

# The Early Neolithic artifact assemblage from the Galeria da Cisterna (Almonda karstic system, Torres Novas, Portugal)

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## Résumé

Malgré l'attrition post-dépositionnelle et le manque de différenciation stratigraphique, les données typologiques indiquent une utilisation funéraire prolongée de la zone AMD2 de Galeria da Cisterna, en bon accord avec les résultats de la datation directe de tessons de poterie (par TL) et d'objets de parure (par le radiocarbone), lesquels situent le Néolithique ancien de ce site entre 5500 et 4500 cal BC. Les comparaisons à l'échelle intra- et extra-régionale indiquent que la diversité de la céramique décorée (un minimum de 40 récipients) refléchit la présence de trois phases différentes : Cardial ancien, Cardial récent et Épicardial. Les distributions spatiales des tessons appartenant à un même récipient et des objets de parure des différents types indiquent une préférence pour des dépositions au centre de la chambre et contre la paroi Est dans les deux phases initiales, et pour des dépositions vers le coin Sud de la chambre et contre la paroi Ouest dans la phase finale. Le Cardial ancien est représenté par des morphologies céramiques à décoration baroque et par des parures en coquillage, dent et os identiques à celles des niveaux contemporains de la Cova de l'Or, en bon accord avec des modèles de colonisation maritime pionnière pour les origines des premières communautés de paysans du Portugal central. L'absence de bracelets en pierre et d'anneaux en os indique par contre que, durant ce processus, la transmission de la culture matérielle fut aussi caractérisée par des pertes (ou des choix).

## Abstract

*Despite post-depositional attrition and a lack of stratigraphic differentiation, typological arguments indicate extended funerary use of the AMD 2 zone of Galeria da Cisterna and are consistent with direct dating of potsherds, by TL, and of ornaments, by radiocarbon, that place the site's Early Neolithic in the 5500-4500 cal BC interval. Intra- and extra-regional comparisons show that the diverse ceramic assemblage, which contains a minimum of 40 decorated vessels, reflects three different phases of occupation: Early Cardial, Late Cardial and Epicardial. The spatial distributions of the sherds from different individual vessels and of the ornaments of different types suggest a preference for depositions in the middle of the chamber and against its East wall in the earlier phases, and for depositions towards the South end of the chamber and against the West wall in the later one. The Early Cardial phase features baroquely decorated ceramic morphologies and shell, tooth and bone beads and pendants identical to those from the coeval levels of Cova de l'Or. This evidence is consistent with maritime pioneer colonization models for the origins of central Portugal's earliest farmers, but the absence of stone bracelets and bone rings suggests that, in the process, the transmission of material culture was also affected by selection and/or loss.*

Collectif, 2009. *De Méditerranée et d'ailleurs... Mélanges offerts à Jean Guilaine*. Archives d'Écologie Préhistorique, Toulouse, 853 p., 389 fig., 14 tabl.

## 1 - Introduction

In 1970, Jean Guilaine and O. da Veiga Ferreira published a synthesis of the ceramic documents concerning the Early Neolithic of Portugal (Guilaine and Ferreira 1970). Among the sites containing pottery fragments characteristically decorated with impressions made with the edge of a cockle shell, mention is made of the Cave of the Almonda Spring, near Torres Novas, where, between 1937 and 1942, M. Vaultier, J. Bensaúde, A. do Paço e G. Zbyszewski had carried out limited archeological work (Paço *et al.* 1947). These authors describe a homogeneous deposit of black earth and limestone blocks that filled a shaft-like depression in the bedrock and contained abundant ceramics and some human bone. Given the lack of stratigraphic differentiation, typological arguments were used to classify the ceramic assemblage. Three different periods were recognized: Iron Age, Mediterranean Bronze II, and Mediterranean Bronze I. The latter included the ensemble of 20 sherds that Guilaine and Ferreira re-classified as Early Neolithic.

The assemblage from Almonda, stored at the Museum of the Geological Survey in Lisbon, was the largest of those discussed by Guilaine and Ferreira. Despite the fact that the diagnostic material was mixed with that from later periods, this site thus provided the bulk of the support for the major conclusion of their seminal analysis: that the distribution of the Cardial culture of Mediterranean Europe extended westwards to the Atlantic shores of southern and central Portugal.

Since 1988, renewed archeological research of the complex karstic system associated with the Almonda spring added substantially to our understanding of the Early Neolithic assemblage published by Paço *et al.* through the excavation of the deposits that remained in the small chamber designated AMD2 (fig. 1). This new work was the object of preliminary publication (Zilhão *et al.* 1991), and the implications of key finds for the chronology, the rates and the modes of dispersal of agricultural economies across west Mediterranean Europe were discussed by comparison with material from the Cova de l'Or (Valencia, Spain) (Zilhão 2000, 2001).

A summary of the artifactual evidence has been produced recently, in the framework of a doctoral dissertation (Carvalho 2007). Here, the focus is on the topographic and stratigraphic context, the dating evidence, and the illustration of the archeo-

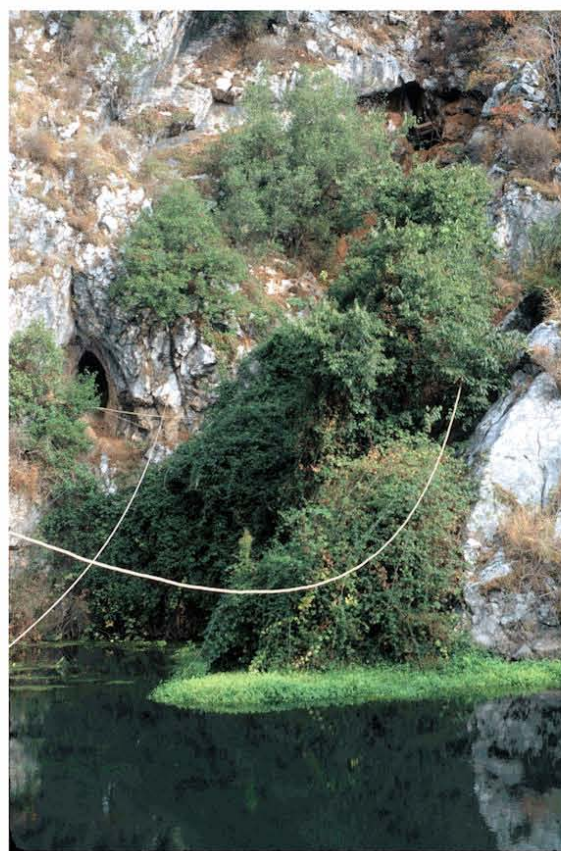
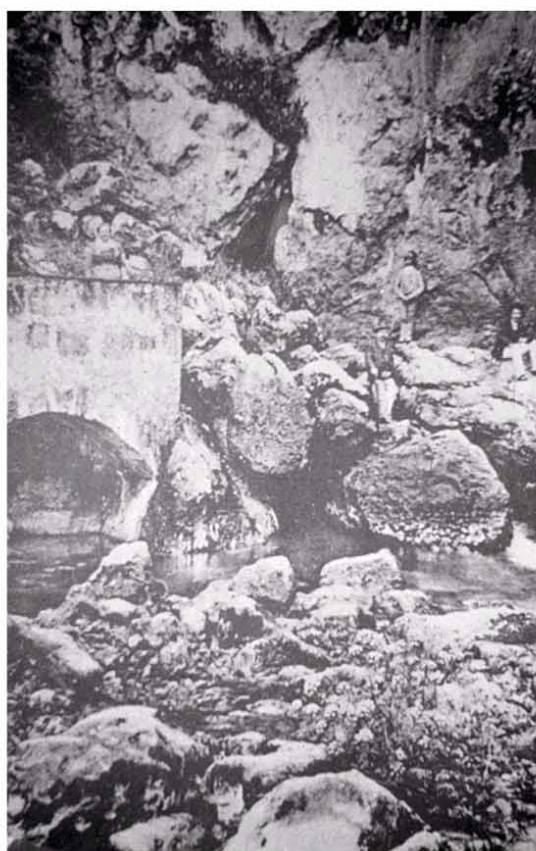
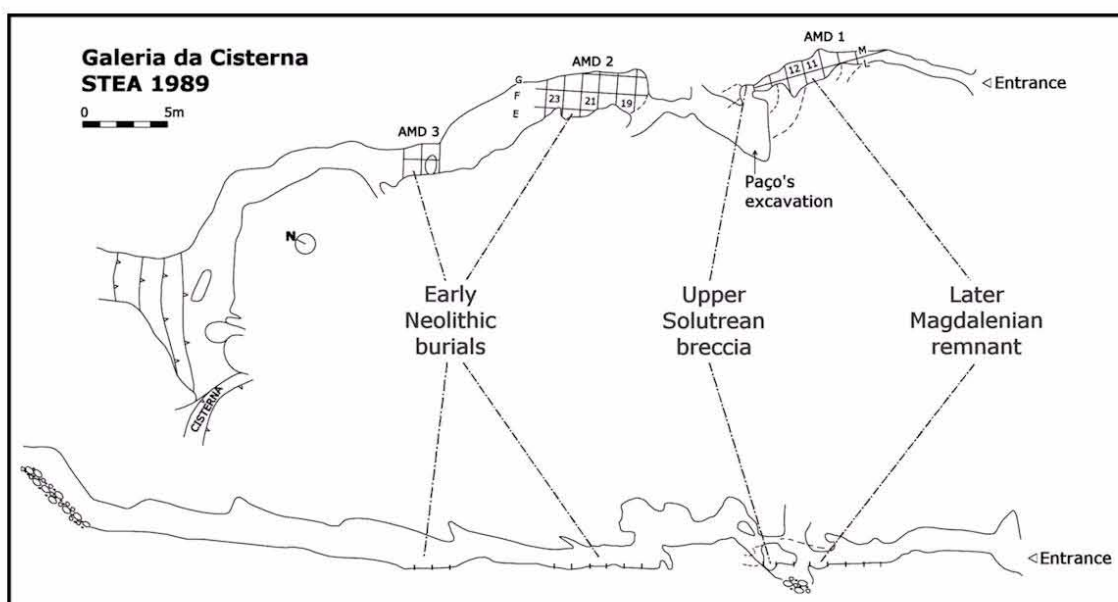
logical material of primary concern for the assessment of cultural process at the origins of farming in the Iberian peninsula.

## 2 - Site and stratigraphy

The Galeria da Cisterna (Gallery of the Cistern) is a fossil spring (fig. 1). The river now flows out of the karst  $\approx 5$  m below, at the base of a  $\approx 75$  m high rock face, part of the NE-SW fault escarpment that separates Portuguese Estremadura's Central Limestone Massif from the Tertiary Basin of the Tagus, of which the Almonda is a tributary. Exposed in the 1920s by a landslide, this gallery provides access to a network of active and fossil passages of which some 12 km have already been mapped. Several other collapsed entrances are currently known at different elevations in the escarpment, and some have been reopened for ongoing archeological excavation of the sealed Lower, Middle or Upper Paleolithic sequences they contain (Zilhão *et al.* 1993; Zilhão and McKinney 1995; Zilhão 1997; Marks *et al.* 2001, 2002; Chabai *et al.* 2000/2001; Trinkaus *et al.* 2003, 2007; Gameiro and Almeida 2004).

The length of the narrow, meandering Galeria da Cisterna is approximately 100 m, and its cross-section is in general less than  $2 \times 2$  m. The ceramic material described by Paço *et al.* includes the produce of their excavations, which were carried out in a small chamber located some 15 m from the entrance, as well as the produce from the collection of surface finds. The few lines of Paço *et al.* where artifact proveniences are discussed suggest that such surface collection work was restricted to two areas only: the initial part of the gallery, between the entrance and the area of their excavations; and the raised landing immediately adjacent to the latter. Paço *et al.* make no mention of finds made further inside, namely in the AMD2 chamber, inward from the landing, but it remains a distinct possibility, as discussed below, that such is in the fact the provenience of part of the collection they assembled. The fact that most Early Neolithic sherds in the Museum of the Geological Survey belong to vessels documented by numerous fragments excavated from the AMD2 zone is in this respect most significant.

Over the years, and especially so after a speleological breakthrough made at the end of the 1960s, the Galeria da Cisterna was to be the object of intensive curiosity, by cavers, boy scouts and local



**1** Top: topographic plan and profile of the Galeria da Cisterna. Bottom, the spring: in the early 20th century, prior to the construction of the RENOVA factory dam (left); and in the present (right); the entrance to the Galeria da Cisterna is apparent in both photos, ≈5 m above the water.

youth. As a result, prehistoric artifacts, namely ceramics, continued to be collected at the site, but, having ended-up in private hands, there is no way to estimate the extent to which such amateur spoiling affected the integrity of the archeology that Paço *et al.* left unexplored. However, in 1987, one

local caving club, the *Sociedade Torrejana de Espeleologia e Arqueologia* (STEA), recovered three typical Solutrean points in a small, intact sediment pocket adjacent to Paço *et al.*'s excavations (Maurício 1988). This prompted them to contact the professionals, to whom they passed on those and

other significant surface finds collected over the years (including Early Neolithic ceramics), leading to initiation of the ongoing research work.

Where the Galeria da Cisterna is concerned, two field seasons (1988 and 1989) eventually exhausted the remaining deposits. These corresponded to the fill of discontinuous depressions of the bedrock located in the areas designated AMD1, AMD2 and AMD3 (fig. 1). Under Holocene cave earth, a remnant Upper Paleolithic sequence, discussed in detail elsewhere (Zilhão 1997), existed in the AMD1 zone. In AMD3, only very thin, low-density organic sediments were found, directly atop bedrock. AMD2 (of which AMD3 is but a continuation, an outcrop of bedrock separating the two zones) is the more spacious chamber in the Galeria da Cisterna (fig. 2); the stratigraphy uncovered here featured a homogeneous, archeologically rich Holocene cave earth, 20-40 cm thick (level A), lying on archeologically sterile, beaver teeth-yielding, river-accumulated Pleistocene sands (level C), the upper part of which contained a dense lens of microfaunal bone remains (mostly bats).

### 3 - Taphonomy

Narrow fissures opening on the side walls of the AMD2 chamber connect it with the lower level of active galleries through which the Almonda flows onto the spring. Paço *et al.* (1947) report a similar observation for the area that they excavated

and for the rock landing that separates it from the AMD2 zone. At times of high water levels inside the karst, exceptional but having occurred within living memory, the Galeria da Cisterna itself reactivates as a spring. These observations, combined with the repeated prehistoric and early historic human frequentation and the activity of burrowing animals suffice to explain the lack of internal stratigraphic differentiation of the Holocene deposits, themselves rather thin to begin with.

The above also implies that, over the millennia, not just mixing but also significant attrition must have affected the material culture abandoned in the AMD2 zone; the different pre-archeological, 20<sup>th</sup> century explorations of the Galeria da Cisterna only added to that attrition. The fragmentation and scatter of the ceramic vessels (fig. 3; Table 1) is consistent with these inferences, as is, taking Paço *et al.*'s account literally, the presence of sherds belonging to vessels from the 1988-89 excavation of AMD2 in the assemblage from the 1937-42 work, despite the raised landing that separates the two areas. This presence, however, needs to be assessed in the context of the fact that no Early Neolithic material was found in the 1988-89 excavation of the thick Holocene deposits of the AMD1 zone, which, despite being immediately adjacent to the area excavated by Paço *et al.*, only yielded characteristic Copper and Bronze Age ceramics and ornaments.

|                           | Epicardial | Late Cardial | Early Cardial | TOTAL |
|---------------------------|------------|--------------|---------------|-------|
| <b>Fragmentation</b>      |            |              |               |       |
| Vessels (MNI)             | 13 (a)     | 25 (b)       | 2 (c)         | 40    |
| Sherds (N)                | 96         | 89           | 71            | 256   |
| Sherds/Vessel             | 7.4        | 3.6          | 35.5 (d)      | 6.4   |
| <b>Type of decoration</b> |            |              |               |       |
| Cardium impressions       | —          | 17 (e)       | 1             | 18    |
| Comb impressions          | 1          | 2            | 1             | 4     |
| Other impressions         | 5          | 6            | —             | 11    |
| Incisions                 | 4          | —            | —             | 4     |
| Canellured                | 3          | —            | —             | 3     |

(a) - Vessels IV, VI, VII, VIII, IX, X, XI, XVIII, XIX, XX, XXV, XXXIX, XL

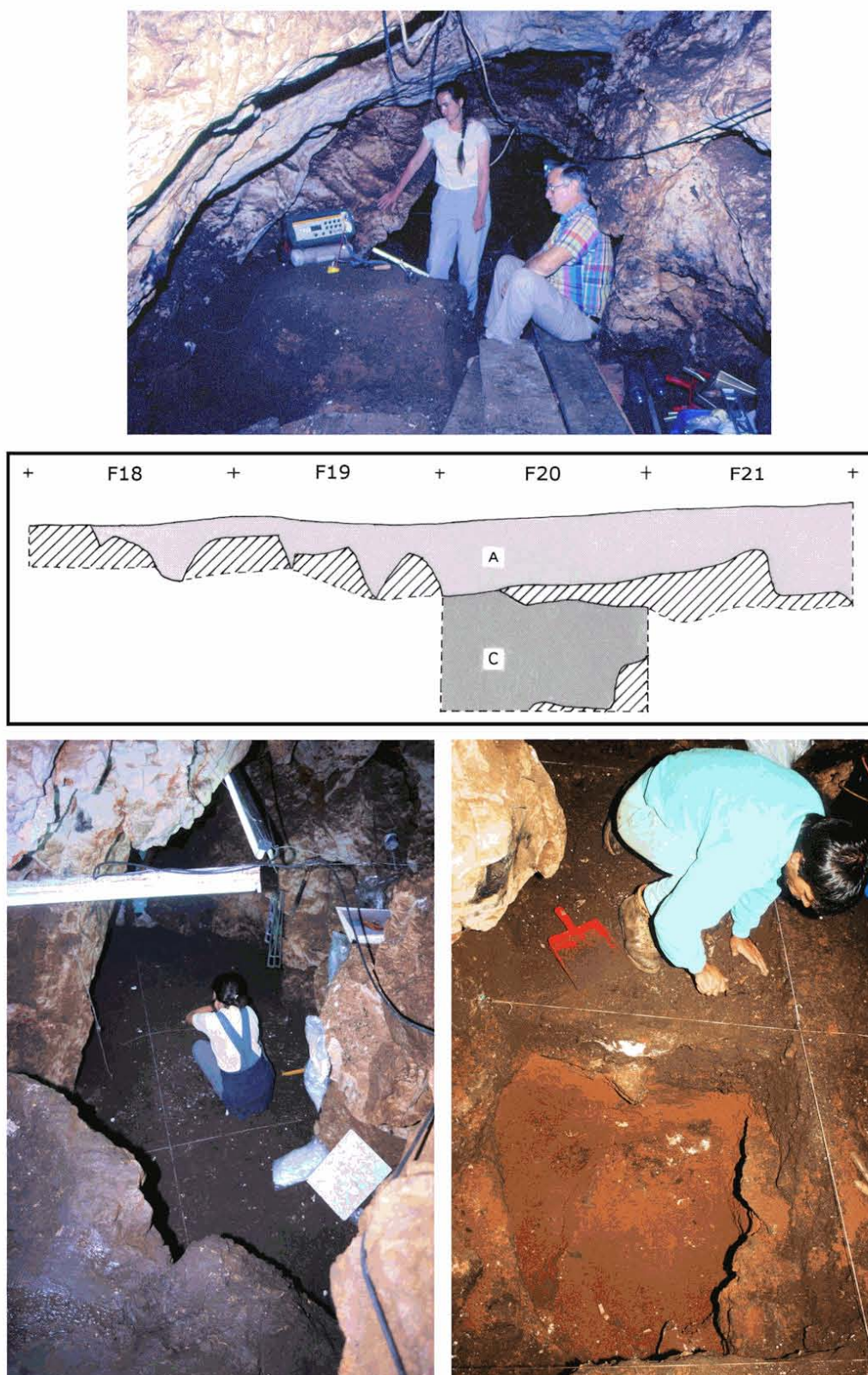
(b) - Vessels III, V, XII, XIII, XIV, XV, XVI, XVII, XXI, XXII, XXIII, XXIV, XXVI, XXVII, XXVIII, XXIX, XXX, XXXI, XXXII, XXXIII, XXXIV, XXXV, XXXVI, XXXVII, XXXVIII

(c) - Vessels I, II

(d) - The higher sherd/vessel ratio reflects extensive decoration, not greater fragmentation

(e) - Vessel XXI combines *Cardium*- and comb-impressions

**Tab. 1** Galeria da Cisterna. Fragmentation and type of decoration of the assemblage of 40 decorated Early Neolithic vessels from zone AMD2 (1988-89 excavations).



**2** The AMD2 zone of the Galeria da Cisterna. Top: Sheridan Bowman, assisted by A. E. Marks, measures environmental radiation for TL dating in square F22 (1989). Middle: stratigraphy in the West face of the 1988 trench (A – Holocene; C – Pleistocene river sands; dashing represents bedrock). Bottom, the chamber in 1988: prior to excavation (the person is in grid unit G21), seen from the rock landing that separates it from the area of Paço *et al.*'s work (left); and during excavation of grid unit G20 (note the contrast between the Holocene dark earth and the Pleistocene red sands in the North profile of adjacent unit G19).

|                                             | Cisterna | Cendres  | Or       | Sarsa    |
|---------------------------------------------|----------|----------|----------|----------|
| <b>PENDANTS (SHAPED)</b>                    |          |          |          |          |
| <b>Oval</b>                                 |          |          |          |          |
| stone                                       | —        | 2        | 8        | —        |
| shell                                       | 46 (a)   | 2        | 36       | 5        |
| bone                                        | 5        | —        | 3        | 1        |
| <b>Curved</b>                               |          |          |          |          |
| stone (schist)                              | —        | —        | 4        | —        |
| bone                                        | —        | —        | 4        | —        |
| tooth (boar canine)                         | —        | —        | —        | 1        |
| <b>Triangular (bone)</b>                    | —        | —        | 2        | —        |
| <b>Rectangular (bone)</b>                   | —        | —        | 1        | —        |
| <b>Conical/globular (ceramic)</b>           | —        | —        | 4        | —        |
| <b>PENDANTS (NATURAL FORMS, PERFORATED)</b> |          |          |          |          |
| <b>Bones</b>                                |          |          |          |          |
| sesamoid, <i>Equus</i> sp.                  | —        | —        | —        | 1        |
| metapodial, <i>Ovis aries</i>               | 2        | —        | —        | —        |
| <b>Teeth</b>                                |          |          |          |          |
| incisor, <i>Sus</i> sp.                     | —        | —        | 1        | —        |
| canine, <i>Sus</i> sp.                      | —        | —        | 1        | 4        |
| canine, <i>Cervus elaphus</i>               | 10       | —        | 5        | 3        |
| canine, carnivore                           | —        | —        | 7        | 4        |
| canine, <i>Vulpes vulpes</i>                | 8        | —        | —        | —        |
| canine, <i>Felis sylvestris</i>             | 1        | —        | —        | —        |
| canine, <i>Canis lupus</i>                  | 1        | —        | —        | —        |
| indeterminate tooth                         | —        | —        | 1        | —        |
| <b>Pierced gastropod shells</b>             |          |          |          |          |
| <i>Columbella rustica</i>                   | 2        | 93       | 170      | 109      |
| <i>Charonia</i> sp.                         | 1        | —        | —        | —        |
| <i>Conus mediterraneus</i>                  | —        | 13       | 5        | 2        |
| <i>Hynia reticulata</i>                     | 19       | —        | —        | —        |
| <i>Luria lurida</i>                         | —        | 5        | 18       | 5        |
| <i>Strombus</i> sp.                         | —        | 3        | —        | —        |
| <i>Theodoxus fluviatilis</i>                | 181      | 2        | 98       | 2        |
| <i>Trivia europaea</i>                      | —        | —        | 1        | 2        |
| Other                                       | 4 (b)    | 7 (c)    | 5 (d)    | 4 (e)    |
| <b>Pierced bivalve shells</b>               |          |          |          |          |
| <i>Acanthocardia tuberculata</i>            | —        | 1        | 5        | —        |
| <i>Cerastoderma edule</i>                   | —        | 1        | 12       | 25       |
| <i>Glycymeris</i> sp.                       | 1        | 8        | 33       | 15       |
| <i>Pecten maximus</i>                       | 1        | —        | —        | —        |
| <i>Venus decusata</i>                       | —        | —        | —        | —        |
| indeterminate                               | 2        | 1        | —        | —        |
| bivalve shell fragments                     | 19 (f)   | —        | —        | —        |
| <b>BEADS</b>                                |          |          |          |          |
| <b>Fish vertebrae (g)</b>                   | 5        | 1        | 12       | —        |
| <b>Discoidal</b>                            |          |          |          |          |
| limestone                                   | 134      | abundant | abundant | abundant |
| shell ( <i>Conus</i> sp.)                   | —        | —        | 32       | 4        |
| bone                                        | —        | —        | 1        | —        |
| <b>Cylindrical</b>                          |          |          |          |          |
| limestone                                   | —        | —        | 1        | —        |
| ceramic                                     | —        | 1        | —        | —        |
| shell ( <i>Dentalium</i> sp.)               | 1        | 3        | 34       | 2        |
| bone                                        | —        | —        | 6        | 4        |
| <b>DISKS AND PLAQUES</b>                    |          |          |          |          |
| stone disks                                 | —        | —        | 1        | 3        |
| shell disks                                 | —        | —        | 1        | —        |
| bone disks                                  | —        | —        | 4        | 2        |
| bone plaques                                | —        | —        | 3        | 2        |
| <b>RINGS</b>                                |          |          |          |          |
| stone                                       | —        | —        | 1        | —        |
| shell ( <i>Conus</i> sp.)                   | —        | 1        | 20       | 5        |
| bone                                        | —        | 3        | 165      | 36       |
| <b>STONE BRACELETS</b>                      |          |          |          |          |
| schist                                      | —        | —        | 22       | 17       |
| marble                                      | —        | 2        | 2        | —        |
| other                                       | —        | 2        | 3        | 2        |

(a) - *Glycymeris* sp. (35); *Unio pictorum* (5); *Sepia officinalis* (4)

(b) - *Hynia pfeifferi* (1); *Unio pictorum* (1); indeterminate gastropod (2)

(c) - *Haliotis tuberculata* (1); *Thais haemastoma* (1); indeterminate gastropod (5)

(d) - *Arcularia gibbosula* (1); *Giberula milinaria* (1); *Marginella* sp. (1); *Patella* sp. (1); indeterminate gastropod (1)

(e) - *Melanopsis* sp. (1); *Scaphader lignarius* (1); *Thais haemastoma* (1); *Trophon muricatus* (1)

(f) - *Glycymeris* sp. (1); *Mytilus edulis* (3); *Pecten maximus* (8); *Unio pictorum* (7)

(g) - with enlarged central perforation; *Alosa* sp. (1); *Raja* sp. (2); *Salmo* sp. (1); indeterminate (1)

**Tab. 2** Galeria da Cisterna. Ornaments from zone AMD2 (1988-89 excavations) compared with those from the Early Neolithic of Valencia (Pascual 1998).

| DISCOIDAL LIMESTONE BEADS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|---------------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                      |   | 0  | 0  | 1  | 5  | 23 | 29 | 22 | 2  | G |
|                           | 0 | 0  | 0  | 1  | 0  | 1  | 10 | 32 | 7  | F |

| THEODOXUS FLUVIATILIS BEADS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|-----------------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                        |   | 0  | 3  | 2  | 7  | 58 | 18 | 14 | 13 | G |
|                             | 3 | 5  | 5  | 2  | 11 | 13 | 14 | 12 | 0  | F |

| OVAL SHELL PENDANTS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|---------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                |   | 0  | 0  | 1  | 2  | 11 | 4  | 7  | 0  | G |
|                     | 2 | 0  | 2  | 1  | 1  | 4  | 4  | 5  | 2  | F |

| PIERCED DEER CANINES AND IMITATIONS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|-------------------------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                                |   | 0  | 0  | 0  | 0  | 4  | 1  | 1  | 2  | G |
|                                     | 0 | 0  | 0  | 0  | 2  | 1  | 1  | 3  | 0  | F |

| SHERDS OF EARLY CARDIAL STYLE VESSELS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|---------------------------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                                  |   | 0  | 3  | 0  | 7  | 18 | 6  | 0  | 1  | G |
|                                       | 7 | 2  | 0  | 5  | 5  | 6  | 4  | 1  | 0  | F |

| SHERDS OF LATE CARDIAL STYLE VESSELS |    | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|--------------------------------------|----|----|----|----|----|----|----|----|----|---|
| AMD3                                 |    | 0  | 2  | 0  | 1  | 10 | 5  | 2  | 1  | G |
|                                      | 15 | 0  | 0  | 5  | 9  | 5  | 3  | 2  | 0  | F |

| SHERDS OF EPICARDIAL STYLE VESSELS |   | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 |   |
|------------------------------------|---|----|----|----|----|----|----|----|----|---|
| AMD3                               |   | 0  | 3  | 0  | 4  | 22 | 3  | 14 | 3  | G |
|                                    | 8 | 3  | 1  | 3  | 5  | 8  | 4  | 2  | 0  | F |

**3** Spatial distribution patterns of selected Early Neolithic artifact categories from the Galeria da Cisterna (1988-89 excavations).

As mentioned above, this may indicate that the Early Neolithic finds in Paço *et al.*'s assemblage in fact come from surface collection in the AMD2 zone. The richness of the ornament assemblage recovered in the latter, clearly apparent in the comparison with the evidence from the Valencia sites (Table 2), is largely a result of the fact that, in 1988-89, the deposits were entirely water-sieved with a 2 mm mesh. Paço *et al.* made no similar finds, despite having dry-sieved their sediments, as they explicitly report. Clearly, such a striking contrast cannot be entirely explained by the difference in recovery methods, and lends further

support to the notion that the Early Neolithic ceramics described by Paço *et al.* and Guilaine and Ferreira do not come from the area they excavated but from their collection of artifacts found on the surface of the AMD2 area.

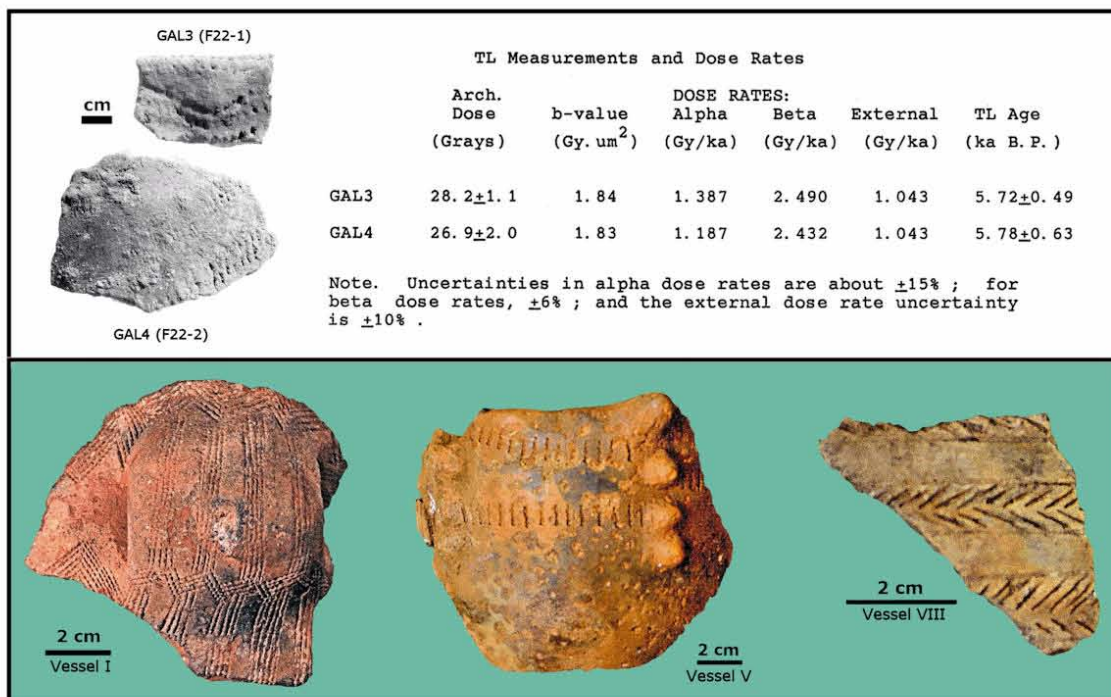
In sum, the spatial information suggests that, prior to disturbance, the behaviors that resulted in the accumulation of the Early Neolithic artifact assemblage from the Galeria da Cisterna took place in the AMD2 chamber only. Given the restricted space, unsuitable for residential purposes, and the abundance of human bone in AMD2, such behaviors are likely to have been funerary ones exclusively. The Galeria da Cisterna was an Early Neolithic cemetery, and the range of Copper Age, Bronze Age, Iron Age and Roman ceramic, lithic, osseous and metal artifacts also recovered there indicates that it continued to function intermittently as such in later prehistoric and early historical times.

#### 4 - Dating

The overwhelming majority of the ceramic assemblage from AMD2 is of unambiguous attribution to the Early Neolithic, and the same applies to the small associated stone tool assemblage. The range of ornaments in these deposits is also dominated by items that, by comparison with the Valencia sequence (Pascual 1998) and with the Holocene burial contexts of the nearby cave site of Caldeirão (Zilhão 1992, 1993), clearly are of Early Neolithic age too.

However, the stratigraphic mixing with remains from later periods prevented use of the charcoal, animal and human skeletal remains for radiometric dating by association. Moreover, by comparison with the evidence from Portugal and west Mediterranean Europe as a whole (Guilaine 1976; Zilhão 1992, 1993, 2000; Zilhão and Carvalho 1996; Barnett 2000; Bernabeu 1989; Carvalho 2007), it was also readily apparent that the Early Neolithic ceramic assemblage itself corresponded to a palimpsest of burial uses of the site extending over a considerable period of time. The decorative patterns, in particular, suggested that three different phases were represented: Early Cardial, Late Cardial and Epicardial (fig. 4).

The conclusion that dating by association was going to be problematic was thus reached early on in the 1988 field season, and a decision was made to only attempt direct dating of artifacts that carried meaningful chronological information themselves. In particular, the decision was then made



4 Top: the TL-dated sherds from the Galeria da Cisterna (photos taken before cleaning; GAL3/F22-1 is a Vessel VI sherd) and the raw analytical results; note that water content in the associated soil samples was low at the time of collection and that, as a result, the ages may be underestimated (probably by no more than 5%) if significantly higher values for this parameter pertained throughout the time of burial (Debenham, personal communications, December 10, 1991 and May 29, 1992). Bottom: typical examples of the three decorative styles represented in the Early Neolithic ceramic assemblage (Vessel I, Early Cardial; Vessel V, Late Cardial; Vessel VIII, Epicardial).

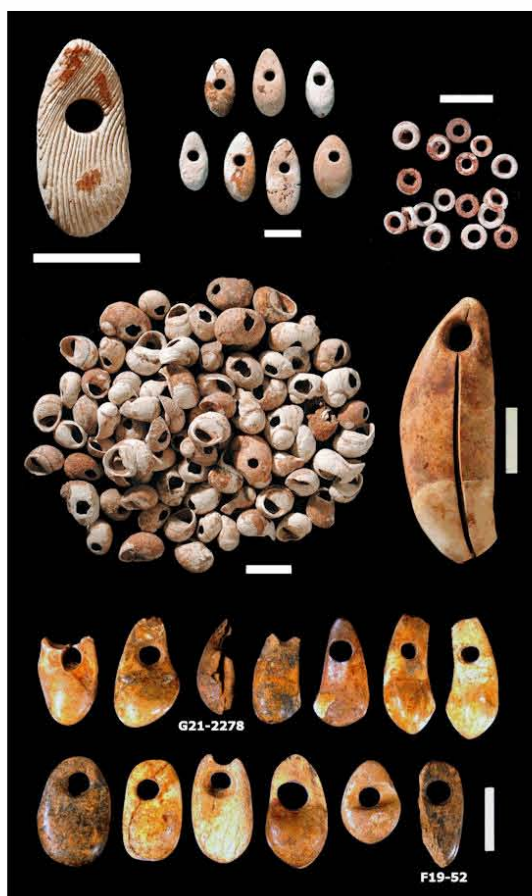
to save half of the deposit for future excavation, in order to allow for the dosimetry work required for the TL dating of ceramic fragments, eventually carried out in the 1989 field season (which exhausted the AMD2-AMD3 deposits).

Environmental radiation was measured *in situ* in square F22 (fig. 2), where the Holocene sediments were the thickest, and, together with the associated soil samples, two ceramic sherds collected in the immediate vicinity of the dosimeter during the subsequent excavation of that square were sent for analysis. Considering their standard deviations, the results obtained for those sherds — 5720  $\pm$  490 and 5780  $\pm$  630 BP — are not inconsistent with the early to middle fifth millennium BC age (late Early Neolithic) suggested in particular by the type of decoration seen in the dated sherd F22-1 (sample GAL3; fig. 4).

It was also noted early on that two particular kinds of pendants well represented in the Cisterna assemblage (pierced red deer canines and bone pendants imitating their shape) were, conversely, completely absent from both the previous Mesolithic and the later Cardial and post-Cardial periods of Portuguese prehistory. It was thus hypothe-

sized that these ornament types had originally been associated with the burial episode represented by the large number of sherds belonging to two baroquely decorated vessels from the AMD2 ceramic assemblage (cf. vessel I, fig. 4). Unrepresented in the Museum of the Geological Survey collection studied by Guilaïne and Ferreira, these vessels documented a tradition of ceramic decoration likewise unique, i.e., one which, until the excavation of AMD2, was completely unknown in the Portuguese Early Neolithic (with the exception of small fragments devoid of context and of uncertain chronology that had been recovered in the 19<sup>th</sup> century excavation of the Eira Pedrinha cave site; Zilhão 2000).

This inference was strengthened by comparison with the Valencian sites (Bernabeu 1989; Pascual 1998). Here, those two types of pendants are characteristic of the earliest part of the Neolithic sequence (Table 2), which is defined by ceramics featuring a *Cardium*- and/or comb-impressed decoration covering the entire container, identical to that seen in vessel I of the AMD2 assemblage. The hypothesis was tested, and validated, through AMS <sup>14</sup>C dating of one specimen of each ornament type,



**5** Early Neolithic ornaments from the Galeria da Cisterna (1988-89 excavations; all scale bars = 1 cm). Top row, left to right: oval pendant made on squid shell (*Sepia officinalis*); five oval pendants made on *Glycymeris* sp. shells; discoidal limestone beads. Middle row, left to right: *Theodoxus fluviatilis* shell beads; pierced wolf canine. Bottom row: pierced red deer canines and bone pendants imitating their shape (the two radiocarbon-dated specimens are indicated by the corresponding inventory numbers). Photos: top and middle, José Paulo Ruas; bottom, Francesco d'Errico.

which provided the same result for both samples (OxA-9287, red deer canine G21-2278; OxA-9288, bone pendant F19-52; fig. 5):  $6445 \pm 45$  BP, that is,  $5419 \pm 44$  cal BC (Zilhão 2001).

### 5 - The artifact assemblage

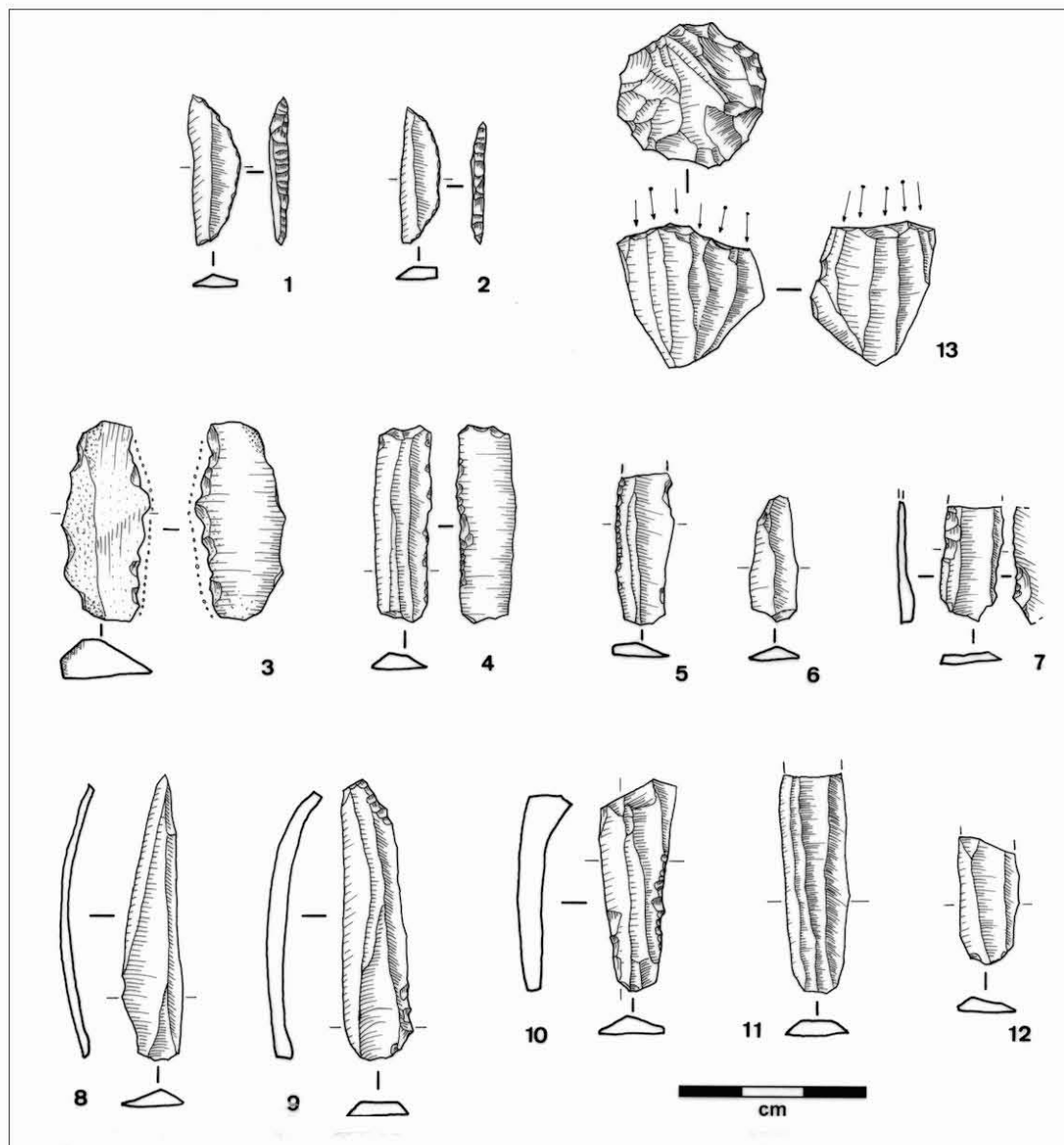
In the following, the material from AMD3 has been amalgamated with that from AMD2. With the exception of two robust blades, in all likelihood related to the Copper Age use of the site otherwise documented by a collection of a dozen V-perforated bone buttons, the lithic assemblage is clearly of Early Neolithic affinities (fig. 6; Table 3). From a technological point of view, it is characterized by the use of pressure and indirect per-

cussion techniques for the extraction of bladelet blanks (Carvalho 2007). Trapeze, the geometric type associated with the Late Cardial find horizon from Gruta do Caldeirão (Zilhão 1992, 1993), are absent, but there are three segments, which characterize the latter site's Epicardial find horizon. Therefore, the age and context of deposition of the Cisterna assemblage likely is, mostly if not entirely, that signaled by the Epicardial ceramic assemblage discussed below.

A minimum number of 40 vessels could be reconstructed from the 267 decorated sherds in the collection (Table 1; fig. 7-8); eleven isolated sherds (three of which *Cardium*- and four comb-impressed) may belong to an indeterminate number of additional other vessels. The undecorated sherds remain unanalyzed, and in all likelihood belong to undecorated parts of those 40 vessels, as there is no independent evidence (such as typical beads) for the use of the AMD2 chamber during the Middle Neolithic (when only undecorated ceramics were in use, at least for burial purposes, as widely documented in the numerous megalithic monuments of Portugal). Based on the analysis of the decorative patterns, those 40 vessels can be divided into three separate typological groups: Early Cardial, Late Cardial and Epicardial.

Two of the vessels (I and II), of an identical shape (with a clear neck and large handles applied mid-height, where the vessel is widest), feature extensive impressed decoration, which in one case is made with the edge of a *Cardium* shell and in the other is made with a comb. The sherd/vessel ratio, 7.3 times higher than that obtained for the remainder of the Early Neolithic ceramic assemblage, reflects the extent of the decoration, not a greater degree of fragmentation. As discussed above, these two vessels must represent the earliest period (Early Cardial) of cemetery use of the AMD2 area, ca. 5400 cal BC.

A second typological group includes 13 vessels, among which vessel VI, to which belongs the TL-dated F22-1 sherd (fig. 4). This group features different kinds of incised and impressed motifs, including cannelures, *sillons d'impressions* and bands delimited by incisions filled with spiked motifs. A clear parallel is the Epicardial find horizon from Gruta do Caldeirão, radiocarbon dated to  $4730 \pm 60$  cal BC (calibration of the weighted average of three statistically identical results, TO-350, OxA-1036 and OxA-1037) (Zilhão 1992, 1993). The third typological group is the most numerous,



**6** Early Neolithic flints from the Galeria da Cisterna (1988-89 excavations). 1-2. segments; 3. cortical blade with denticulated edge and "cereal polish;" 4-12. retouched and unretouched bladelets; 13. bladelet core (after Carvalho 2007).

with 25 vessels. Seventeen of these feature a characteristic decoration of *Cardium* impressions forming bands limited to the area below the rim (sometimes with festoons extending to the middle of the vessel but always leaving the lower half undecorated) and associated with different types of handles and marmelons; the other eight feature a similar decorative system but one in the execution of which the *Cardium* shell was replaced by other types of tools (nails, combs). This group has a clear parallel in the Late Cardial find horizon from Gruta do Caldeirão, radiocarbon dated to

5200 ± 90 cal BC (calibration of the weighted average of three statistically identical results, OxA-1033, OxA-1034 and OxA-1035) (Zilhão 1992, 1993). In good agreement with radiometric dating patterns for both site and region, the ceramic evidence thus reflects continued burial use of the AMD2 chamber throughout the Early Neolithic, over an interval of time of seven to nine centuries. The Early Cardial and the Epicardial typological groups of vessels represent the two, non-overlapping endpoints of the variation in decorative trends over this interval. The Late Cardial group

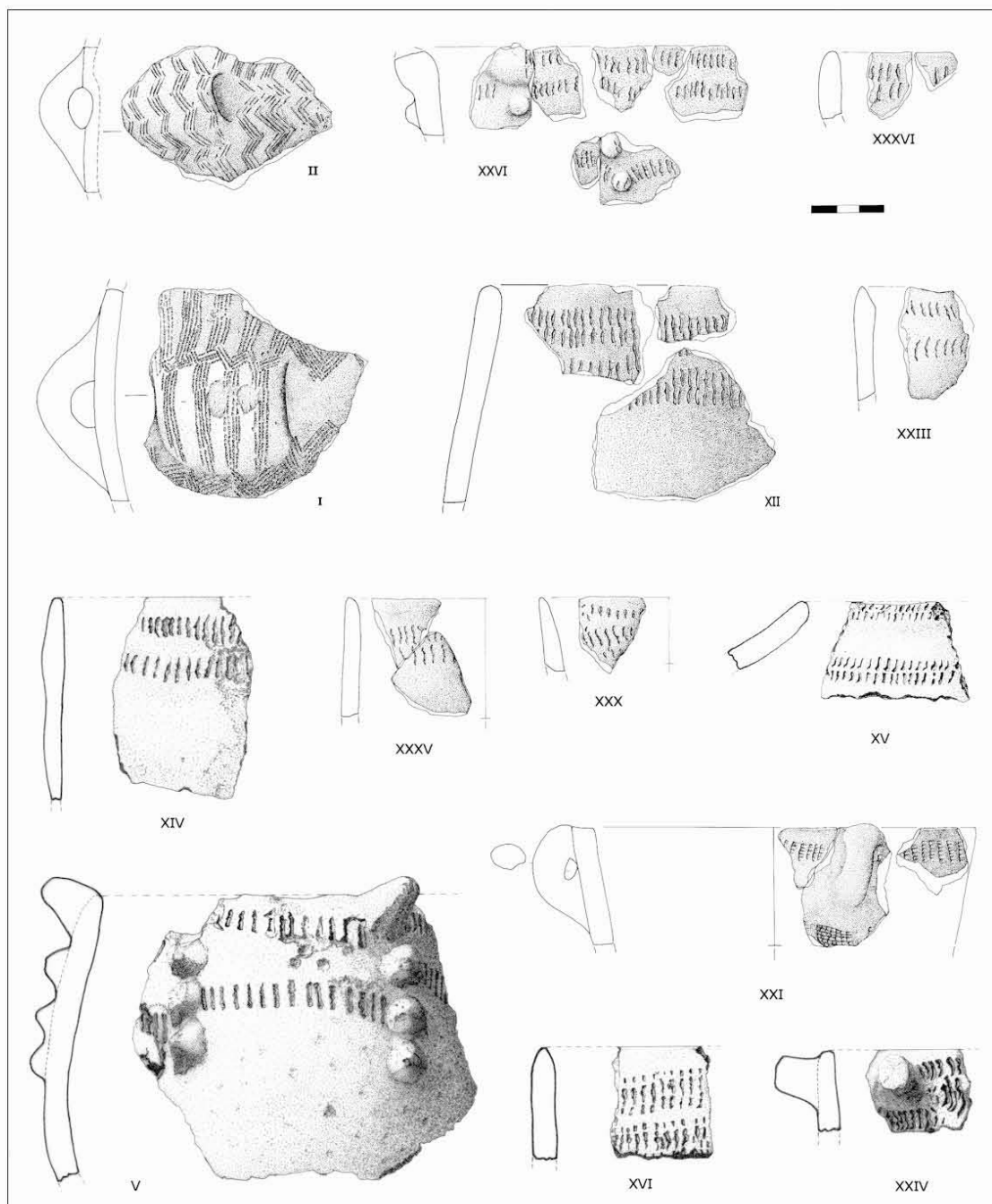
|                                  | Flint | Quartz | Schist | TOTAL |
|----------------------------------|-------|--------|--------|-------|
| <b>Cores</b>                     |       |        |        |       |
| Crystal                          | —     | 1      | —      | 1     |
| Prismatic                        | 10    | —      | —      | 10    |
| Non-prismatic                    | 2     | —      | —      | 2     |
| <b>Preparation</b> (crests)      | 1     | —      | —      | 1     |
| <b>Debitage</b>                  |       |        |        |       |
| Cortical flakes                  | 6     | 1      | —      | 7     |
| Part-cortical flakes             | 9     | 1      | —      | 10    |
| Non-cortical flakes              | 18    | —      | —      | 18    |
| Blades                           | 3     | —      | —      | 3     |
| Bladelets                        | 73    | 4      | —      | 77    |
| <b>Debris</b> (chips and chunks) | 9     | 4      | —      | 13    |
| <b>Tools</b>                     |       |        |        |       |
| Flakes with marginal retouch     | 2     | —      | 1      | 3     |
| Blades with marginal retouch     | 1     | —      | —      | 1     |
| Bladelets with marginal retouch  | 15    | —      | —      | 15    |
| Denticulated blades              | 1     | —      | —      | 1     |
| Segments                         | 3     | —      | —      | 3     |
| Truncated bladelets              | 3     | —      | —      | 3     |
| <b>TOTAL (N)</b>                 | 156   | 11     | 1      | 168   |
| <b>TOTAL (weight in grams)</b>   | 407   | 19     | 4      | 430   |

**Tab. 3** Galeria da Cisterna. Lithics from zone AMD2 (1988-89 excavations) (after Carvalho 2007).

is chronologically intermediate, but it cannot be excluded that some of the vessels included in that group relate in fact to either one of the other two phases of the Early Neolithic burial use of the site. Where the ornament assemblage is concerned (Table 2; fig. 5), oval-shaped shell pendants and pierced shells of *Theodoxus fluviatilis* are well represented in the Late Cardial find horizon from Gruta do Caldeirão, but such is also the case in the lower-most levels of the Cova de l'Or. The Valencia sequence shows continuity in types across the entire duration of the Early Neolithic, with the one significant trend being the marked decrease in numbers: at Cova de l'Or, for instance, 94% of the ornaments come from the Cardial levels, while at Cendres the corresponding percentage is 58%. The Caldeirão sequence follows the same pattern (Zilhão 1992). Based on these parallels, it seems legitimate to suggest that the large majority of the AMD2 ornaments were deposited at the site in the context of the Early Cardial and Late Cardial funerary uses documented by the ceramic assemblage and by the two identical direct dates on a pierced red deer canine and a bone pendant of the same shape.

A significant contrast with the Valencian sites, however, is the complete absence from the AMD2 assemblage of rings, stone bracelets, disks and plaques, all of which are abundantly represented in the three key localities (Or, Sarsa and Cendres) (Table 2). The latter are residential, not funerary sites, and therein may lay, at least in part, the explanation for the observed discrepancy. Another possibility is that the difference reflects the operation of cultural selection processes in the transmission or transportation, via diffusion or migration, of the original cultural package.

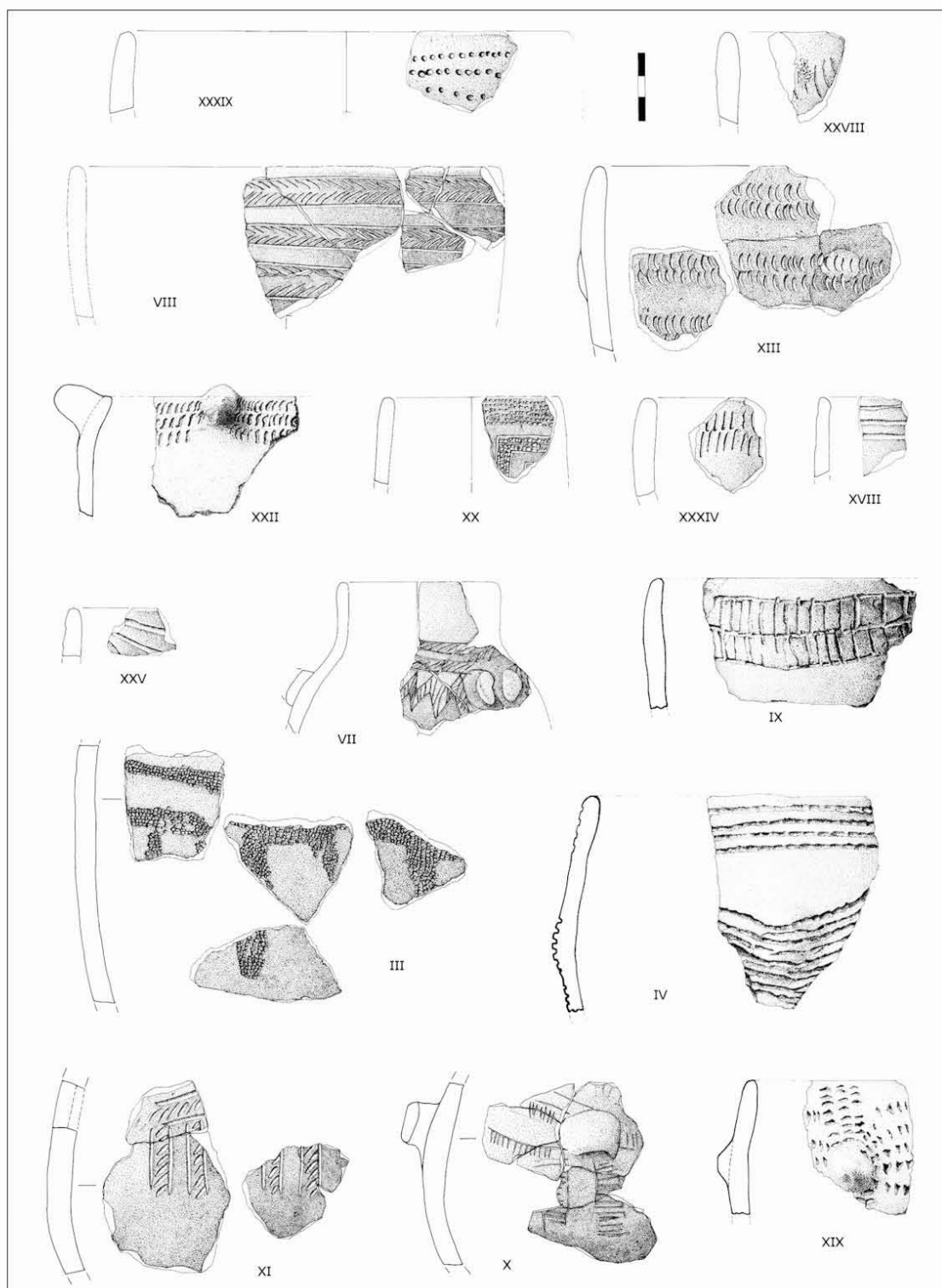
The spatial distributions in fig. 3 are consistent with the notion that the AMD2 ornaments are mostly of Early Cardial and Late Cardial age. The more characteristic types (pierced deer canines and bone pendants imitating their shape, oval-shaped shell pendants, and pierced *Theodoxus fluviatilis* shell beads) were found in close association with sherds from vessels of the corresponding typology, whose distribution is unimodal and centered, like that of such ornaments, in grid unit G21. The distribution of the Epicardial vessel sherds, by contrast, is bimodal — one cluster is also in the middle of the cham-



**7** Early Cardial (vessels I and II) and Late Cardial ceramics from the Galeria da Cisterna (1988-89 excavations) (after Zilhão *et al.* 1991 and Carvalho 2007).

ber, but there is another towards its southern end, in the 19 row, reflecting a concentration of sherds from vessels IV and XX in particular. Moreover, one of the Epicardial vessels whose distribution centers on the 21 row (vessel VIII) had most of its 18 sherds in the F squares, against the West wall, whereas the two Early Cardial vessels clearly were originally deposited against the East wall.

The majority of the discoidal limestone beads, however, comes from the southern side of the chamber, with 40% of those that are provenanced to square coming from the 19 row. No such beads were found at Caldeirão, and no information is available concerning diachronic variation in the Valencian sites. The Galeria da Cisterna distributions suggest deposition



**8** Late Cardial ceramics with *Cardium* impressions (vessels XXIV and XXVIII), Late Cardial ceramics with non-Cardium or comb impressions (vessels III, XIII and XXII), and Epicardial ceramics from the Galeria da Cisterna (1988-89 excavations) (after Zilhão *et al.* 1991 and Carvalho 2007).

mostly if not entirely during the Epicardial period, at a time when they may have functionally replaced the shell beads of previous phases. Se-

veral ensembles of up to six such stuck-up disks were found, further indicating their use as part of composite beadworks.

## 6 - Conclusions

Despite the lack of internal stratigraphic differentiation of its Holocene deposits, the Galeria da Cisterna yielded important information concerning the material culture of the earliest agricultural communities of central Portugal. The complete contrast that, in this regard, exists with the hunter-gatherer groups of the Tagus and Sado valleys, with which the dating evidence proves several centuries of contemporaneity, has been taken to suggest that those first farmers of Portugal were an intrusive population, a notion for which there is also some aDNA support (Zilhão 2001; Chandler *et al.* 2005).

The strong similarities with the Valencian Cardial in ceramic decoration and ornament types indicate the origins of the pioneer agricultural settlers of Portuguese Estremadura must be sought in that culture. By the same token, if those similarities are an element of affiliation, then the elements of the original cultural package (rings, spoons, bone tools) so far lacking in Portugal — an absence that is unlikely to have an exclusively functional basis — might reflect patterns of deliberate selection in the transmission or transportation of that package that are equally significant and deserve future investigation.

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