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Looking for the traces of the last hunter–gatherers: Geophysical survey in the Mesolithic shell middens of the Sado valley (southern Portugal)

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ABSTRACT

This paper presents the results of an application of geophysical surveying methods to Mesolithic sites in Portugal. Magnetic gradiometry maps have been produced at the sites of Vale de Romeiras and Poças de São Bento. At the latter, three excavation seasons have provided information to test the results of the survey. It is concluded that these techniques can be considered efficient tools for the delimitation of the sites and for the identification of Mesolithic and Neolithic structures.

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1. Introduction. The shell middens of the Sado valley

The Sado shell middens are among the most outstanding points of reference for the European Mesolithic. Twelve open-air Mesolithic sites are known in the lower sector of this valley, most of them including concentrations of human burials, and even cemeteries, dating to the late seventh and the sixth millennia cal BC. The sites are spread along 15 km on both banks of the valley of the River Sado (Fig. 1), which crosses a Tertiary basin opened in the chiefly Palaeozoic landscape of Alentejo, in southern Portugal. As has been frequently highlighted, the settlement is surprisingly upstream (41–57 km from the current mouth of the river near Setúbal) for sites that are usually described as “shell middens”. This has usually been explained by the supposed existence of a very deep postglacial palaeoestuary (see, for instance, Arnaud, 1989, p. 627), although recent research suggests that this interpretation should be revised (Arias et al., 2015b).

Discovered in the 1930s, the Sado Mesolithic sites were extensively excavated in the 1950s and the 1960s by Manuel Heleno, then

the director of the National Museum of Archaeology (*Museu Nacional de Arqueologia*), and some members of his team (Heleno, 1956; Santos et al., 1974; Soares, 2013). A revision of the mainly unpublished data from Heleno's research and new excavations in the sites of Cabeço das Amoreiras, Cabeço do Pez and Poças de São Bento, the latter in collaboration with Lars Larsson, were attempted by José Morais Arnaud in the 1980s (Arnaud, 1989, 1990; Larsson, 1996, 2010). However, this promising programme was interrupted before its completion, and the Sado Mesolithic sites were nearly forgotten, in spite of some partial analyses of the archaeological material stored in the *Museu Nacional de Arqueologia* (Araújo, 1995–1997; Cunha and Umbelino, 1995–1997; Marchand, 2001; Umbelino, 2006; Diniz, 2010; Nukushina, 2012; Umbelino and Cunha, 2012). In 2010, a new research programme on the Mesolithic of this area was launched, the SADO MESO project, directed by two of the authors of this paper (P.A. and M.D.) It is included in a larger programme of research, analysing the processes of transition to the Neolithic in three coastal areas of Atlantic Europe: Brittany, northern Spain and southern Portugal (see the acknowledgement section for details). Within the framework of this new project, a systematic revision of the Sado Mesolithic has been started, including palaeoenvironmental research, a

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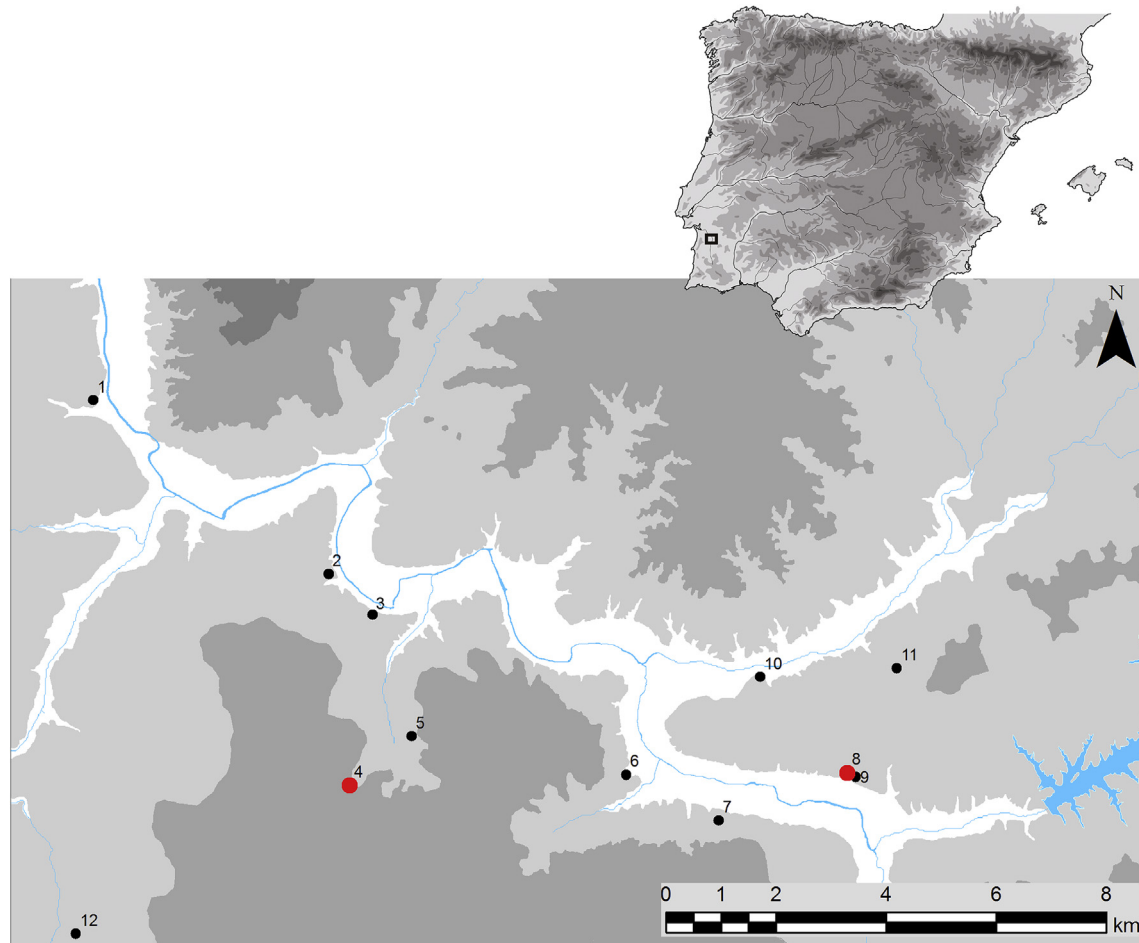


Fig. 1. Location of the shell middens in the Sado valley, highlighting the sites discussed in the text. Key: 1. Arapouco; 2. Cabeço do Rebolador; 3. Barreirão; 4. Poças de São Bento; 5. Fonte da Mina; 6. Barrada das Vieiras; 7. Cabeço das Amoreiras; 8. Vale de Romeiras; 9. Cabeço do Pez; 10. Várzea da Mó; 11. Barrada do Grilo; 12. Barranco da Moura.

systematic archaeological survey of the region, and excavations at the sites of Poças de São Bento, Cabeço do Pez and Cabeço das Amoreiras (Diniz and Arias, 2012; Araújo et al., 2015; Arias et al., 2015b; Diniz and Cubas, 2015; Duarte et al., 2015; López-Dóriga et al., 2015; Pimentel et al., 2015). In this paper we will focus on the geophysical survey in two selected sites: Poças de São Bento and Vale de Romeiras.

2. An overview on the surveyed sites

As stated above, the Sado shell middens are located in the lower section of the valley. They are typically situated on the edge of small plateaus some 60 m above the river, with a good visual control over ample sectors of the valley (Fig. 2). Only three sites were located at lower altitudes above the river – Barrada do Grilo, Barradas das Vieiras and Várzea da Mó, which are just at 8–20 m –, whereas Poças de S. Bento is in a slightly different location, on top of the 80 m tableland, but 2.5 km from the main river, on the left bank of a small brook. Due to this kind of location, aquatic resources were not available in the close vicinity of the sites, and therefore some effort had to be involved in food transport, especially in the case of Poças de S. Bento.

The geological setting of the sites is quite homogeneous (Pimentel et al., 2015). Typically, they are located above Pleistocene sandy layers (in some cases real dunes) covering the Tertiary bedrock formed mainly by sandstone and conglomerates. As a

result of this, the Mesolithic layers are usually sandy deposits with variable concentration of anthropogenic material: mainly *Scrobicularia plana* and *Cerastoderma edule* shells, but also charcoal, mammals and fish bones, lithic and bone industries and other less visible pieces of evidence such as seeds, micromammals, insects ... The excavations performed in these sites, especially those applying modern recording techniques, have shown that they include many



Fig. 2. Mesolithic site of Vale de Romeiras. Note the wide visual control of the bottom of the valley from the site.

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