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CHAPTER TWENTY-SIX

LITHICS IN A MESOLITHIC SHELL MIDDEN: NEW DATA FROM POÇAS DE SÃO BENTO (PORTUGAL)

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Abstract

The development, since 2010, of a research project on the Mesolithic of the Sado valley has provided new insights into the study of the lithic technology of the last hunter-gatherer societies. The new excavations carried out at Poças de São Bento shell midden, one of the largest and richest sites identified in the Sado valley, include a protocol for the systematic recovery and recording of archaeological remains, including the water sieving of all the excavated sediments. Therefore, as the new lithic materials do not suffer from any excavation or previous selection bias, it is possible to characterize raw material resources, lithic reduction strategies, tool production and functional areas in a more reliable approach. Selecting a specific excavation area and two different stratigraphic units for analyses allowed us to evaluate site integrity and to test some conventional interpretations concerning tool production and

discard. Besides the common lithic blanks (flakes and bladelets) and tools (geometric armatures) already known from previous archaeological works, the analysed sample showed an unsuspected amount of non-characteristic debris, which was underrepresented in the collections of the 1950s, 1960s and even the 1980s. This fact is not exclusively related to the applied recovery methods; it also relates to the existence of intra-site variability (different functional areas) as recent investigations at the shell midden seem to indicate.

The Site and its History

Poças de São Bento belongs to a cluster of 12 shell middens located along or in the vicinity of the Sado River, a main watercourse of southern Portugal (Fig. 26.1). At the time of their occupation, during the late Mesolithic (ca 8 200 – 7 200 cal BP), estuarine conditions of ecotonal areas were much closer to the Mesolithic settlements than today due to the postglacial changes in sea level, although brackish water influence seems to be overrated (see Arias et al., this volume). The section of the valley where these sites are located is 40 to 55 km upstream from the present-day estuary. The location of Poças de São Bento differs somewhat from the general riparian pattern that characterizes the majority of the Sado shell middens (Fig. 26.1, 10). In fact, the site is 3 km distant from the river valley, at 85 m.a.s.l., on the left bank of a rivulet, as opposed to most of the other sites which over-view the main river or its most important tributaries. The area occupied by this settlement probably extended over some 3500 m² (Arnaud 1987, 1989), making it the second-largest shell midden of the Sado valley, after Cabeço do Pez (Figs. 26.1).

The site was identified and excavated during the 1950s and 1960s under the supervision of Manuel Heleno, the former director of the Portuguese National Museum of Archaeology (Machado 1964). Stone tools, human and animal bones, including burials preserved in paraffin, molluscs and other remains have been stored at this museum since then and have remained almost unpublished until today. Three decades later, in the 1980s, the site was revisited and excavated again as part of a wider and multidisciplinary research project directed by José Arnaud and Lars Larsson (Arnaud 1989; 2000; Larsson 1996; 2010). 26 m² were opened in a contiguous area of Heleno's excavation (Fig. 2, Arias et al., this volume), showing that stratigraphy was much more complex than previously thought (according to the profile drawings of the 1950s and 1960s kept at the National Museum), with important lateral and vertical variations. At least three different shelly accumulations were identified,

although there is a lack of this component in some sectors of the excavated area (Larsson 2010: 31). The quantity and spatial/vertical distribution of stone tools and waste, bones, shells, domestic features and other archaeological remains vary considerably and any particular distribution pattern was observed. As this author pointed out, the 1980s' excavated sequence may not necessarily be the same in the other areas of the site.

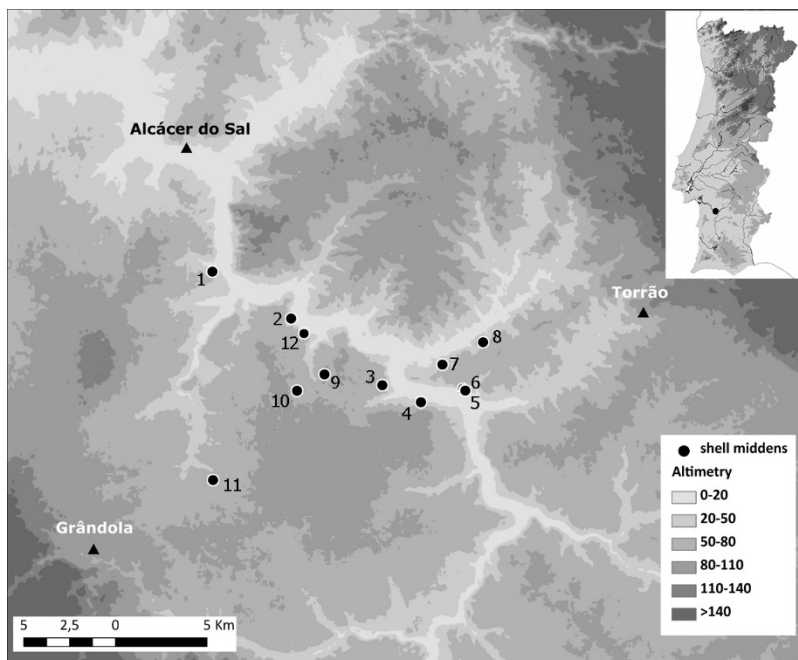


Fig. 26.1. Location of Poças de São Bento and the other shell midden sites in the Sado valley. 1. Arapouco; 2. Cabeço do Rebolador; 3. Barrada das Vieiras; 4. Cabeço das Amoreiras; 5. Cabeço do Pez; 6. Vale de Romeiras; 7. Várzea da Mó; 8. Barrada do Grilo; 9. Fonte da Mina; 10. Poças de São Bento; 11. Barranco da Moura; 12. Barreirão (the one found in the framework of Back to Sado and COASTTRAN projects). Adapted from an image (ArcMap 10) done by Ana Costa.

Although the majority of the archaeological components recovered in this shell midden remain unstudied and unpublished, some important general characterizations have been made available (Arnaud 1987, 1989, 2000; Larsson 1993, 1996, 2010). The site provided enormous and important items concerning i) human subsistence—including molluscs (mainly cockles and peppery furrow-shells), crustaceans, and mammal and

salt-water fish specimens; ii) knapping activities, with the successive stages of the reduction process being represented; iii) domestic features (some elementary combustion areas and post-holes) and; iv) the presence of funerary practices. Thirteen burials were identified mostly during the Heleno excavations, although the anthropological analyses indicate the presence of 15 individuals (Cunha and Umbelino 1995-97).

Within the organizational model projected by Arnaud for the Mesolithic of the Sado valley, Poças de São Bento was interpreted as a base-camp occupied during the warmer periods of the year. Radiocarbon dates obtained within the Arnaud research project place the site within the following limits: ca 8 000-7 200 cal BP.

Recently, new research projects directed by Mariana Diniz (Back to Sado) and Pablo Arias (COASTTRAN) are underway in the Sado valley (Diniz and Pablo 2011; Arias et al., this volume) and Poças de São Bento has once more become the subject of excavations. Six new areas have been opened and tested since 2010 (Arias et al., Fig. 22.2, this volume) applying innovative and accurate methods of recovery and recording. Although a standard sequence applied to all excavated areas has been established – which includes 4 main depositional phases – significant variations were observed from one area to another, confirming Larsson's observations. These variations relate to the greater or lesser thickness of the shelly mounds (or even its absence) and their morphology, and with the minor or higher representation of material cultural and subsistence items within and outside these mounds. It is important to note that past and recent post-depositional processes have been responsible for some important alterations of the original order of *events*.

Area 1 and SU's 7 and 12

Area 1 is located 50 metres west of the Heleno and Arnaud/Larsson excavations. 12 m² were opened and the sequence was entirely excavated down to the bedrock (Fig. 26.2). Twenty-six stratigraphic units (SUs) were established which documented sedimentological variations, the anthropic nature of the deposits and taphonomical processes. As mentioned above, two stratigraphic units considered as roughly coeval were selected and analysed in order to detect eventual differences in lithic representation through technological types and to evaluate site integrity. This exercise may allow us to design the most suitable approach to undertake the analysis of lithic industries and to detect small scale variations within contemporary stratigraphic units.

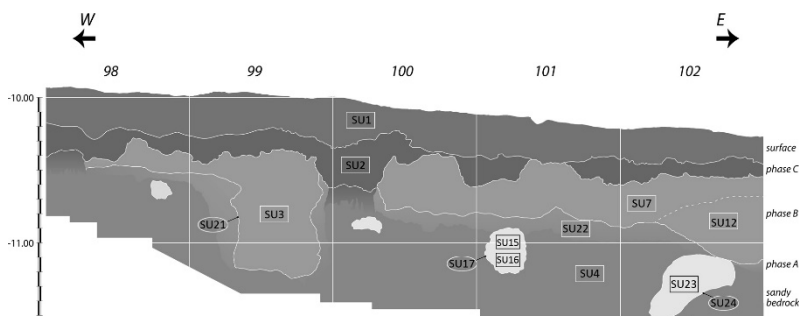


Fig. 26.2. Profile North from Area 1. The white spots correspond to bioturbation. Illustration done by L.C. Teira.

Unit 7 (Fig. 26.2) corresponds to a shell mound (the kitchen refuse) located in the north-western part of Area 1. The maximum thickness of this sandy-grey deposit is approximately 60 cm and it lies directly on top of the sandy bedrock in some of the sectors. Vertical and horizontal variations were observed within the mound with differences in the quantity and preservation of shells, although the majority is extremely fragmented (a shelly paste of *Scrobicularia plana*). In addition to shells, small amounts of lithic material and bones were retrieved.

Unit 12 (see Fig. 26.2) is a sandy-dark brown deposit (adjacent to SU7) which is poor in shells but richer in lithic remains. In some of the sectors, this unit also lies directly on top of the sandy bedrock. SU12 appears to be earlier, notwithstanding the difficulties for the interpretation of this kind of sediment and due to the complexity of site formation processes and taphonomy. Ongoing geoarchaeological and micromorphological analyses, together with the study of the different archaeological components, will surely clarify many of the problems related to the spatial and vertical relations and variations between and within the stratigraphic units. Although different, they belong to the same cultural complex (Phase B, considered as the main period of human activity at the site; see Arias et al., this volume).

SU7 and SU12: Neighbouring and Alike

In contrast to the idea of abundance and the ubiquitous presence of cores, bladelets and geometrics throughout the settlement as suggested by previous works (based on the inventory files of the National Museum of Archaeology; the Heleno collections), the excavations of SU7 and SU12

of Area 1 show that these technological categories are poorly represented. This is not exclusively related to the methods applied during the former works, where sediments and materials were dug and collected by large and uniform tranches, not considering lateral and vertical variations, but with the possibility that Area 1 may correspond to a different activity area located away from the settlement centre. The differences concerning the lateral variability mentioned above did not pass unnoticed in the excavations of Arnaud and Larsson. Comparing results from supposedly interrelated stratigraphic layers identified during both field campaigns (Arnaud/Larsson and Back to Sado/COASTTRAN), some divergences concerning lithic representation patterns were detected which pointed towards the hypothesis that spatial differentiation could have played a major role in the issue.

Main Results: Raw Material Procurement and Economy

Raw materials represented in both SUs (Fig. 26.3) are available nearby (Araújo 1995-97; Pimentel et al., this volume). A wide-ranging set of fine-grained rocks, largely dominated by cherts, jaspers and mostly siliceous schists, was first selected by the inhabitants of the site to produce their equipment, especially the small elongated bladelets (63%, in SU7; 82%, in SU12) and tool components (67%, in SU7; 86%, in SU12). The frequency of flakes produced from fine-grained rocks is much lower (36% and 31% from SU7 and SU12, respectively). The majority of these siliceous lithologies are locally represented by small elongated pebbles (e.g., tabular forms) – generally presenting thin cortical surfaces – with a moderate variety of shapes and dimensions. Most of these raw materials are found in Paleogene conglomerates (Pimentel et al., this volume).

Coarse-grained igneous rocks, mostly porphyries, together with the quartzite and quartz mineral form the second choice and occur in similar proportions (Fig. 26.3). They appear in local primary and secondary deposits, as pebbles and irregular blocks or fragments of blocks, presenting high range variability both in composition and texture within each rock-type. These lithologies were essentially used to produce non-standardized flakes, considering both the morphology and size. Hyaline quartz, which can be found in local secondary deposits, is represented by a small number of pieces, two bladelet cores and 3 chips, all found in SU7.

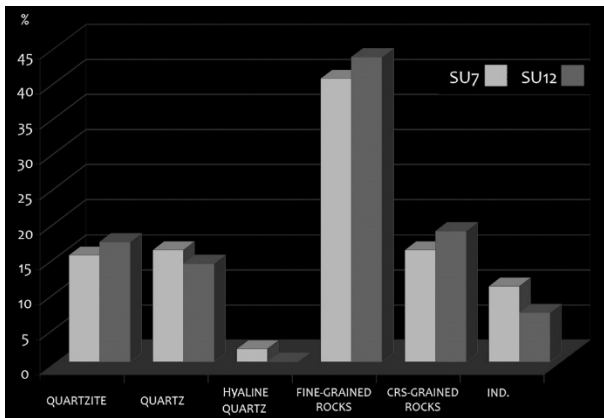


Fig. 26.3. Lithic assemblages from SU7 and SU12 by raw-material types (relative frequencies).

Although some differences in the relative representation of raw materials can be observed between the two stratigraphic units, those differences are quite negligible. This same pattern of raw-material procurement and economy was also recognized in the Arnaud and Larsson lithic series (Araújo 1995-97). As it has been pointed out here, the region in which these shell middens are located presents high lithological diversity, mostly due to tectonic and fluvial dynamics. These were responsible for the fracturing, transportation and subsequent redeposition of raw materials originating from Palaeozoic formations into the local alluvial and gravel deposits. These rock types were transported into the site, then tested and selected by the São Bento tool-makers.

Main Results: Débitage, Tool-blank Selection and Tool types

Flakes, which are rarely converted into formal tools by retouching, prevail within the lithic assemblage from both stratigraphic units (30.7%, in SU7; 34.5%, in SU12; Fig. 26.4, A). A great number show lateral or distal fractures (57%) and the cortex is present in 35% of cases. This pattern of flake representation can be applied to all raw material types, except for the hyaline quartz, as mentioned above. The high percentage of chips and chunks is mostly related to the poor quality of raw material, simultaneously showing that knapping activities took place in Area 1.

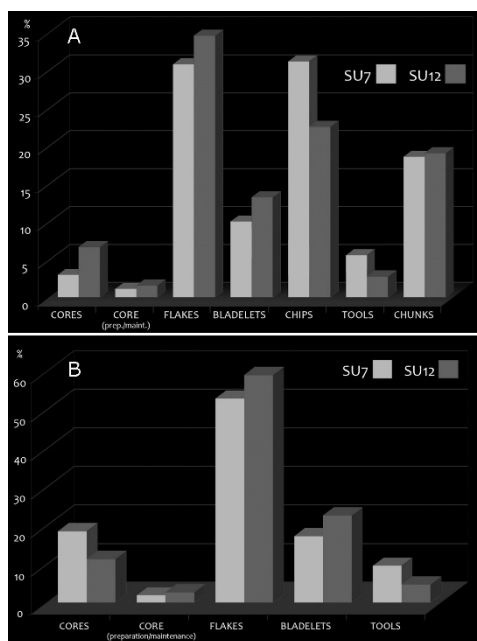


Fig. 26.4. A. Lithic assemblages from SU7 and SU12 by artefact types (relative frequencies); B. Excluding chips and chunks from the calculation.

Elongated blanks, almost exclusively dominated by small bladelets produced from fine-grained rocks (63%/SU7; 82%/SU12), are weakly represented in both stratigraphic units (10% in SU7; 13%, in SU12) and present high rates of fragmentation (72% of specimens). This type of blank, however, was largely used to manufacture the geometric armatures found not only at Poças de São Bento, but in all other shell midden sites of the Sado valley. The production of bladelets was essentially limited to the use of prismatic cores, mainly following a unidirectional reduction strategy. The use of indirect percussion is attested in the Mesolithic of the Sado valley (Marchand 2010), although raw material properties often impede the observation of debitage techniques. Bladelet cores dominate the core assemblage of both stratigraphic units. They were abandoned due to their reduced size or due to hinge fractures.

If chips and chunks were excluded from the analysed sample (see Fig. 26.4, B), the former representation patterns do not present any major changes (however, the frequency of cores in SU7 is then higher than tools).

Tools (22 pieces in total, 68% in SU7 and 32% in SU12) made from quartz and siliceous schist are dominated by partially and irregularly retouched flakes, although some pieces present well-defined typologies. Three trapezes and two undetermined geometric forms (Fig. 26.5) were recovered in both stratigraphic units, but with higher proportions in SU7. It is interesting to note that tools and cores predominate within the shell refuse (SU7). Although the overall preservation of the shell midden has suffered from post-depositional processes (e.g., due to cultivation, bioturbation, etc.), both stratigraphic units still retain much of the original arrangements, as shown by the field observation of several flakes (SU12) from the same raw material volume in close proximity to one another. This was later confirmed through refitting.

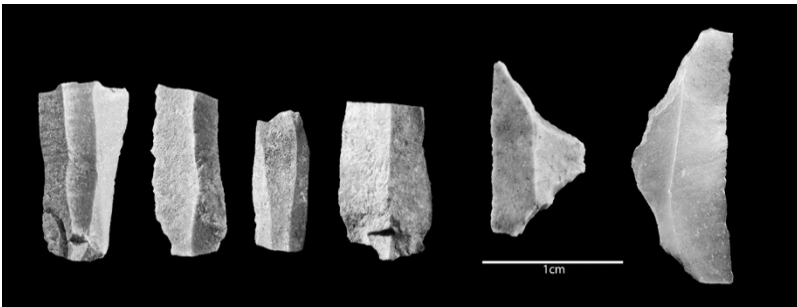


Fig. 26.5. Bladelets and two trapezes, all made from siliceous rocks. Photos by J.P. Ruas.

Although belonging to the same occupational phase, the two stratigraphic units present different characteristics concerning the amount of shells (higher in SU7) and artefacts (higher in SU12) as it was pointed out above. However, the representation of blanks and tool types does not differ substantially between the two stratigraphic units, attesting to the same morphological and dimensional patterns, the same knapping techniques and procedures and the same raw-material uses. Both stratigraphic units seem to reproduce the same representation pattern provided by other archaeological materials. Besides the dog burial retrieved in the western part of SU7 (Arias et al., this volume), shells, fish, mammal remains and fire-cracked rocks were also part of the archaeological deposit. These seem to reveal a multi-purpose area where retouched flakes could have been part of a multi-tasking tool kit.

SU7 and Layer C: Nearby but Dissimilar

Comparing lithic assemblages recovered in SU7 and Layer C (the shell midden in the Arnaud and Larsson excavations; Araújo, 1995-1997; Arias et al., this volume, Fig. 26.2), we noticed that important differences exist in the relative representation of bladelets (Fig. 26.6, A and B). Their frequency is much higher in Layer C, where this blank type is represented by 30% (N=230) of the total amount of pieces, considering all technological categories (as opposed to 10%, i.e. 27 pieces from SU7). If we exclude by-products such as chips and chunks from this calculation, the representation of bladelets reaches 45% in Layer C, while in SU7 it does not exceed 20%. The relative frequency of flakes from both lithic series does not present significant differences, although there is a slightly higher representation in SU7 (especially if we exclude the above-mentioned by-products).

Comparing frequencies of tool components from SU7 and Layer C, differences are negligible (5.3% in layer C and 5.5% in SU7), but they become significant when considering the types of tools represented in the two lithic series. In fact, in Layer C geometric armatures (N=31) are the dominating tool (76%), while retouched flakes predominate within the tool assemblage from SU7 (55%). In both cases, however, trapezes are the most important type among the geometrics.

These differences may result from a sampling bias, i.e. the number of analysed pieces and the extension of the excavation areas (771 from Layer C, corresponding to 26 m², as opposed to 270 from SU7, corresponding to 12 m²) or from lateral variations related to distinct activities held in each area (the space could have been organized in areas by the Mesolithic inhabitants to perform different tasks). Comparing the archaeological record of both the Heleno and Arnaud/Larsson excavations and the main excavation area opened during the Back to Sado and COASTTRAN projects (Fig. 22.2, Arias et al., this volume), obvious differences exist concerning the total amount of archaeological remains recovered from one and from the other side of the track that nowadays separates this shell midden (see Fig. 22.2, Arias et al. this volume).

Despite the fact that the number of lithics analysed is low, this exercise allows us to evaluate the way that future lithic studies should be performed at this shell midden with high lateral and vertical variations within the same occupational phase. The establishment of stratigraphic units based on archaeological, sedimentological and taphonomic variations allows us to detect and comprehend, in a more accurate way, the meaning of

presence/absence and the major/minor occurrence of lithic artefacts produced in the framework of all stages of the lithic reduction sequence.

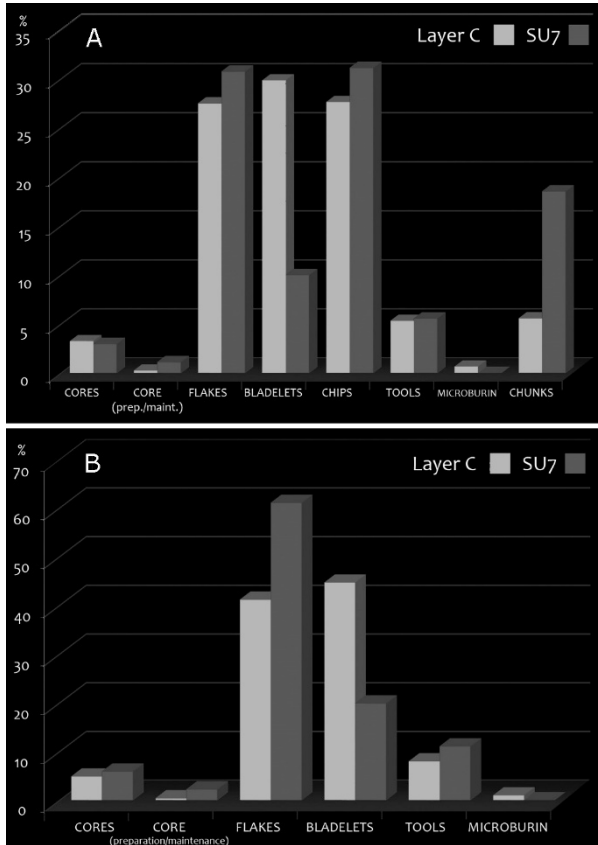


Fig. 26.6. Lithic assemblages from Layer C (the shell midden in Arnaud's and Larsson's excavations) and SU7 by artefact types (relative frequencies). A. Considering all artefact groups; B. Excluding chips and chunks from the calculation.

One of the main challenges concerning lithic studies is related to the relative representation of triangles, trapezes and crescents within and between the Mesolithic shell midden sites of Portugal. Differences in the relative frequency of each type have induced several theories about the variation of these geometric tools based on chronology, function or style

(Roche 1972; Vierra 1995; Araújo 1995-97; Marchand 2001; Carvalho 2009). However, this problem remains unsolved due to the scarcity of chronometric results, well-defined stratigraphic sequences and lithic studies. Future research on lithic assemblages from Poças de São Bento, based on occupational units and supported by radiocarbon data, will surely bring new insights into the question of geometrics. Hopefully, it may also clarify other aspects concerning the lithic technology of the Mesolithic inhabitants of the Sado valley.

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