e. that each site had specific characteristics, as reflected in the clear differentiation of its economic activities. Thus, as far as the production of cheese moulds is concerned, their importance is only apparent at Penedo do Lexim: although the excavated area is the smallest among the four fortified Chalcolithic settlements under consideration, it yielded the largest number of ›cheese moulds‹. Outeiro Redondo lies on the opposite end.

137 It seems important to emphasize that the presence of ›cheese moulds‹ in the settlements of Portuguese Estremadura is exclusively limited to the Full/Final Chalcolithic occupations. This corroborates the fact that the ›Secondary Products Revolution‹ was still in full development and diversifying the productions during the second half of the third millennium BC[83].

138 **Fireplace supports** (Fig. 31, 4): Several fragments of these pieces were collected: nine in contexts of the Early Chalcolithic and seven in contexts of the Full/Final Chalcolithic.

139 In a previously published study dedicated to this archaeological site, it was demonstrated that these pieces were associated with contexts relating to the manipulation of fire[84], having an evident functional nature.

76 Correia 1914, 3.
77 Cardoso – Carreira 2003, 224 fig. 68, 4.
78 Vasconcelos 1922.
79 Arnaud 2013.
80 Cardoso 2006.
81 Cardoso 2014a, 289 fig. 50; 290 fig. 51.
82 Sousa 2010, 136 fig. 138; 137 fig. 139.
83 Sherratt 1981.
84 Cardoso 2013.

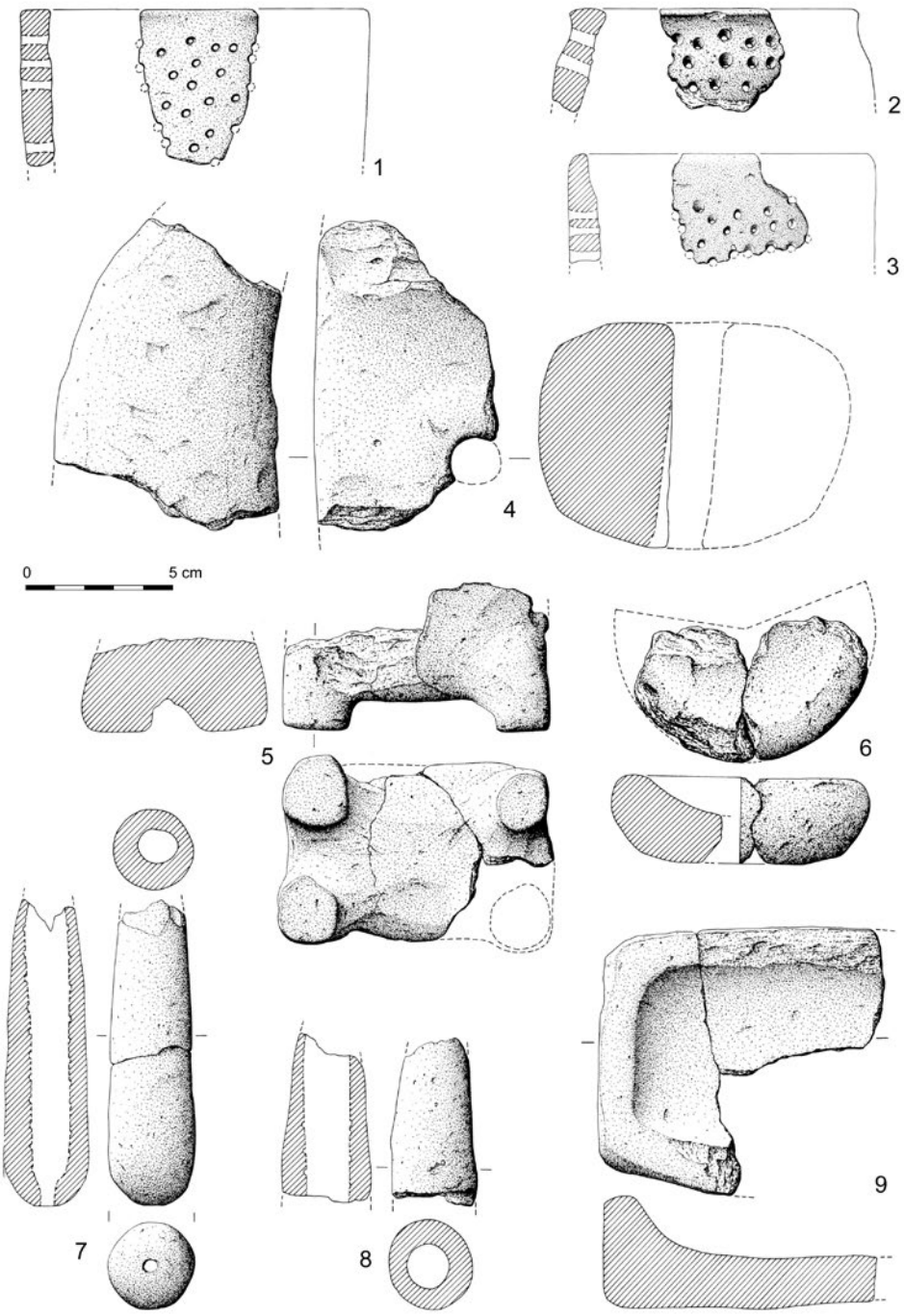

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Fig. 31 Outeiro Redondo. ›Cheese-moulds‹, fireplace supports, melting pots and forge tubes. Layer 2 (1–3. 6) and Layer 3 (4. 5. 7–9).

140 All specimens have, when preserved, a wide and flat base, in order to secure the support of the containers that were placed on the fire; although very fragmented, seven specimens show traces of a mesial cylindrical perforation, in order to facilitate the heat circulation.

141 In the western sector of the village, no specimens were collected; the eastern and northeastern sector of the village provide the largest number of specimens, in three cases in close proximity to combustion structures[85]. This evidence supports the functional character of these pieces, directly associated with the domestic use of fire, as has been repeatedly mentioned. This is the case at the fortified Chalcolithic

85 Cardoso 2019b.

settlements of Vila Nova de São Pedro[86], Penha Verde[87], Outeiro Redondo[88], Leceia[89] and Moita da Ladra[90].

7.7 Metallurgy

142 **Crucibles:** The importance of copper metallurgy carried out at the site, initially recognized due to the presence of a copper ingot in the collection assembled by Gustavo Marques[91], was further underlined with the foundry crucibles recovered during the excavations. The respective copper alloys have already been addressed, in a paper dedicated to their study, based upon the pieces collected in the first phase of the excavations (2005–2009)[92].

143 The evidence for metallurgy increased following the discovery, mainly during the 2013 to 2016 field seasons, of abundant fragments of crucibles of various shapes and types, all incomplete, some with small portions of molten copper adhering to them. These items were mostly found in Layer 2 and in the northeast sector of the inhabited space.

144 Layer 3 crucibles are mostly sub-rectangular and deeper than those from Layer 2 (like the exemplar of Fig. 31, 9). Some of them have cylindrical feet, (like the exemplar of Fig. 31, 5). Crucibles with feet were also found at Zambujal, in Torres Vedras[93], where they were also scarcer than those without feet. Moreover, the crucible shown in figure 31, 5 is quite similar to the recently published exemplars from the Travessa das Dores settlement, in Lisbon[94], and from Chibanes, Palmela[95]. At Leceia, the only recovered exemplar came from Layer 3 (Early Chalcolithic) and also features cylindrical feet[96].

145 In some cases, Layer 2 crucibles tend to be ellipsoidal to sub-circular in shape, shallow (Fig. 31, 6) and similar to those found at Zambujal, in Torres Vedras[97], while others show a sub-rectangular tendency and are deeper, like those from Layer 3, but all with a flat base, without supporting feet.

146 Regarding the association of crucibles with habitational structures, the following evidence stands out, pertaining exclusively to the northeast area of the settlement (see Fig. 4):

Two concentrations of crucibles were identified in Layer 3: a set of three crucibles inside the enclosure of hut R, near the base of the large ash dump, surrounded by a reddish layer, certainly related to the R1 hearth; and another set near structure S. Regarding Layer 2, two exemplars were found next to structure O1 and another set of two next to structure X, perhaps belonging to the same piece.

147 **›Tuyeres‹** (furnace tubes) (Fig. 31, 7. 8): Six more or less complete ›tuyeres‹ (furnace tubes) were recovered, all from the northeast sector of the settlement, evenly distributed between both layers.

86 Jalhay – Paço 1945; Paço – Arthur 1952.
87 Cardoso – Ferreira 1990.
88 Cardoso 2013; Cardoso – Martins 2016/2017; Cardoso – Martins 2018; Cardoso 2019b.
89 Cardoso 2006.
90 Cardoso 2014a.
91 Cardoso 2009a.
92 Pereira et al. 2013.
93 Sangmeister 1995, pl. 14, 9. 10.
94 Neto et al. 2015, 259 fig. 29, 13.
95 Silva – Soares 2014, 142 fig. 33.
96 Cardoso 2006, 124 fig. 85, 10.
97 Sangmeister 1995, pls. 12. 13.

148 The three furnace tubes from Layer 3 (Fig. 31, 7. 8) were found at the same spot, associated with hut R, embedded in the ash layer and close to a crucible; there is no doubt that their occurrence is related to a copper smelting furnace.

149 Regarding Layer 2, the presence of a mesial fragment of a furnace tube associated with hearth U stresses the importance of metallurgical activities carried out in combustion structures integrated in domestic contexts. In the absence of this type of evidence, such combustion structures could simply be related to cooking or heating.

150 The rarity of ›tuyeres‹ in Portuguese Chalcolithic settlements is indicated by the scarce reference made to such items in scholarly literature: an incomplete exemplar, corresponding to the distal end, from the settlement of Moita da Ladra was recently published[98]; an almost complete example, very similar to those of Outeiro Redondo, came to light at Vila Nova de São Pedro[99]; another one, shorter and more solid, was also found at Pedra de Ouro[100]; and, finally, a further exemplar was recovered at the Três Moínhos settlement, in the cupriferous region of Baixo Alentejo (Beja)[101].

151 Interestingly enough, some ›tuyeres‹ found at the Chalcolithic metallurgical settlement of Cabezo Juré (Huelva, Spain) show different characteristics, being shorter and with larger diameters. This settlement yielded abundant combustion structures and, in some cases, even the fittings of the ›tuyeres‹ were recorded[102]. Moreover, the Cabezo Juré crucibles are similar to those recovered from the Chalcolithic contexts of the Perdigões site[103].

152 It is worth pointing out the small diameter of most Portuguese ›tuyeres‹, perhaps with the purpose of generating an oxygenated air flow, well directed and tailored according to the size of the respective combustion structures; actually, the diameters generally do not exceed 0.50 cm. Note that, to ensure the required adherence of the leather bellows that were adjusted to the internal face of the two better preserved pieces, they feature a regular crenulation, clearly visible in cross section. Finally, two of them (Fig. 31, 7. 8) may have originally belonged to the same bellows, given their similarity and spatial proximity thus forming a pair of tubes working in combination, like some present-day African metallurgical bellows[104].

153 **Prill and slag** (Fig. 32, 1–20): Another testimony of copper smelting are the prill and slag that were recovered from both stratigraphic layers: Layer 3 yielded five items related to hearth J, and there is even one item from the interior of the hearth; Layer 2 yielded fifteen pieces of prill and slag from the interior of hearth U, besides the parts collected in other places on the site.

154 **Utilitarian copper artefacts:** A total of 109 metal artefacts were recovered, of which thirteen belong to Layer 3 and 96 to Layer 2. They were concentrated, in both layers, in the northeastern sector of the settlement, as this is the best suited area for domestic occupation. Small utilitarian artefacts dominate in both layers, e. g. awls, punches, and small chisels with sub-quadrangular to sub-rectangular cross sections (Fig. 32, 21–25), spatulate knives, sometimes featuring two side notches for hafting, some undetermined fragments as well as seventeen irregular strips with no definite shape, perhaps intended for remelting, some with cutting marks along the edges.

98 Cardoso 2014a, 290 fig. 51, 11.
99 Jalhay – Paço 1945, pl. 21, 4; Müller – Soares 2008, 99 fig. 1.
100 Paço 1966, fig. 13 b.
101 Soares 1992, 314 fig. 10, 9.
102 Nocete Calvo et al. 2004, 282 fig. 13, 8; Nocete – Nocete 2015, 24.
103 Valera – Basílio 2017, 95 fig. 8, 11. 12.
104 Chirikure et al. 2009.

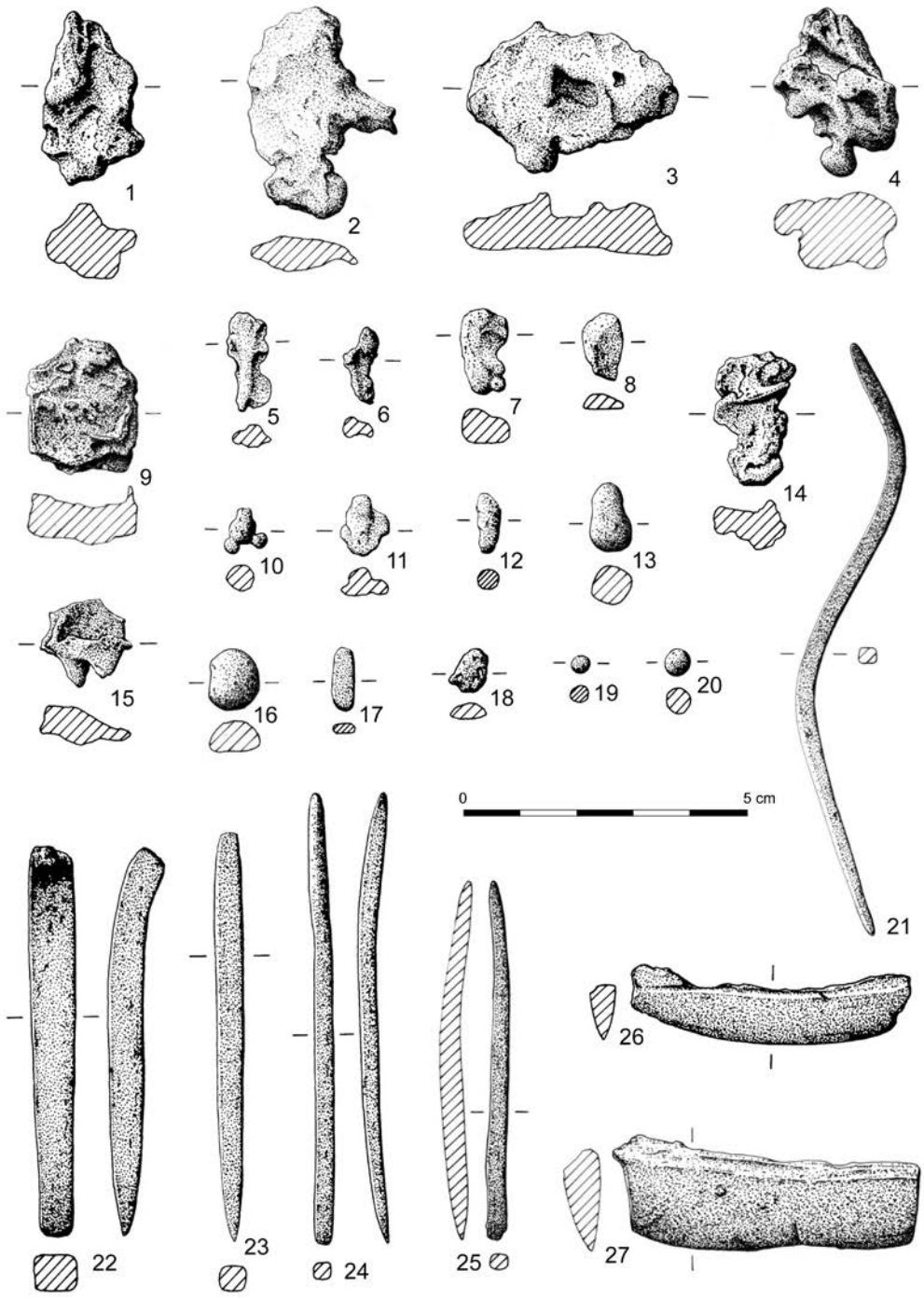

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Fig. 32 Outeiro Redondo. Metallurgical products. Foundry drops and slag, awls, chisels and an intentionally sawn axe edge. Layer 2 (1–6. 9–17. 19. 21–23. 25–27) and Layer 3 (7. 8. 18. 20. 24).

155 Among the larger artefacts, there are saws or scythes, made from copper sheets serrated on one side (Fig. 33, 9–12); in some cases, the teeth are dulled, a sign of intense use. One of these saw blades was found broken, with the two parts juxtaposed, a sign of intentional folding, probably related to the future reuse of the metal (Fig. 33, 11).

156 Hooks are one of the most interesting objects found at the site; a total of ten exemplars were recovered (Fig. 33, 1–8). This is the most numerous set ever found at a prehistoric settlement in Portuguese territory. Moreover, this set includes hooks of several different sizes, intended for the capture of different species, a previously unobserved aspect, now evidenced for the first time.

157 Three intentionally cut axe edges deserve some consideration as well (Fig. 32, 26. 27). The reason for sawing off the axe edges is unknown. This is common

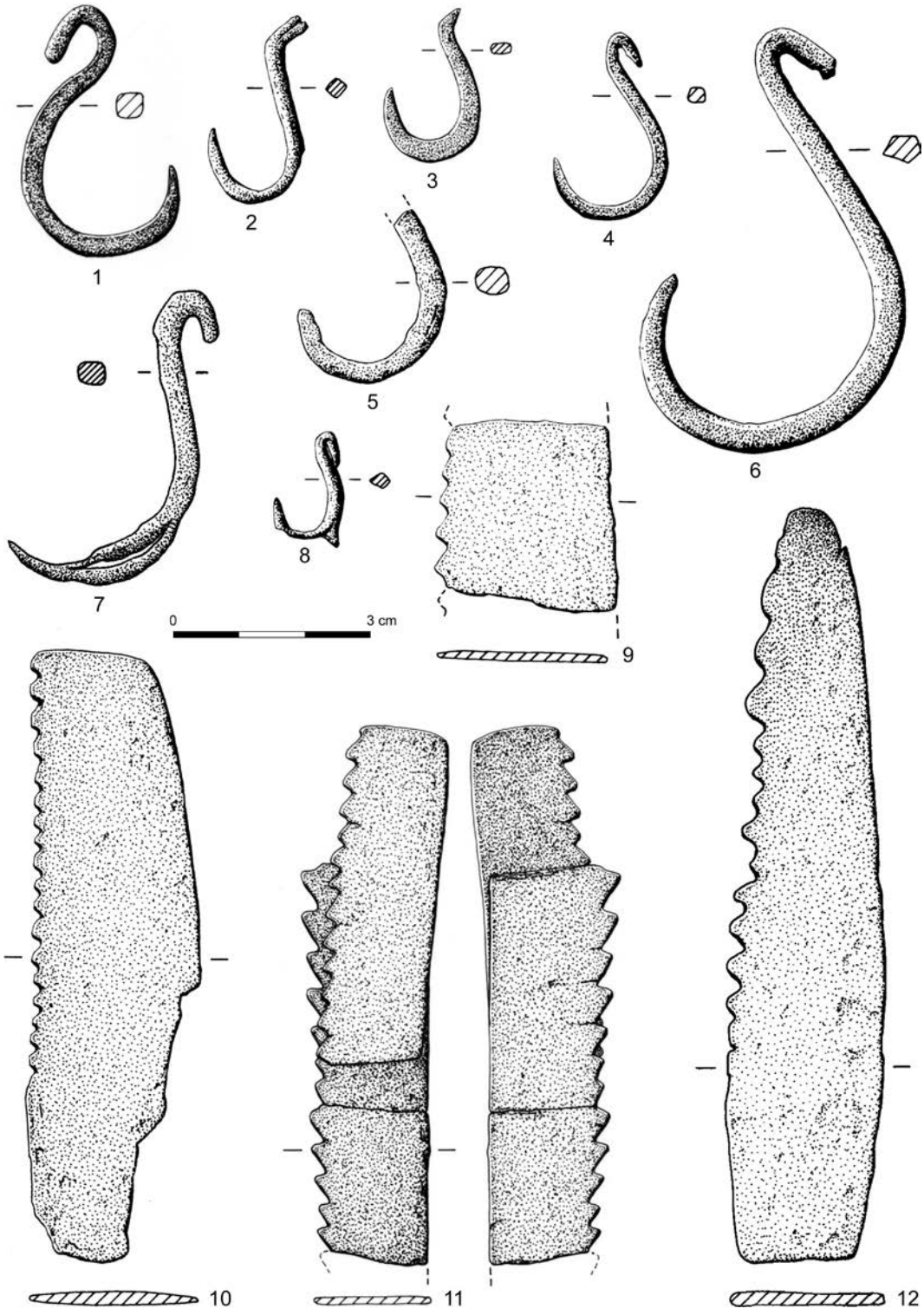

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Fig. 33 Outeiro Redondo. Metallurgical products. Hooks and saws/sickles, with jagged edge. Layer 2.

practice in many other Chalcolithic sites, both in Estremadura and in Southwestern Iberia. Yet, the items concerned show wear marks, as a result of their use. If the purpose was reshaping the cutting edges, it would not have been necessary to saw them off, as this is a time-consuming operation with the further disadvantage of progressively reducing the mass of the pieces, which is essential to their effectiveness. Hammering, either cold or hot, would be much easier and more appropriate, with the added advantage of increasing the hardness of the edge. The alternative would be to consider the so-called flat copper axes as ingots, from which raw material could be obtained as

needed. However, there are also some objections to this alternative, firstly because real ingots, with more or less regular and well-defined shapes, are known from these sites, e. g. the one recovered by Gustavo Marques prior to the start of the Outeiro Redondo excavations[105]; secondly, because the edges of these sawed-off axes often show wear marks, contrary to the hypothesis that the original artefacts from which they were detached were only simple ingots. Thus, this increases the difficulty in explaining why such edges were produced intentionally and then separated from the axe, as well as the use marks that some of them clearly show, indicating an effective use of the original piece. There is, therefore, still a considerable number of aspects to be clarified regarding these enigmatic artefacts.

158 The meaning of this practice was discussed in previous papers and some of the many known parallels were presented, some of them recently published, e. g. the exemplar from Moita da Ladra, encompassing Chalcolithic settlements of the Estremadura area and Southwestern Iberia[106]. Once again, the objectively observed situation can support two alternative readings: one emphasizing the putative symbolic act of cutting the edge off a functional object which, due to its importance in daily life, could easily have gained a particular value in the cognitive superstructure of these populations, hard to evaluate nowadays; and another, opposite reading, of a strictly functionalist nature, which sees these copper artefacts, particularly the larger ones, as simple ingots, from which portions could be cut-off as required, from the distal end, i. e. the cutting edge.

159 **Copper weapons** (Fig. 34. 35): Three particular artefacts deserve to be highlighted; they were recovered from Layer 2 in 2013, in the northeast sector of the settlement, close to structure N (see Fig. 4):

tanged halberd, with a robust midrib (Fig. 34, 2; 35, 2), an exceptional item in the context of the Final Chalcolithic production of western Iberia. In fact, the oldest known halberds in this vast region, represented by the ›Carrapatas‹ type, can be ascribed to an immediately subsequent period, corresponding to the so-called Montelavar Horizon. The non-tanged halberd, the fixation to the cable being ensured by usually three rivets in the proximal extremity, occurs throughout the Portuguese Estremadura, and is represented e. g. by the halberd from the Baútas site, near Lisbon[107]. Yet another example of this type is the halberd found at the Bell Beaker necropolis of Humanejos (Madrid, Spain), also featuring a midrib and a three-rivet in the convex proximal extremity, similar to the Baútas exemplar[108], further confirming the occurrence of this type of halberds in Chalcolithic contexts.

In these terms, the exemplar recovered at Outeiro Redondo in 2013 embodies a new type of halberd with midrib in western Iberia, more archaic than the examples referred to above, given the presence of a prominent tang without rivets, corresponding to a clearly Chalcolithic form. This is a unique exemplar, with an absolute date of 2440–2110 cal BC, at 2 σ[109].

double dewlap and spyke arrowhead (Fig. 34, 1; 35, 1) is another piece worth discussing. Indeed, this exemplar, discovered in 2013 not far from the halberd mentioned above, could be considered one of the oldest examples of this type of arrowhead. Bearing in mind the generally accepted morphological evolution of Palmela points, with the most recent exemplars being lanceolate, with a narrower blade and tending

105 Cardoso 2009a, 86 fig. 11, 6.
106 Cardoso 2014a, 291 fig. 52, 1.
107 Brandherm 2003, pl. 97, 1380.
108 Blasco Bosqued et al. 2016, 26 fig. 6; Garrido-Pena et al. 2019, 45 fig. 44.
109 Cardoso et al. 2010/2011.

to be smaller than the older ones, it is possible to conclude that the barbed and tanged points might correspond to the final stage of this evolution. In fact, the finding of a hybrid exemplar from the Huelva region[110], not really much different from a Palmela point, except for the two small basal notches, does support this conclusion. If this is the case, it would seem reasonable to ascribe the double dewlap and tanged point from Outeiro Redondo to the final stage of the site's occupation, in the last quarter of the third millennium BC, thus coexisting with the last Palmela points, which have not been identified at this site. On the other hand, in Outeiro Redondo no further evidence was identified postdating the end of the Chalcolithic period, which reinforces the conclusion that this arrowhead is one of the oldest representatives of this type of point, whose direct affiliation to the Palmela points seems to be illustrated by the exemplar published by Francisco Nocete. This conclusion does not rule out the possibility that, in other cases where isolated specimens have been recovered at fortified Chalcolithic settlements, the sites were actually being reoccupied, as in the case of Vila Nova de São Pedro, Azambuja[111] and, probably, also Zambujal[112]. Thus, the existence of hybrid examples of metallic weapons is a clear way of demonstrating phylogenies that would otherwise be less evident.

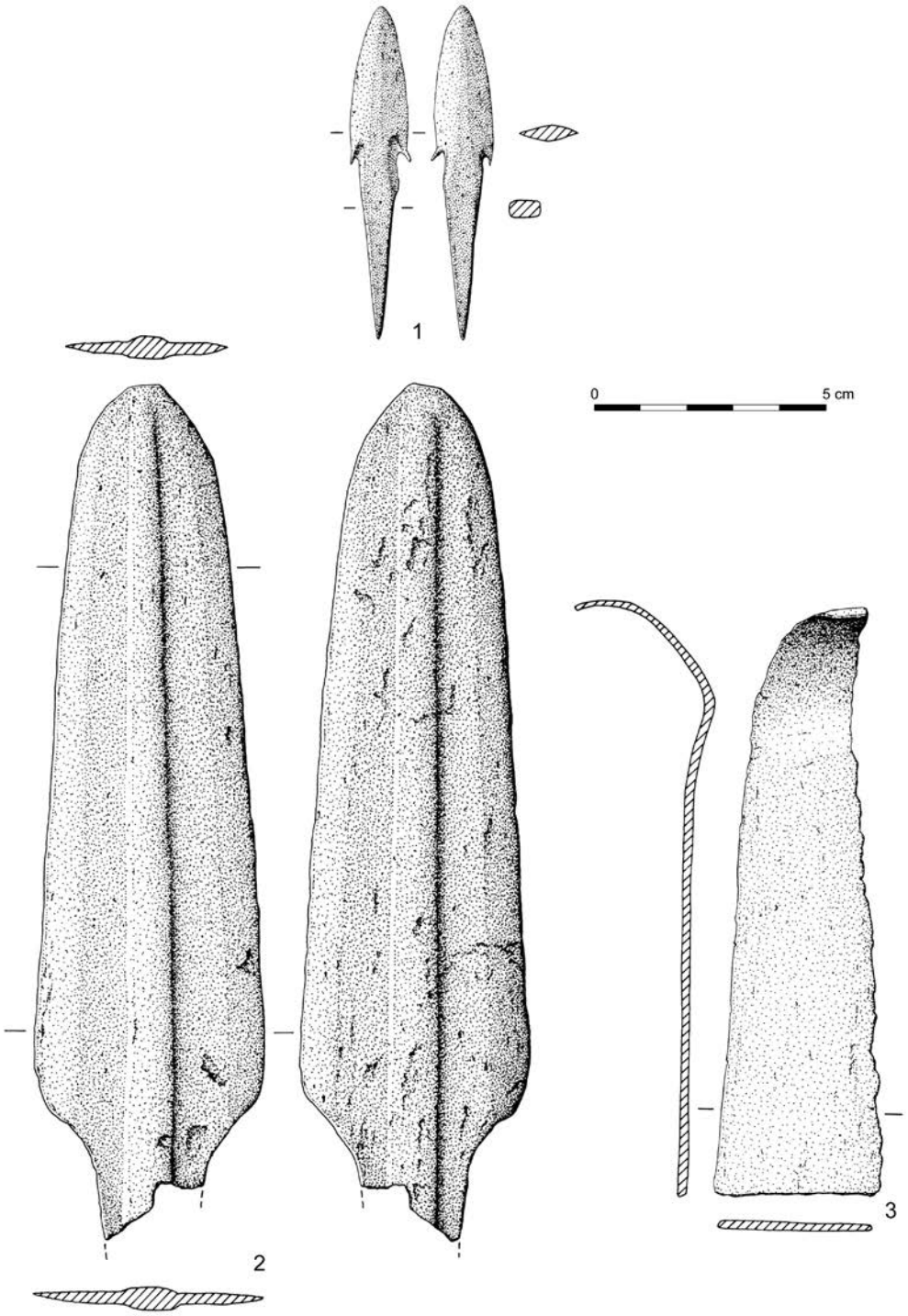
The third copper artefact that should be highlighted here is the distal part of a sword, with a slightly curved tip and sectioned by an intentional transversal cut (Fig. 34, 3). Unfortunately, as the handle part has not been preserved, it is not possible to determine the type of sword to which this blade section belonged. In any case, this piece is contemporaneous of a well-known sword with a short-tanged handle from Pinhal dos Melos, an exceptional product that can be ascribed to the Montelavar Horizon, dating back to the beginning of the second millennium BC[113].

In the case of the Outeiro Redondo exemplar, the intentional sectioning of the blade would be enough, if the archaeological context was different, to connect it with a ritual, given the deliberate and definitive lack of functional utility of the said piece. In the domestic context in which it was found, it is not hard to admit that this section of a sword, along with other intentionally cut items, such as the axes' edges mentioned above – hence also considered ingot-axes by several authors[114] – could have been intended for local remelting. This hypothesis is well supported by the considerable evidence for metallurgical activities at the site.

160 With regard to copper alloys, the arsenic content of Chalcolithic copper artefacts is deemed unintentional[115]. A recently published paper dedicated to the Outeiro Redondo archaeological site already included some considerations on this matter[116], commented by the author[117], and this conclusion was recently reaffirmed with regard to the 145 Chalcolithic artefacts discovered at Leceia (Oeiras)[118].

161 It is possible that, in Estremadura, Chalcolithic copper metallurgy has progressively benefited from different sources of raw material. This notion was forwarded for the first time in the study of the metallic assemblage from Moita da Ladra, Vila Franca de Xira[119]. Thus, in addition to the exploitation of small mineralizations associated with

110 Nocete – Nocete 2015, 46.
111 Soares 2005.
112 Sangmeister 1995, pl. 10, 5.
113 Brandherm 2003, pl. 19, 287.
114 Soares 1992.
115 Cardoso – Guerra 1997/1998.
116 Pereira et al. 2013.
117 Cardoso 2013.
118 Cardoso et al. 2020.
119 Cardoso et al. 2013b.



34

Fig. 34 Outeiro Redondo. Spike and dewlap arrowhead, tanged halberd and distal portion of intentionally sawed sword. Layer 2.

late-Hercynian quartz veins widespread over the Ossa Morena Zone[120], there would have been a gradual exploitation of the supergene mineralizations of polymetallic sulfides of the South Portuguese Zone. Therefore, the pieces with higher levels of arsenic would have resulted from the growing diversification of the procurement of minerals, extending, from a certain moment in the second half of the third millennium BC onwards, to the cupriferous deposits of Baixo Alentejo and to the exploitation of the ›iron hats‹ of the pyrite belt[121].

120 Müller – Cardoso 2008; Müller – Soares 2008.

121 Pereira et al. 2017.

35

Fig. 35 Outeiro Redondo. 1 Spike and dewlap arrowhead; 2 tanged halberd.

162 However, the results of the analyses of all recovered materials should be awaited in order to draw more substantiated conclusions.

163 In short, the data collected so far suggest that this settlement served as an important metallurgical center. The presence of exceptional weapons further indicates a different social reality from that observed in the large settlements of the same region, such as Leceia or Zambujal. One should bear in mind the geographical location of the settlement, away from the main commercial axis connecting Alentejo and Estremadura, which would be located further east. There was, therefore, an economic reason that made Outeiro Redondo relevant on a regional scale, to the point where raw materials imported from other regions, like copper and amphibolite, flowed into the settlement, in order to be transformed and used there.

7.8 Objects of Adornment

164 In the context of the Early Chalcolithic, a single object of adornment was collected; it is a perforated shell of *Luria lurida* (L., 1758) (Fig. 38, 3) from the northeast platform, next to the N structure (see Fig. 4).

165 The most likely origin of this adornment is the Algarve coast. Augusto Nobre reports that he collected rolled shells of this species in Cabo de Santa Maria (Faro)[122].

122 Nobre 1932, 129.

36

37

More recently, the species' distribution has been extended to the Olhão estuary, being especially mentioned in Tavira and surroundings[123], presuming, in the absence of other indications, that they were living specimens. This conclusion is added to that obtained on the origin of other shells used as adornments in Estremadura in contexts of the Late Neolithic or Chalcolithic as the two beads of *Conus mediterraneus* Bruguière, 1792[124], collected in the caves of the Poço Velho, Cascais[125].

166 In contexts of the Full/Final Chalcolithic there were five necklace beads, four in green mineral, discoid in shape and with double troncoconic perforations, made from both sides, all collected in Layer 2 (three in the northeast sector and two in the western sector of the settlement). This set of green stone beads must have similar origins as the majority of specimens collected in the Chalcolithic sites of the region (Penha Verde, Leceia and Moita da Ladra), namely the Zamora region (mines of Palazuelo de las Cuevas[126]).

167 One piece stands out in the context of Chalcolithic gold production in the Iberian Peninsula. It is a fine plate of beaten gold, later wrinkled, with a geometric reticulated decoration forming horizontal lines of lozenges apparently obtained by hammering a narrow and elongated punch, and laterally topped off by two thin, wider, parallel lines (Fig. 36). It was collected between Wall G and Wall V, in the northeast sector of the settlement, next to the rocky substrate, in a Full/Final Chalcolithic context. It is a very rare specimen within the peninsular framework, with similarities to the La Pijotilla (Badajoz) specimen[127], which comprises a set of five plates of finely beaten gold, also decorated with thin lozenges filled inside. In this respect, it also approaches the deformed tube plate, collected in the village of Moita da Ladra[128]. It is worth emphasizing now, and while the respective detailed study has not been completed, the conformity between its decorative pattern and the patterns present in the Chalcolithic ceramic production in the region.

Fig. 36 Outeiro Redondo. Beaten and folded gold leaf, decorated by rows of lozenges filled internally by lattice. Layer 2.

Fig. 37 Outeiro Redondo. Head of a naturalistic anthropomorphic statuette, made of bone or ivory darkened by heat. Layer 2.

123 Macedo et al. 1999, 148.
124 Nobre 1932, 73.
125 Cardoso – Guerreiro 2001/2002.
126 Odriozola et al. 2013.
127 Celestino Pérez – Blanco Fernández 2006.
128 Cardoso 2014a, 293 fig. 54, 13.

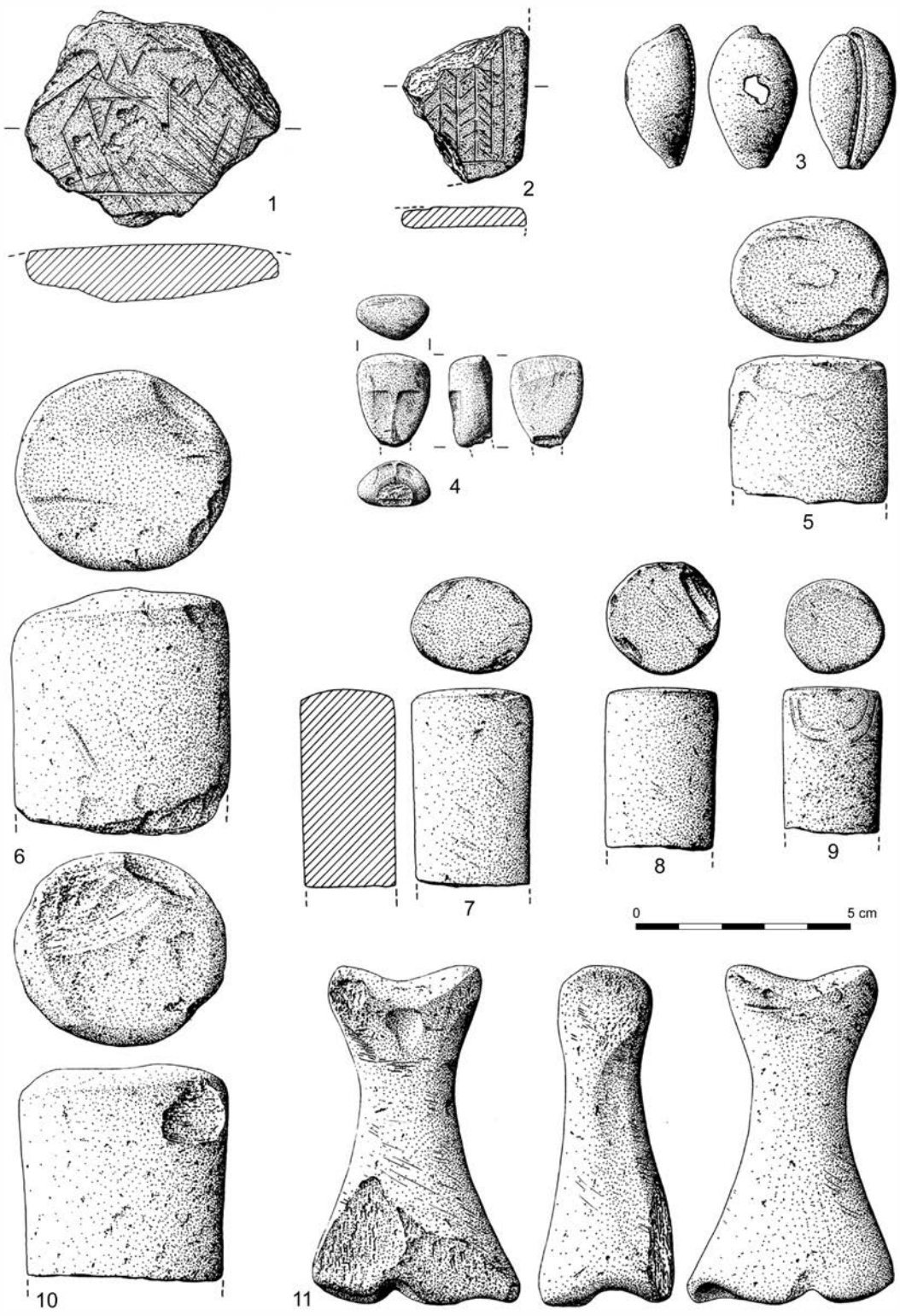


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Fig. 38 Outeiro Redondo. Adornment and symbolic-religious objects. Perforated shell of *Luria lurida* (L., 1758); limestone and basic rock cylinders (10), one of them bearing ›facial tattoos‹ (9), anthropomorphic head of a statuette made of bone or darkened ivory (4) and the first phalanx of *Equus caballus* L., 1758, whose polishing accentuated its anthropomorphic shape. Layer 2 (1. 2. 4–8. 10. 11) and Layer 3 (3. 9).

7.9 Ideotechnic Objects

168 Among all the objects that can be included in this category there is an anthropomorphic statuette, of which only the head, made of bone or ivory darkened by heat, was preserved. It was recovered from Layer 2, in the western sector of the settlement. This is a major figure, clearly different from the objects recently discovered at the Per-

digões archaeological complex, Reguengos de Monsaraz[129], which have clear affiliations with the numerous known Andalusian examples, like the figurines found at Valencina de la Concepción (Seville, Spain)[130], with large eyes, facial tattoos and sometimes well-marked eyebrows.

169 By contrast, the Outeiro Redondo exemplar has a distinctive naturalist appearance, with a straight nose, straight and well-marked supraciliary arches and a small mouth, which suggests this unique exemplar represents a new type (Fig. 37; 38, 4).

170 Other ideotechnic objects deserve to be mentioned as well:

- A first phalanx of horse (*Equus caballus* L.) well polished, in order to enhance its natural anthropomorphic outline, recovered at the northeast end of the settlement (Fig. 38, 11). Such pieces are common in Chalcolithic necropolises of Estremadura and Southwestern Iberia, and are less frequent in settlements. In the Portuguese Estremadura, several instances are known from Leceia, Olelas and Vila Nova de São Pedro[131] and, more recently, Alcalar, Portimão[132], in the Algarve region.
  The Outeiro Redondo exemplar indicates the existence of domestic altars dedicated to a Chalcolithic female deity. It could have been painted, the paint thus replacing the anthropomorphic engraving of the characteristic attributes, as they are remarkably evidenced by the two phalanges discovered at Lapa da Bugalheira, in Torres Novas[133], which, along with completely undecorated specimens, just like the Outeiro Redondo one, belonged to a sanctuary located on one side of the cave. The specimens of Lapa da Bugalheira are identical to several decorated first phalanxes from Perdigões[134], evidencing the broad geographic distribution of these pieces of ritual character, or at least of the artistic conception that underlies them, bringing together very different worlds, the western peninsular and the Guadiana basin.
- The cylindrical limestone idols, not-decorated (but possibly painted) or bearing the well-known facial tattoos, present in both chrono-cultural phases recorded at Outeiro Redondo, emphasize the existence of small domestic altars within the inhabited space (Fig. 38, 5–10). The larger idol, the only one made from diorite rock, with traces of reuse (Fig. 38, 10), deserves to be highlighted, as it demonstrates the loss of the original symbolic meaning of the representation to which it was initially associated. A similar incident was recorded at the Leceia settlement, where a limestone cylinder with facial tattoos was transformed into a pestle/hammerstone, causing the partial mutilation of the tattoos[135].
- Two small fragments of schist plaques (Fig. 38, 1. 2) both collected in the northeast area of the settle-

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Fig. 39 Outeiro Redondo. In the foreground, partial view of the pavement of Hut R (Early Chalcolithic), where a small hole was dug to receive a large shell of Mytilus sp. In the background the stratigraphic sequence observed, formed from bottom to top by a layer of ash resulting from the fire that reached this sector of the settlement, overlaid by a dark brown earthy layer with spoils of the Full/Final Chalcolithic, on which the Hut O is founded, represented by the alignment of blocks that occupy the top of the cut (see Fig. 4).

129 Valera – Evangelista 2014; Valera 2020.
130 Hurtado 1980.
131 Cardoso 1995a.
132 Morán Hernández 2018, 173.
133 Cardoso 1995b.
134 Valera 2020.
135 Cardoso 1989, 116 fig. 110, 8.

ment and in a context of the Full/Final Chalcolithic. They are very worn and fragmented, evidence of a long domestic use, probably as amulets or relics connected with ancestor worship, as the funeral character of these pieces is evident.

Fragments of reused shale plaques in funerary and domestic contexts in Estremadura and Alentejo are good indicators of the maintenance of their symbolic meaning[136]. Three pieces were recently published from the necropolis of Lapa do Fumo, Sesimbra, located next to Outeiro Redondo[137].

In domestic Chalcolithic contexts the presence of reused slate plaques has recently been inventoried[138]. Being scarce, its occurrence is not rare, as is the case of the fortified site of Vila Nova de São Pedro[139]. Complete plaques are the exception, such as the example found at the settlement of Pedrão, Setúbal[140]. Most of the extant plaques are reduced to very small sizes with a sometimes rounded contour, like one of the pieces collected in the fortified site of Zambujal, Torres Vedras[141].

As relics, their use extends well beyond the time when they were manufactured, but their production must have continued, in some cases, throughout the Chalcolithic. A fragment (Fig. 38, 2) shows a decorative pattern which is rare among this type of artefact, but very similar to the one seen on a Chalcolithic limestone cylinder, collected in the Correio-Mor cave, Loures[142].

8 Rituals

171 Despite the remarkable assemblage of ideotechnic objects recovered at the site, none of them can be directly associated with any domestic place of cult. However, such practices are well documented in the settlement by two contexts that we were able to isolate.

172 One of them, ascribed to the Early Chalcolithic, involved the placement of a mussel shell (*Mytilus* sp.), of exceptional dimensions, inside a small sub-trapezoidal shallow pit dug into the Upper Jurassic limestones of the bedrock (Fig. 39) located inside hut R, in the northeast sector of the settlement (see Fig. 4). As this ritual deposit would necessarily be covered by the ground floor of the hut, it is not unreasonable to think that it was related to a foundational ceremony, ultimately of the settlement itself. In fact, this practice would encompass not only the habitational structure to which it was directly related, but also the very settlement space to be occupied, the hut itself being the first stage. In these terms, the decision to bury a large mollusc from the nearby coast, of high dietary interest and of exceptional size, more than 12 cm long, can be explained by stressing the importance of the sea and the resources obtained from it in the daily dietary economy of the community that settled here.

173 In fact, the gathering of shellfish and other marine resources played an important role in the diet, despite their low protein content. The identified species reveal the exploitation of various types of coastal environments, from rocky to sandy or sandy-muddy sea floors, accessed directly or using devices handled from boats or by diving. The procurement of the various species of molluscs identified at this site could be conducted with varying intensity and frequency according to subsistence needs, distance-to-time ratios, or exploitation costs and benefits depending on the quantity and

136 Gonçalves et al. 2003; Lillios 2010; Cardoso – Vilaça 2020.
137 Cardoso – Vilaça 2020.
138 Andrade et al. 2015.
139 Jalhay – Paço 1945, 44 fig. 5, 1. 3. 4.
140 Soares – Silva 1975.
141 Kunst 2017, 206 fig. 11.
142 Cardoso 2003b, 290 fig. 30, 3.

quality of the available resources. And also depending on the traditions, habits and dietary preferences of the various communities that successively inhabited Outeiro Redondo, according to the conclusions already published[143].

174 Some coeval parallels are known from other residential contexts of Estremadura: at Vila Nova de São Pedro, a ritual ceremony was held involving the burial of at least one bovine animal or parts of it[144], and at the settlement of Carrascal, in Oeiras, two portions of domestic ox hemimandibles were deposited at the bottom of a circular ditch dug into the Cretaceous limestones and marls[145], highlighting the dietary importance of this animal, thus ritualized, in the economy of the communities living at these two settlements. This can easily be paralleled with the role played by marine resources at Outeiro Redondo.

175 Two decorated ceramic vessels (Fig. 28) ritually placed side by side in an inverted position and at a depth of only 10 cm, were recovered at the western sector of the settlement, on the inner side of one of the alignments of large blocks (forming a parapet) of Wall G (Fig. 40). One is a large globular vessel with an inverted and thickened rim, bending inwards, and fluted geometric decoration on the body. The second one is a large bowl, with a thickened rim and a prominent, strongly convex lip, with fluted geometric decoration on the inner wall. Both feature good quality pastes, with a medium texture, hard and fired in oxidizing-reductive environments. Due to their low depth and position, these vessels can be related to the final phase of occupation of the Chalcolithic settlement, and thus to a ceremony of abandonment of the archaeological site itself. This ritual deposition was compared with other sites and other periods, and widely discussed in a paper dedicated to this particular find[146].

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Fig. 40 Outeiro Redondo. View of the western sector of Wall G, formed by successive longitudinally adjoining panels, on which the two containers were inverted (see Figs. 4. 28).

176 We would thus have recorded the two key moments in the life of this prehistoric settlement: its possible foundation, marked by a ritual that enhanced marine resources, essential to the daily life of the settlers, and its abandonment, symbolically embodied by the way in which two vessels, of excellent manufacture indeed, were deposited, expressing the ultimate loss of their usefulness.

9 Conclusive Synthesis

177 The main conclusions obtained from the series of excavations carried out between 2005 and 2016 at the fortified Chalcolithic settlement of Outeiro Redondo can be summarized as follows:

143 Coelho – Cardoso 2010/2011.
144 Paço 1943.
145 Cardoso 2009b, 363 fig. 7.
146 Cardoso 2011b.

1) The importance of various economic activities, closely linked to daily life, has been demonstrated[147]. A wide range of raw materials supporting the elaboration and/or use of artefacts at the Outeiro Redondo settlement was identified, revealing an optimised exploitation of the territory and an efficient resource management. This also supported the evident interactions with other, more or less remote regions, through the acquisition/reception of goods, from a local level to a supra-regional scale. The presence of exogenous elements such as amphibolite, jasper or oolitic flint (and rhyolite), must be considered within this resource procurement logic, or, as consequence of a high mobility of a segment of this population, although nothing indicates the use of these resources within a scheme of ›sumptuous consumption‹ of ›prestige goods‹ reserved for ›local elites‹. On the contrary, evidence shows that these artefacts were integrated in undifferentiated domestic activities, as demonstrated by the use-wear marks that some of them bear.

2) Metallurgical practices have been documented since the earliest occupation of the site, by the end of Initial Chalcolithic, increasing during the Full/Final Chalcolithic. The importance of these practices is one of the dominant aspects of the economic activities documented at this site. In this regard, the recovery of a considerable number of crucibles of different types, along with several ›tuyeres‹, is noteworthy. Indeed, this is one of the most important assemblages ever recorded in contemporaneous contexts in Portuguese territory.

In order to support this intense metallurgic activity, carried out in domestic combustion structures, the copper supply to the settlement would have to be constant, and it is quite plausible that the required ores were procured in the Alto Alentejo region, like in the case of Leceia, but it cannot be ruled out that the diversification of sources already included Baixo Alentejo.

3) Other specialized domestic activities were documented as well, such as weaving; eight weights, indicating the presence of a loom, were identified in the northeast sector of the settlement, inside hut R. The abundance of loom weights at this settlement confirms the relevance of weaving activities, while the limited production of dairies is evidenced by the meagre number of only nine ›cheese mould‹ fragments recovered at the site, exclusively dated to the Full/Final Chalcolithic (Layer 2), as usual in the Chalcolithic contexts of Estremadura.

178 Fishing is expressively represented by several copper hooks; for the first time, selective fishing was documented through the differences in the size of the recovered hooks, notwithstanding the use of fishing nets, evidenced by the presence of several grooved stone net sinkers.

179 Among the recovered ornaments, the highlights are the small set of green rocks, probably variscite beads, and a bead made from a *Luria lurida* L. shell. Concerning the perforated shell, its provenance from the Algarve is the most likely, since this is the only region where this species has been recorded so far in Portuguese territory; some specimens are known from other Chalcolithic sites, such as Porto Torrão (excavations performed by the Neoépica, Lda. Archaeology Company).

180 The analyses carried out so far on beads made from the same mineral, found at neighbouring settlements (Moita da Ladra, Leceia and Penha Verde), indicate the Palazuelo de las Cuevas mine, in Zamora (Spain) as the raw material source, contrary to what might be expected, given the greater proximity of the Encinasola mine, in Pico Centeno, Badajoz (Spain). The finding of a gold leaf decorated with incised geometric motifs, which will be the subject of a future study, should be emphasised, since it embodies the existence of a local elite, associated with a small but very significant set of artefacts related to the emerging warrior segment of society, expressively represented

147 Agriculture is indirectly present by some artifacts discussed above.

by the remarkable halberd and the distal end of a sword, sectioned by sawing, possibly the oldest exemplar ever found in Portugal. Both pieces, like the gold jewel, were recovered in the northeast sector of the settlement, corresponding to the only existing platform within the inhabited space.

181 The religious superstructure is documented by the occurrence of cylindrical limestone idols, which support the existence of domestic altars, as in other coeval settlements. Other types of ideotechnic objects were recovered as well, the most outstanding one being the head of a substantial anthropomorphic statue, which can be ascribed to the most recent occupation of the site. The typology of its face is quite unique, making it an extremely relevant object in the context of the ideotechnic production of Western Iberia.

182 The social status of the Chalcolithic population that occupied Outeiro Redondo explains these facts. In addition to an intense metallurgical activity, which would be practiced by specialized craftsmen, weaving, another specialized activity, was also very important, as evidenced by the abundance of loom weights, countering the scarcity of these elements in settlements of larger dimension and higher importance, such as Leceia, where loom weights are very scarce, even though they were known since the Initial Chalcolithic[148].

183 This fact suggests that, between the Early and Full/Final Chalcolithic, the Outeiro Redondo settlers were the specialized elite of a community, whose main population would have lived outside the walled enclosure. In fact, besides artefacts related to the warrior elites, such as a copper halberd of a new typology, the fauna of mammals indicates an essentially hunting-related subsistence. This fact also suggests a different way of life, as compared to what is usually found in settlements such as Zambujal, in Torres Vedras[149], Penedo do Lexim, in Mafra[150] and Leceia, in Oeiras[151], among others, in which livestock played a relevant role in the subsistence of its populations. The predominance of hunted fauna has been documented in the Bell Beaker contexts of Monte da Tumba, corresponding to the final stage of the site's occupation[152], and can be explained, as in Outeiro Redondo, by the presence of a specific segment of the community with a higher social status.

184 Thus, the prestige of the small Outeiro Redondo community would be reflected in the captured species, dominated by deer but also including aurochs, an animal that, due to its large dimensions and aggressiveness, would have been a coveted prey.

185 When discussing these issues, one must also take into account the almost absolute absence of Bell Beaker ceramic productions. Considering Outeiro Redondo's location and time frame, i. e. a region and a period where these productions were of prime importance, the fact that the inhabitants of Outeiro Redondo did not adopt such ceramic productions in their everyday life, can only be explained by the fact that they deliberately rejected them[153], as it also happened at Penedo do Lexim, Mafra[154].

186 This means that, contrary to what has been stated so far, the genesis and development of such ceramics in the region did not follow a linear path. In terms of such a modality, it would be expected that their presence would gradually increase over time, following the production of the ›acacia leaf‹ and ›cruciferae‹ group.

187 Instead, several different modalities may have been followed and some productions could have been adopted by certain communities and not by others, even

148 Cardoso 2006.
149 Driesch – Boessneck 1976.
150 Driesch – Richter 1976; Moreno-García – Sousa 2015.
151 Cardoso – Detry 2001/2002.
152 Antunes 1987.
153 Cardoso 2017.
154 Sousa 2010.

though they were neighbours and contemporaneous[155]. See, for example, the abundance of Bell Beaker productions both in the fortified Chalcolithic settlement of Rotura[156], and Chibanes[157]. This would indicate a considerable flexibility and variety, in terms of times and modes, in the way the Bell Beaker ceramics were incorporated into the material culture of the populations inhabiting the Lower Estremadura region.

188 Lastly, let us highlight the practice of two rituals, one possibly related to the foundation of the Chalcolithic settlement itself, the other probably related to its abandonment.

Acknowledgements

189 The excavation works that started in 2005 at Outeiro Redondo were only possible thanks to the support of several institutions and people that must be mentioned here. Noteworthy, is the collaboration provided over the years by dozens of Archaeology students from different Universities, to whom the results are due: Universidade de Lisboa, Universidade Nova de Lisboa, Universidade de Coimbra, Universidade Aberta (Lisboa) and Universidade Autónoma de Lisboa. The former Instituto Português de Arqueologia (IPA) and the Fundação Calouste Gulbenkian partly supported the 2005 to 2007 and 2008 field seasons, respectively; works carried out between 2013 and 2015 were fully supported by the Sesimbra Municipality. The author wishes to express his gratitude to Mr. João Pinhal, retired municipal employee of this local authority, for his commitment, dedication and the affection he has always devoted to the archaeological works carried out since 2013. Finally, I would like to thank Filipe Martins for the support he gave me, both in carrying out the field work and in the office work, owing him all the drawings that make up the present work.

155 Cardoso 2014b.
156 Gonçalves 1971.
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ZUSAMMENFASSUNG

Die befestigte chalkolithische Siedlung von Outeiro Redondo (Sesimbra, Portugal). Ein Bericht über die Grabungen von 2005 bis 2016

João Luís Cardoso

Dieser Artikel stellt eine Synthese der insgesamt acht archäologischen Feldforschungskampagnen dar, die in der prähistorischen befestigten Siedlung von Outeiro Redondo (Sesimbra) von 2005 bis 2016 durchgeführt wurden.

Nach den Ergebnissen der ^{14}C-Analysen zu urteilen, kann die Besiedlung des Platzes auf die Zeit von 2600 bis 2100 cal. BC datiert werden. Während der 500 Jahre andauernden Siedlungstätigkeit auf diesem felsigen Hügel, der die Bucht von Sesimbra dominiert, wurde ein mächtiges Verteidigungswerk aus großen lokal verfügbaren Kalksteinblöcken errichtet. Diese Mauerlinie umwehrte den höchsten Teil des Hügels, ein ellipsoides Areal, auf dem sich mehrere kreis- oder ellipsenförmige Hausgrundrisse befanden. In mehreren dieser Häuser ließen sich Herdstrukturen nachweisen, die in manchen Fallen für die Kupfermetallurgie eingesetzt wurden. Diese ökonomische Aktivität ist auf dem Platz sehr gut dokumentiert.

Die zusammenschauende Analyse der absoluten Chronologie, der stratigraphischen Sequenz, der Typologie des archäologischen Fundmaterials sowie der Bausequenz sowohl der häuslichen als auch der defensiven Strukturen bringt folgende Ergebnisse:

Erste Siedlungsphase – Frühchalkolithikum (2600–2500 cal BC): geringe Hinweise auf Metallurgie; Kannelurverzierte Keramik; Fehlen defensiver Strukturen; mehr oder weniger kreisförmige Hausgrundrisse mit klar definierten Herdstellen.

Kurzer Besiedlungshiatus (der eventuell auch nur partiell sein könnte) mit einer Dauer von ein oder zwei Jahrzehnten, der in einem Brand endete, welcher den am dichtesten besiedelten und sich auf der Plattform der Ostseite befindlichen Teil der Siedlung zerstörte.

Zweite Siedlungsphase – Mittel-/Endchalkolithikum (2440–2110 cal BC): eindeutige Hinweise auf Kupfermetallurgie, Keramik mit Akazienblatt- und Kerbblattverzierung; in einer einzigen Bauphase errichtete Verteidigungsstrukturen; Hütten mit ellipsenförmigem Grundriss und klar begrenzten Herdstellen.

SCHLAGWORTE
Chalkolithium, befestigte Siedlung, archäologische Ausgrabungen, Materialvorlage

RESUMEN

El poblado fortificado de Outeiro Redondo (Sesimbra, Portugal). Informe de las excavaciones efectuadas entre 2005 y 2016

João Luís Cardoso

Este artículo presenta una síntesis de los resultados obtenidos durante las ocho campañas de excavaciones, entre 2005 y 2016, llevadas a cabo en el poblado prehistórico fortificado de Outeiro Redondo (Sesimbra).

Según los resultados de los análisis de radiocarbono, la ocupación del yacimiento se puede fechar entre 2600 y 2100 cal BC. Durante estos aproximadamente 500 años de presencia humana en este cerro rocoso, que domina la bahía de Sesimbra, se construyó un poderoso sistema defensivo, utilizando grandes bloques de calizas duras locales, de planta elipsoidal y rodeando la parte más alta del cerro. Esta línea amurallada defendía un área ocupada por varias estructuras habitacionales circulares o elipsoidales, algunas de las cuales presentan estructuras de combustión, en algunos casos utilizadas para la metalurgia del cobre, actividad económica muy bien documentada en este sitio.

El análisis conjunto de la cronología absoluta, la secuencia estratigráfica identificada, la tipología de los conjuntos arqueológicos recuperados y la secuencia de construcción de las estructuras habitacionales y defensivas, sustenta las siguientes correlaciones:

1ª fase cultural – Calcolítico inicial (2600–2500 cal BC): escasa evidencia metalúrgica; producción de cerámica con decoración acanalada; ausencia de estructuras defensivas; estructuras habitacionales representadas por cabañas de planta más o menos circular y hogares estructurados.

Breve hiatus de ocupación (que podría ser solo parcial), quizás de una o dos décadas, después de un gran incendio, que destruyó la parte más densamente poblada del asentamiento, correspondiente a la plataforma ubicada en su lado este.

2ª fase cultural – Calcolítico pleno / final (2440–2110 cal BC): fuerte evidencia de metalurgia del cobre; cerámica con motivos decorativos ›hoja de acacia‹ y ›crucífera‹; estructuras defensivas construidas en una sola fase de construcción; cabañas de planta elipsoidal y hogares estructurados.

PALABRAS CLAVE
Calcolítico, asentamiento fortificado, excavaciones arqueológicas, estudio de materiales

SOURCES OF ILLUSTRATIONS

Title Page: Photo. J. L. Cardoso
Fig. 1: author
Fig. 2: author
Fig. 3: Photos: J. L. Cardoso
Fig. 4: Field drawings by F. Martins under the supervision of J. L. Cardoso; definitive drawing by B. Lam Ferreira
Fig. 5: Field drawings by F. Martins under the supervision of J. L. Cardoso; definitive drawing by B. Lam Ferreira
Fig. 6: author
Fig. 7: Photo: J. L. Cardoso
Fig. 8: Photo: J. L. Cardoso
Fig. 9: Photo: J. L. Cardoso
Fig. 10: Photo: J. L. Cardoso
Fig. 11: Photo: J. L. Cardoso
Fig. 12: Photo: J. L. Cardoso
Fig. 13: Photo: J. L. Cardoso
Fig. 14: Photo: J. L. Cardoso
Fig. 15: Photo: J. L. Cardoso
Fig. 16: Photo: J. L. Cardoso
Fig. 17: Drawings by F. Martins
Fig. 18: Drawings by F. Martins
Fig. 19: Drawings by F. Martins
Fig. 20: Drawings by F. Martins
Fig. 21: Drawings by F. Martins
Fig. 22: Drawings by F. Martins
Fig. 23: Drawings by F. Martins
Fig. 24: Drawings by F. Martins
Fig. 25: Drawings by F. Martins
Fig. 26: Drawings by F. Martins
Fig. 27: Drawings by F. Martins
Fig. 28: Drawings by F. Martins
Fig. 29: Drawings by F. Martins
Fig. 30: Drawings by F. Martins
Fig. 31: Drawings by F. Martins
Fig. 32: Drawings by F. Martins
Fig. 33: Drawings by F. Martins
Fig. 34: Drawings by F. Martins
Fig. 35: Photo: J. L. Cardoso
Fig. 36: Photo: J. L. Cardoso
Fig. 37: Photo: J. L. Cardoso
Fig. 38:Drawings by F. Martins
Fig. 39: Photo: J. L. Cardoso
Fig. 40: Photo: J. L. Cardoso

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