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El Collado shell midden and the exploitation patterns of littoral resources during the Mesolithic in the Eastern Iberian Peninsula



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ABSTRACT

The 1980s excavations at the El Collado, a large open-air Mesolithic site on the Eastern coast of Spain, revealed a sequence of human occupations consisting of a large shell midden and 14 human burials dated to the Mesolithic period. Human palaeodietary reconstructions based on bone collagen $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope ratios, identified a variable contribution of marine proteins, ranging from fully terrestrial diets to a maximum input of 25%. Most subsequent research on Mediterranean coastal and dietary adaptations refers to the site's funerary record and palaeodietary study, but the composition of its shell midden has remained unstudied.

This work reports the first systematic study of a representative sample of mollusc and a comparatively small assemblage of fish bone recovered from the different stratigraphic horizons of El Collado site. Results indicate a mixed marine–terrestrial mollusc composition of the shell midden. The edible land snail *Sphincterochila candidissima* and the marine bivalve *Cerastoderma glaucum* are the best represented species throughout the archaeological sequence. The pattern of intertidal resource exploitation is clearly dominated by bivalves (*C. glaucum*, *Glycimeris violacescens*, and *Ruditapes decussatus*) and gastropods (*Cerithium vulgatum*, *Hexaplex trunculus*) inhabiting mud and sand flats in coastal lagoon environments. The presence of rocky shore intertidal species is minimal, mostly related to the manufacture of pierced shell ornaments made from *Columbella rustica*. On the other hand, fish bone assemblages are overwhelmingly dominated by the gilthead sea bream (*Sparus aurata*) a coastal species frequent in brackish water coastal lagoons and estuaries, both on rocky and sandy grounds. The biometric analysis of *C. glaucum* records differences on shell size amongst the different layers, suggesting variations of marine productivity throughout the archaeological sequence.

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1. Introduction

In recent years, the study of intertidal resources during the Late Glacial and Early Holocene has been of considerable interest for interpreting processes of economic intensification and coastal adaptations in the Mediterranean (Jordá et al., 2011; Mannino et al., 2011; Mannino and Mazzanti, 2013; Colonese et al., 2014). A key debated issue is to what extent the low primary productivity of Mediterranean coastal ecosystems was a structural limiting factor

for the intensive use of intertidal resources, leading to a different pattern of dietary adaptations than Atlantic Europe (García-Guixé et al., 2006; Colonese et al., 2011; Mannino et al., 2012).

In the southern coasts of the Iberian Peninsula, a relationship between the amplitude of the inter-tidal range and the biomass of infra-littoral rocky shore mollusc taxa (Mytilidae and Patellidae) has been consistently demonstrated (Fa, 2008). Consequently, a lower overall contribution of key intertidal genera to hunter gatherers' subsistence systems could be predicted in those rocky shore littoral areas under reduced or very low tidal influence.

Unlike exclusively marine littoral environments, estuaries and coastal lagoons support richer ecosystems and exhibit greater species diversity because their primary productivity is often extraordinarily high (availability of nutrients, variety of organisms

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present, and large number of niches). The prehistoric exploitation of Mediterranean coastal lagoons dates back to the Middle Palaeolithic (Zilhão et al., 2010), even though its intensive use is reported from the Late Glacial onwards (Colonese et al., 2011). Analysing the patterns of human exploitation of this rich ecosystem during the Mesolithic is relevant because this period witnessed a more intensive use of terrestrial resources (Aura et al., 2009; Marín-Arroyo, 2009; Stiner and Munro, 2011) and the appearance of cemeteries (Gibaja et al., 2015), both suggesting major changes in settlement patterns, human demography and social organisation.

In the central Mediterranean region of Spain, the El Collado site—a multi-layered archaeological deposit containing shell middens associated with a Mesolithic cemetery—provides a unique opportunity to analyse evolving patterns of coastal and inter-tidal resource exploitation from the Early to Middle Holocene. Previous studies from this site have reported the presence of marine molluscs (*Cerastoderma glaucum*, *Hexaplex trunculum* and *Cerithium vulgatum*), suggesting the exploitation of nearby coastal lagoons (Boscà, 1916; Mateu Bellés et al., 1985; Aparicio Pérez, 2008). However, those works were based on very partial samples of materials without known stratigraphic context or quantifications. A later study on the human palaeodiets based on bone collagen $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope ratios identified a variable contribution of marine proteins, ranging from fully terrestrial diets to a maximum marine input of 25% (García-Guixé et al., 2006). In the same region, subsequent stable isotope palaeodietary research on different Mesolithic sites has confirmed the low-level contribution of marine proteins to human diets, suggesting a different geographic pattern between inland and coastal areas, in which the marine signal is only identified at those sites up to 30 km from the coast (Fernández-López de Pablo et al., 2013; Salazar-García et al., 2014).

Therefore, the current knowledge on the exploitation patterns of marine resources in the central Mediterranean region of Spain during the Mesolithic is clearly unbalanced towards the isotopic

evidence provided by the human remains. In this context, there is very little understanding of the exploitation strategies of coastal and inter-tidal resources from the Early to Middle Holocene, a period of major sea level rise on the Valencian Gulf.

This study reports the first integrated results of a representative sample of mollusc and fish bone assemblages produced within the framework of the research project *POSTGLACIAL-MED: Environmental dynamics and human responses during the Postglacial in the Mediterranean façade of Iberia* (c. 12,700–8000 cal BP). In particular, our analysis of the El Collado collections will try to determine a) the general contribution of intertidal resources during the different occupation episodes; b) the relative importance of shellfish in comparison to other non-marine molluscs throughout the archaeological sequence; and c) the zonation of fishing activities (i.e., shellfish collection and fish catching).

2. Regional settings

The El Collado site is located in the municipality of Oliva (Valencia), at the southern sector of the Valencian gulf in Eastern Spain (Fig. 1). The site lies at 70 m.a.s.l. on the south-eastern slope of a small Cretaceous relief unit that forms part of the Benthic chain. The distance to the present Mediterranean coast is 3.1 km. El Collado is placed between two main water bodies delimiting a coastal fringe that underwent significant changes along the Late Pleistocene and Holocene periods. The first is the lower course of the Serpis River, approximately 7 km north of the site. The dominant morphologies in this area are Pleistocene and Holocene alluvial fans, delimited towards the west by Mesozoic reliefs and towards the east by beach barriers (Rey and Fumanal, 1996). The second is the Pego-Oliva marsh, located 5.3 km south of El Collado. Here, we find a landscape consisting of a beach barrier and lagoon system with associated adjacent marshes (Viñals and Fumanal, 1995).

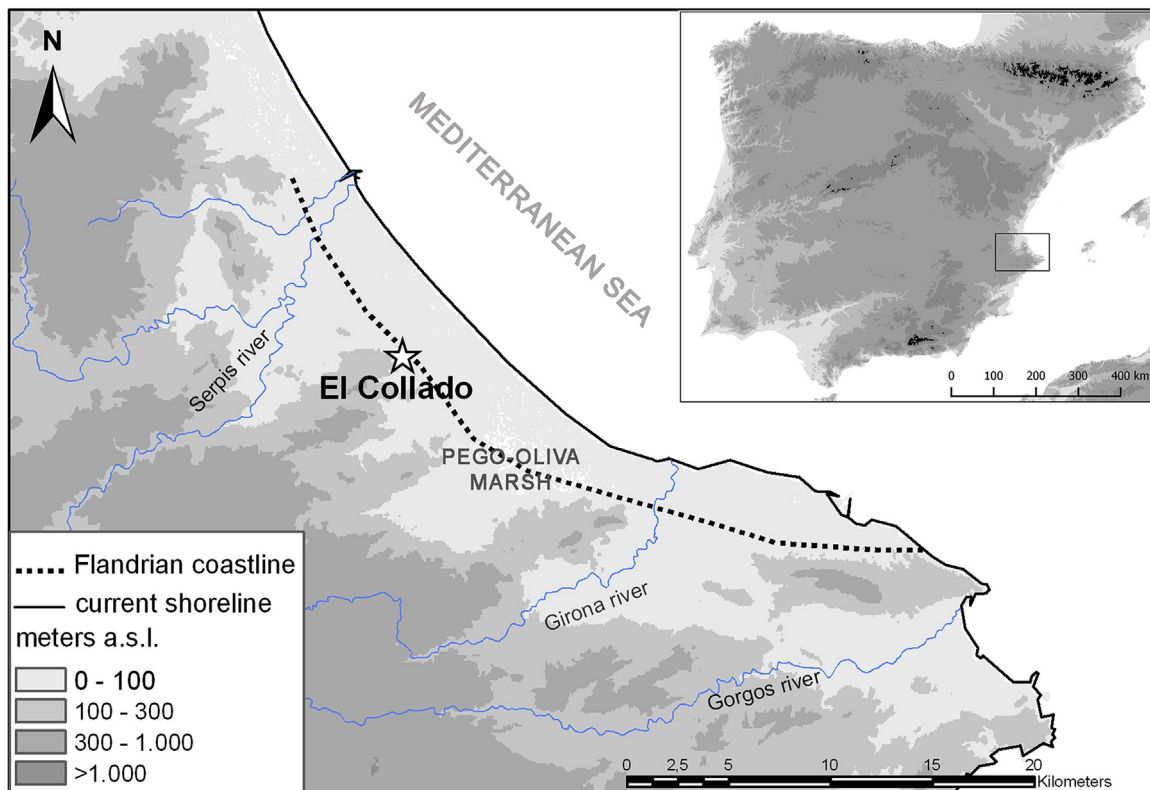


Fig. 1. The location of the El Collado site in the Southern Sector of the Valencian Gulf, Spain.

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