

Sonia Carbonell Pastor*

* GRAP (Grup Arqueològic de Recerca Protohistòrica) (soniacarbonellpastor@gmail.com).

CONSTRUCTION METHODS AND TECHNIQUES OF MENORCAN ROCK-CUT TOMBS (BALEARIC ISLANDS)

LINK AL DATASET: 10.13131/UNIPI/QHCH-RD40

Abstract: This paper examines aspects related to the construction process of Menorcan rock-cut tombs (also called artificial caves) from the 1st millennium BCE. It gives a brief history of the research, which includes the different studies that have been carried out on carving and stonework in different areas of the island (such as prehistoric quarries and settlements). Secondly, it focuses on the study of rock-cut tombs. The documentation and recording of the tombs using both digital (photogrammetry, GIS and database management) and

traditional recording techniques (drawings, registration sheets and photographs) has allowed us to make some initial hypotheses about the techniques and tools used in the construction of these spaces. As a first approach to the study, hypotheses about the type of tools used will be presented, based on the analysis of carving marks documented in different rock-cut tombs.

Keywords: carving tools, Menorca, Prehistory, quarrying, rock-cut tombs.

1. Introduction

Human occupation of the Balearic Islands began late, around the 3rd millennium BCE, with the arrival of the first Neolithic groups from the Iberian Peninsula, possibly from the Levantine coast, present-day Catalonia or southern France (Guerrero *et al.*, 2006a: p. 45-46). Given their location, winds and currents, navigating to these islands presented some difficulties that limited contact or exchanges between human groups of different origins. The historical development of the islands that make up the Balearic archipelago was not uniform. As several authors have pointed out, the Talayotic culture, characterised by the cyclopean constructions known as *talayots*, only appears in Mallorca and Menorca (also called *Gimnesias* by classical Greek writers.). In the *Pitiusas* (Ibiza and Formentera) there is evidence of a stable human presence at the end of the 3rd millennium BCE (Costa & Guerrero, 2002: p. 489), although according to other authors, this chronology should be advanced to the 2nd millennium

BCE with the construction of megalithic tombs such as Ca Na Costa in Formentera and Can Sargent in Ibiza (Gómez & San Nicolás, 1988: p. 206, 212). However, it is not until the end of the 8th century or the first decades of the 7th century BCE, with the arrival of Phoenician groups (Ramon, 2007: p. 144) from the south of the Iberian Peninsula, that a stable settlement is projected over time. Differentiated cultural forms resulted precisely from these differences in settlement dynamics.

Menorca displays evidence for the arrival of products and materials from other areas. From the second half of the 9th century BCE, the arrival of iron objects such as Atlantic heclaxes, for example, and objects of prestige, within the framework of aristocratic and pre-colonial trade, should be noted (Guerrero *et al.*, 2002: p. 228; Guerrero *et al.*, 2006b: p. 137). Some examples can be found in the Cova des Càrritx (Ciutadella), a burial cave with a sequence of use between 1400 and 800 BCE, where faience beads and ivory objects have been documented (Lull *et al.*, 1999: p. 300). The presence of these materials proves that Menorca was part of the trade routes that linked different areas of the central and western Mediterranean. However, we cannot speak of trade relations or continuous contacts over time until the 5th century BCE and especially from the 4th century BCE, when Ibiza became a producer and redistributor of products – mainly wine – in the western Mediterranean (Hernández-Gasch & Quintana, 2013: pp. 327-328). In fact, archaeological contexts show an increase in foreign products in the second half of the 4th century BCE, most of them amphorae from Ibiza. The gradual appearance of imported products in Mallorca and Menorca from the second half of the 5th century BCE has led some authors to suggest that these territories were part of a “reserved market” of the Ibizan Punics (Ramon, 2017: p. 80).

It was during this period, the Postalayotic (6th-2nd centuries BCE), that the island societies of Mallorca and Menorca underwent significant changes. In the case of Menorca, there was an increase in imports from Ibiza and the appearance of a new type of domestic structures (*cercles*) and ritual enclosures (*recintes de taula*), which share common building techniques and elements also found in some rock-cut tombs.

The main studies on rock-cut tombs or artificial burial caves in Menorca were made by C. Veny (1982), J.S. Gornés (1992; 1996; Gornés *et al.*, 1992; 2006; Gornés & Gual, 2018) and L. Plantalamor (1991; Plantalamor *et al.*, 1999; 2007). The scarcity of thematic studies is mainly due to the lack of systematic excavations of this type of tomb, as most of them are completely empty or lack any archaeological context. On the other hand, these studies focused mainly on the description of the caves and the materials that could be recovered from them (Veny, 1974; 1982; Plantalamor, 1991). In those cases, such as the so-called *hypogeum XXI* at Calescoves (Alaior), where an archaeological intervention could be carried out, the data recovered allowed researchers to obtain new information for the knowledge of the funerary rituals of this type of space between the 8th-7th and 4th centuries BCE (Gornés *et al.*, 2006; Gornés & Gual, 2018).

In this paper we will approach the study of rock-cut tombs by looking at their construction process through the observation and recording of the carving marks documented in these funerary spaces. This thematic line, focused on analysing these types of marks and their implications and significance in the funerary space construction process, has been addressed by various authors in other areas and time-periods

(Porqueddu, 2018; 2023; Porqueddu *et al.*, 2021; 2023). In the case of Menorca, no study of this type had been carried out before. Therefore, this work aims to be a first methodological approach to its study.

2. Menorca's geological features: understanding human occupation

Knowledge of the relief and geomorphology of the island of Menorca is a key factor in understanding the location and construction of each of the architectural manifestations carried out by both ancient and modern societies.

First of all, it should be noted that Menorca is an extremely flat island, and hypsometric studies show that only 0.6% of the island's surface is higher than 200 metres above sea level (Pons & Gómez-Pujol, 2003: p. 1). However, this does not alter the fact that the island has a variety of coastal geographical features, caused either by structural differences in the relief or by different geomorphological processes that have occurred over time.

From a geological point of view, Menorca has the peculiarity of being divided into two distinct zones: Tramuntana and Es Migjorn (fig. 1). The latter, located further south, is geologically characterised by a type of sedimentary rock in which a calcareous rock predominates, known locally as *marés*. It is this type of limestone with detrital character that has been exploited from prehistoric times to the present day. Depending

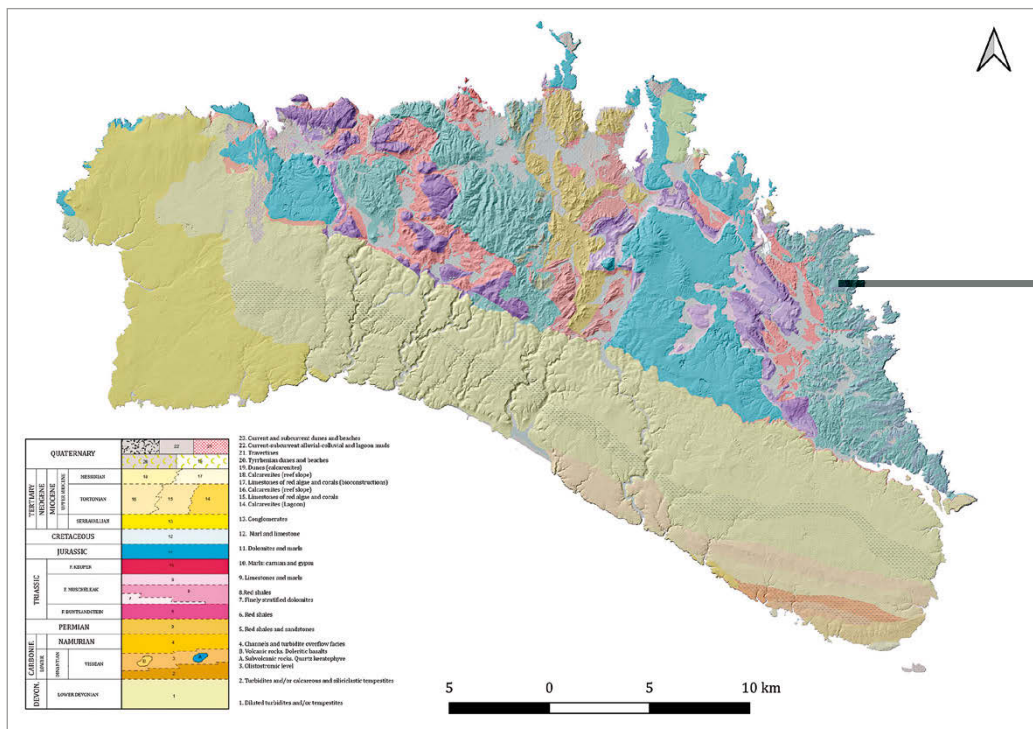


fig. 1. Geological map of Menorca. Author's compilation based on the WMS services of the Geological and Mining Institute of Spain (IGME).

on the degree of cementation, this type of rock can have different levels of consolidation, which gives rise to different types of stone hardness (Salvà, 2020: p. 93). This heterogeneity in composition makes some rocks easier to work than others, and was a determining factor in quarrying.

From a geomorphology point of view, Es Migjorn region was developed mainly during the Upper Miocene and to a lesser extent during the Plio-Quaternary (Gelabert, 2003: 40). It is a region with a practically flat surface, only interrupted by the central sector. In this sector, the fluvial action of the torrents, despite their low flow, erodes the limestone materials, creating large ravines with several karstic caves that have been used over time by different human and animal communities (Gornés, 1994). For this reason, it is also the area where the prehistoric population was concentrated, as it is the most fertile and geologically uniform area of the island.

On the other hand, in the Tramuntana geological area, the terrain is formed by secondary and primary folds, mainly composed of calcareous and siliceous materials, since its geological structuring took place during the Upper Oligocene and Middle Miocene (Pons, Gómez-Pujol, 2003: p. 3-4; Gelabert, 2003: p. 40). In this area, the exploitation of copper from the Bronze Age has been documented and is part of an ongoing research project.

Studies on the settlement dynamics of Menorca from prehistory to modern times indicate that human occupation of the Tramuntana region was scarce, with a preference for the southern part (Migjorn), where there is more fertile land for agriculture and gathering. This is mainly due to the fact that the drainage systems, which allowed the expansion of agricultural fields towards the north, were only introduced in the 19th century (De Cet, 2017). This, together with the ease of quarrying in the Es Migjorn geological area, was the reason for concentrating human settlement here. Both the proximity of the settlements and the higher quality of the limestone were the determining factors for the location of the rock-cut tomb necropolises in the area of Es Migjorn.

3. Knowledge of stonework in Menorcan prehistory: a brief contextualisation

Throughout the 1st millennium BCE, Menorca's human landscape was characterised by a variety of constructions in which stone was the main raw material. From the Talayotic period, with the appearance of the talayots, to the Postalayotic period, with the *cercles* and *recintes de taula*, the common denominator of all these spaces was the use of stone.

A characteristic feature of prehistoric Menorcan buildings is the use of the cyclopean technique. This technique was used to construct the outer walls made of large dry-laid blocks. The type of stone used varied according to the location of the settlements, but since the prehistoric settlement was concentrated in the geological area of Es Migjorn, mainly Miocene calcarenites were used, and only in some cases Paleozoic and Mesozoic blocks were used for the internal division of the structures (Anglada *et al.*, 2017: p. 191).



fig. 2. Various post-alayotic buildings with common architectural features such as columns and pilasters: a) the interior of a domestic unit (*cercle*) the interior of a domestic unit (*cercle*) in the post-alayotic settlement of Torre d'en Gaumés; b) a sacred building (*recinte de taula*) from Trepucó; c) the interior of a rock-cut tomb n.4 from La Cova, with a central column. Own photographs.

Although it is suggested that the prehistoric structures were built using rocks from the surrounding area, only a few quarries have been documented, such as those near the large settlements of Torre d'en Galmés (Alaior) or Son Catlar (Ciutadella). Given the large number of post-alayotic structures (*cercles* and *recintes de taula*), one needs to consider the origin of the stone used in these constructions. Until now, it was thought that the stone used in prehistoric constructions came from these quarries near the settlements, but in recent years there has been a growing interest in the construction processes and it has been established that the settlements themselves sometimes acted as quarries (Pérez-Juez & Goldberg, 2018). It is worth considering that certain architectural elements, like pillars and/or attached pilasters, tend to be observed in domestic structures (*cercles*), ritual buildings (*recintes de taula*), and

rock-cut tombs. This observation raises the possibility that during the Postalalyotic period, there may have been a level of specialized knowledge regarding stone usage, potentially supported by a dedicated group of workers (fig. 2). Additionally, it is worth exploring the alternative possibility of a communal knowledge of these techniques.

Various surveys around some of the main postalalyotic settlements have made it possible to locate some quarries. As already pointed out by M. Ll. Serra, some of them were located close to the settlements in order to extract large blocks for use as pillars or slabs for the outer walls of the buildings; some examples can be seen near the settlement of Son Catlar in Ciutadella, or Sant Vicenç d'Alcaidús and Biniaiet in Alaior (Serra, 1963: p. 188, 190). This researcher proposed that the extraction of stone from quarries close to settlements was a common practice in the prehistory of Menorca, and it is also documented in line with other older constructions, such as the tombs of Rafal Rubí (called *navetes d'inhumació* in Catalan).

A good example of this is the research in the postalalyotic settlement of Torre d'en Gaumés recently conducted by A. Pérez-Juez and P. Goldberg. These authors identified areas of stone quarrying inside buildings and in open spaces between buildings which later on were anthropically blocked or used as cisterns or storage areas. This study concluded that the stones extracted from the interior of the settlement would have been used in the construction of the outer walls and that once finished they would have been refined or carved, which would also explain the presence of documented flakes on the ground levels surrounding the structures (Pérez-Juez & Goldberg, 2018: p. 360-363; 365). The existence of quarries within settlements was also raised in the case of Son Catlar. In this postalalyotic walled settlement, a quarry has been documented in the southern sector inside the walls. The logic of this quarry must be understood in terms of the difficulties that would have been caused by moving and shifting the blocks from outside (García-López & Prados, 2022: p. 84).

In terms of stone extraction methods, a variety of techniques were employed. Primarily, wooden wedges were inserted into the cracks and then moistened with water, causing them to expand and crack the rock (Kopper & Rosselló-Bordoy, 1974: p. 165). This approach aimed to facilitate the extraction of the stone using tools that have not left traces in the archaeological record.

There are also other theories regarding the extraction techniques. According to J. S. Kopper and G. Rosselló-Bordoy, in addition to the traditional methods, a third method could be used, which was the extraction of the blocks by means of fire, creating stress by subsequently pouring water into the grooves (1974: p. 165-166). However, as noted by A. Pérez-Juez and P. Goldddberg, in the case of settlement of Torre d'en Gaumés there is no evidence of the use of fire in the extraction areas identified (2018: p. 367).

As mentioned above, there are few documented examples of quarries from the prehistoric period, and few traces of quarrying have survived. However, concerning construction processes that use stone as a primary component, it is worth noting that stonework on the island of Menorca is still active today with the presence of large quarries. A good example of this, is the work of the "*trencador*", or quarryman, which has left traces throughout history in the form of monumental quarries. This traditional craft is still practised today, although it is gradually disappearing due to automation

and the lack of generational turnover (Florit & Sauleau, 1995: p. 46). This persistence of a traditional productive activity also allows us to approach the knowledge of the construction and extraction of stone in the prehistory of the island.

There are, however, other areas from which a large quantity of stone could certainly have been extracted: the rock-cut tombs.

4. Archaeological material: the rock-cut tombs

The characteristic funerary spaces of the Postalalyotic period are the rock-cut tombs, also known as hypogea (Gornés *et al.* 1992; 2006; Gornés & Gual, 2018). These are tombs carved into the vertical walls of ravines or cliffs, about which there is little information due to the lack of systematic archaeological excavations and the fact that they have been looted and reused over time. Nevertheless, its appearance is framed around the 9th century BCE and its end in Roman times, around the 1st BCE.

A detailed study of the architecture and spatial design of rock-cut tombs necropolis helps us to better understand their construction processes. Although the appearance of rock-cut tombs dates back to the 9th century BCE, as can be deduced from the data provided by the excavation of the so-called hypogeum XXI of (Calescoves), the truth is that not all these tombs present the same characteristics.

Various authors, such as C. Veny and J. S. Gornés, have proposed different typological classifications for the rock-cut tombs of Calescoves. In this sense, Veny, after excavating some of the Calescoves rock-cut tombs that were still filled with sediment, proposed that there were three types of tombs within this complex (1982: p. 286-289): Type I (simple rock-cut tombs with a small circular, semicircular or oval chamber and a horizontal entrance with a semicircular or rectangular morphology), Type II (natural caves with a cyclopean enclosure wall) and Type III (larger rock-cut tombs with a rectangular entrance and internal complexity through the arrangement of attached pilasters).

Gornés, for his part, re-examined the excavations carried out by Veny and the materials recovered, applying basic descriptive statistical analysis to determine the existence of different clusters or groups. His research concluded that there was a group consisting of natural caves (with or without cyclopean enclosures) and three types of rock-cut tombs (1996: p. 95-96): Group I (small in size with circular or rectangular entrances), Group II (with vertical rectangular entrances and three different types of chambers: single, pilastered or divided) and Group III (artificial caves of larger volume, with vertical rectangular and horizontal entrances, double doors and mostly pilastered chambers). He proposed that Group I was dated between the 9th and 7th centuries BCE, while for the rock-cut tombs of groups II and III, the relative chronology based on the elements of the grave goods suggested a period between the 7th and 4th centuries BCE.

The research carried out by Gornés is the most detailed to date, and the one that takes more factors into account, especially when proposing a relative chronology based on the association of materials. In line with the methodology proposed by Gornés, recent studies have focused on the analysis of this formal variability with a larger

sample of 26 burial accumulations and a total of 328 rock-cut tombs studied using hierarchical or cluster component analysis (Carbonell, 2024).

The problems involved in studying rock-cut tombs are many. On the one hand, there are external or physical factors related to preserving and accessing these artificial caves. A large number of rock-cut tombs are in a poor state of conservation due to erosive processes and anthropic reuse (Carbonell, 2018). It should be noted that the development of traditional productive activities, such as cattle raising, has had an important influence on the conservation of these areas. The reuse of these spaces as stables, shelters for livestock or storage for agricultural tools has been documented in many cases.

On the other hand, the inaccessibility of some sites makes it difficult to document them. This is the case of the necropolises that are located on cliffs or in ravines that are covered with lush vegetation. As mentioned in the section on the geology of Menorca, the rock in which most of the caves are dug (*marés*) is easily eroded. Therefore, prehistoric access to these sites may have been different from what it is today. It is also possible that, when they were in use, these cemeteries were managed by the communities that buried their dead, that regular maintenance work was carried out to clear the vegetation, or even that a system of wooden ladders and ropes was used to descend into the caves.

Finally, although it was not a determining factor in the preparation of this paper, it should be mentioned that many of the caves are located on private land, so obtaining the owner's permission was essential.

5. Methodology

As mentioned above, we were able to identify the different groups of rock-cut tombs according to morphological characteristics and the presence or absence of architectural elements by applying statistical analysis of hierarchical clusters. To do this we followed a specific study methodology, which is described in detail in this section. This methodology combined traditional documentation methods (archaeological drawing, detailed photography, compilation of a record sheet) with digital techniques (photogrammetry, GIS and databases). The aim of this section is to outline the registration methodology used to document the rock-cut tombs and then to focus on the study of the carving marks. This will allow us to gain a better understanding of the type of carving marks documented and the type of cave in which they are identified (Groups I, II or III).

The first thing that we did was to consult the *Infraestructura de Dades Espacials de Menorca* (IDE Menorca), a database managed by the Consell Insular de Menorca. It lists all the archaeological structures documented to date and allowed us to select the sites to be included in our archaeological sampling.

The selection of the study sample was based on

– The degree of conservation of the sites: many of them have been affected by erosive processes and are in a virtual state of detachment. For this reason, it is important to take into account the geological aspects and the type of rock surface present in the different parts of the island.

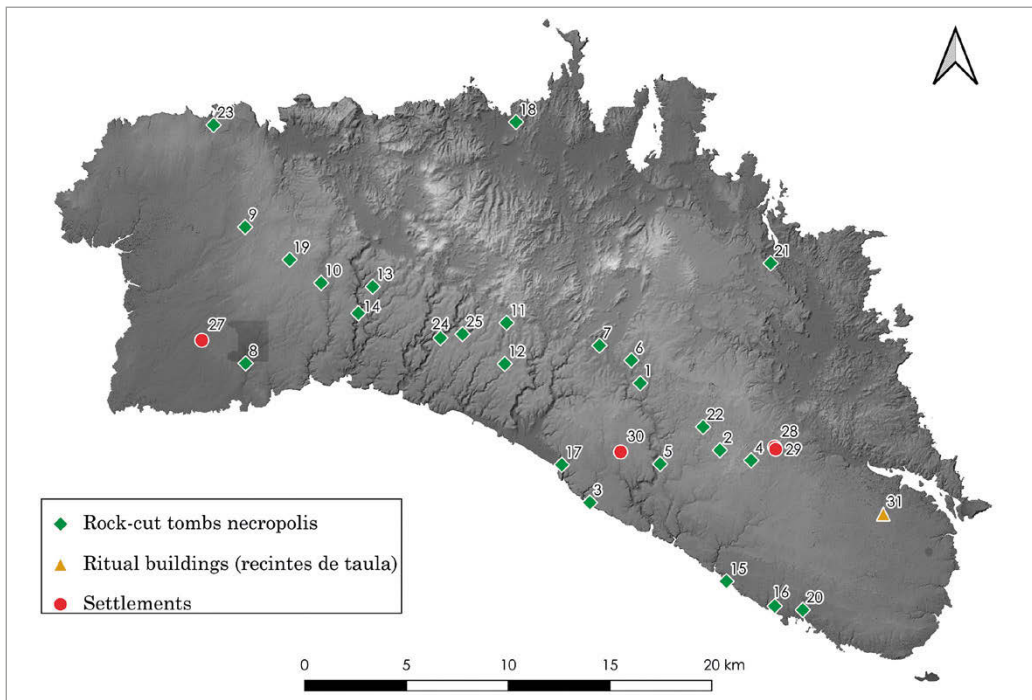


fig. 3. Map showing the archaeological sites mentioned in the text. Rock-cut tomb necropolis: 1. Sa Mola; 2. Cotaina; 3. Torrevella d'Avall; 4. Alcaidús de Dalt; 5. Sant Bartomeu; 6. Biniguarda; 7. Turmadén des Capità; 8. Sa Marjal Vella; 9. Es Tudons; 10. Torreta Saura; 11. Biniatzem; 12. Binicodrell; 13. Algendar Nou; 14. Torrepetxina; 15. Forma Nou; 16. Biniparratx; 17. Son Bou; 18. Binimel·là Vell; 19. Torretrencada; 20. Binisafúller; 21. Addaia; 22. Torralba d'en Salord; 23. Cala Morell; 24. Albranca Nou; 25. La Cova; 26. Calescoves. Settlements: 27. Son Catlar; 28. Sant Vicenç d'Alcaidús; 29. Biniat; 30. Torre d'en Gaumés. Ritual buildings (*recintes de taula*): 31. Trepucó.

– The number of rock-cut tombs: we did not include isolated caves in the area, but we were interested in documenting groups of tombs in order to be able to carry out statistical analyses.

– Accessibility/inaccessibility: it was not always possible to document some of the rock-cut tombs groups by rappelling or removing vegetation, so the sample was conditioned by this factor.

This led us to select 26 case studies (fig. 3), consisting of a variable number of rock-cut tombs¹ (tab. 1). We first carried out archaeological survey or field reconnaissance for archaeological documentation. This consisted mainly of walking around the survey areas to determine the exact location of the caves (access to many of them was hidden by vegetation). Once identified, we mapped each cave in the necropolis with the help of a Garmin GPS. This made it easy to locate the cave (in case the archaeological

¹ In this work, only the rock-cut tomb present in a necropolis, not isolated tombs, is considered. However, it should be noted that there were also natural caves that showed no signs of having been retouched or retouched by the use of artificial techniques.

Necropolis/complex	Municipality	Number of rock-cut tombs
Cala Morell	Ciutadella	14
La Cova – Sa Marjal Vella	Ciutadella	9
Es Tudons	Ciutadella	6
Torreta Saura	Ciutadella	9
Torretrencada	Ciutadella	3
Torrepetxina	Ciutadella	4
Biniatzem	Es Migjorn Gran	13
Binicodrell	Es Migjorn Gran	9
Albranca Nou	Es Migjorn Gran	5
La Cova	Es Migjorn Gran	5
Algendar Nou	Ferrerries	11
Alcaidús de Dalt	Alaior	10
Biniguarda	Alaior	9
Cotaina d'en Carreres	Alaior	6
Sa Mola	Alaior	6
Son Bou	Alaior	12
Sant Bartomeu	Alaior	4
Torralba d'en Salord	Alaior	4
Turmadén des Capità	Alaior	8
Calescoves	Alaior	94
Torrevel·la d'Avall	Alaior	18
Addaia	Es Mercadal	8
Binimel·là Vell	Es Mercadal	9
Biniparratx	Maó	10
Binisafúller	Maó	14
Forma Nou	Maó	19

tab. 1. Analysis of necropolis and number of documented rock-cut tombs in each of them.

documentation had not been completed) and to transfer the data to a GIS², which allowed us to consult the distribution of the tombs that make up the complex.

We then proceeded to the exhaustive documentation of each of the rock-cut tombs. Although the general process we followed is detailed in other papers (Carbonell, 2019; 2020), we will describe here the updated actions for this work. For each of the caves, we filled in a registration form. In this form, we collected information on the presence or absence of certain architectural elements, a brief description of the cave and its state of conservation, an approximate sketch or drawing of the floor plan and sections, or highlights (e.g. the presence of engravings). Then we made a photogrammetric model of the cave, using a tripod to avoid shaking the images, and using flashes attached to the camera in poorly lit areas. Once this was done, we made measurements based on the presence of easily identifiable points inside the cave (we did not use targets, such as those available in Agisoft Metashape, because there were enough natural points to allow us to make measurements).

² In our case we used Quantum GIS and version 3.22 Białowieża. It is free open-source software and can be downloaded from the following link: <https://qgis.org/es/site/forusers/download.html>

With regard to the photogrammetric model, the aim was twofold: on the one hand, to obtain a model to scale that would allow us to make sections to obtain morphological information and, on the other hand, to create a digital database, since many caves are severely affected by erosive and anthropic processes (friability of the rock, contemporary reuse of these spaces³). Although a laser scanner would have provided millimetre accuracy, we were unable to obtain one. However, we do not rule out its use for future studies.

Once the field documentation had been obtained, the work in the laboratory consisted of the processing of all the information. In the case of the photogrammetric models, this was carried out using the Agisoft Metashape software, version 1.5.2, and the sections were obtained using the CloudCompare software⁴. The information obtained from the recording sheets and the detailed photographs was transferred to a database in Access.

Since the main objective of this paper is to deal with the construction process, we will now focus on the formal aspects of the rock-cut tombs and the analysis of the carving marks observed inside them. It should be noted that the friability of the rock in which many of these caves are dug (*marés*) makes it difficult to analyse the carving marks visible on the walls and ceilings of the caves. It was not possible to document carving marks in all the cases studied. Due to the small number of rock-cut tombs in which we were able to observe these marks (tab. 2), the hypotheses we propose here are based on a formal analysis (morphology and directionality) of these marks. In the future, when more case studies are included, a systematic study will be carried out.

A sample of 25 cases was taken for the analysis of carving marks, as it was not possible to clearly identify marks in all the rock-cut tombs studied. The erosion and flaking of the stone surface did not allow us to clearly identify the carving marks in the rest of the caves studied, so we decided to disregard them for inclusion in this paper. The size of the marks was measured with a tape measure, and photographs were taken using a metric scale as a reference. We only considered the width, as the depth was virtually impossible to measure due to erosion. Regarding the classification of the rock-cut tombs (Group type), we follow the classification of the artificial caves proposed by Gornés (1996).

6. Results

From the 25 cases analysed, some questions about the carving marks can be deduced. The presence of linear marks is only documented on the ceilings. The direction of these marks is uneven, they appear in multiple directions and there does not seem to be a specific criterion for their execution.

³ By clicking on the link below, you can see some of the rock-cut tombs that have been included in this study: https://www.google.com/maps/d/edit?mid=1wSdOKVo_v62ZzIH0SIPpnOtLv1oNY1or&usp=sharing

⁴ CloudCompare it is free open-source software and can be downloaded from the following link: <https://www.danielgm.net/cc/>

NECROPOLIS			CARVING MARKS		
Name	ID cave number	Group type	Morphology	Dimensions	Directionality (regarding the walls)
Forma Nou (Maó)	N.7	Group I	Tendency to round	Variable	Indeterminate
			Linear (ceiling)	Indeterminate	Indeterminate
Forma Nou (Maó)	N.8	Group II	Rectangular	2-3 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Forma Nou (Maó)	N.9	Group I	Tendency to round	Variable	Indeterminate (round marks)
			Rectangular (entrance area)	2-3 cm wide	Horizontal (vertical marks)
Forma Nou (Maó)	N.14	Group II	Rectangular	2-3 cm wide	Vertical (wall areas)
Forma Nou (Maó)	N.15	Group II	Rectangular	2-3 cm wide	Vertical (wall areas)
Torrevel·la d'Avall (Alaior)	N.2	Group I	Rectangular	4-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Torrevel·la d'Avall (Alaior)	N.2bis	Group I	Rectangular	4-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Torrevel·la d'Avall (Alaior)	N.14	Group II	Rectangular	4-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Alcaidús de Dalt (Alaior)	N.4	Group I	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular	4-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Alcaidús de Dalt (Alaior)	N.9	Group II	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular (walls)	2-3 cm wide	Vertical (wall areas)
Alcaidús de Dalt (Alaior)	N.10	Group II	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular (walls)	4-5 cm wide	Vertical (wall areas)
Alcaidús de Dalt (Alaior)	N.14	Group II	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular (walls)	4-5 cm wide	Vertical (wall areas)
Calescoves (Alaior)	N.56	Group II-III	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular (walls)	2-3 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)

tab. 2. Case studies of carving marks that have been documented in Menorcan rock-cut tombs (follow).

Algendar Nou (Ferrerries)	N.1	Group II	Rectangular (walls)	2-3 cm wide	Vertical (wall areas)
Algendar Nou (Ferrerries)	N.4	Group II	Linear (lower part of the wall)	Indeterminate	Indeterminate (multiple directions)
Algendar Nou (Ferrerries)	N.6	Group II-III	Rectangular (ceiling and walls)	3-4 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Albranca Nou (Es Migjorn Gran)	N.6	Group I	Tendency to round	Variable	Indeterminate
Sa Cova (Es Migjorn Gran)	N.4	Group II	Rectangular (ceiling and walls)	2-3 cm wide	Vertical (wall areas)
Biniatzem (Es Migjorn Gran)	N.10	Group II-III	Rectangular (ceiling and walls)	3-4 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Binisafúller (Sant Lluís)	N.2	Group II	Rectangular (walls)	3-4 cm wide	Vertical (wall areas)
Son Morell Nou (Ciutadella)	N.1	Group II	Linear (ceiling)	Indeterminate	Indeterminate (multiple directions)
			Rectangular (ceiling and walls)	2-3 cm wide	Vertical (wall areas)
Son Morell Nou (Ciutadella)	N.2	Group II	Rectangular (ceiling and walls)	2-3 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Son Morell Nou (Ciutadella)	N.10	Group II	Rectangular (ceiling and walls)	2-3 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Es Tudons (Ciutadella)	N.1	Group II	Rectangular (walls)	4-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)
Es Tudons (Ciutadella)	N.3	Group II	Rectangular (ceiling and walls)	3-5 cm wide	- Horizontal (connecting areas or corners) - Vertical (wall areas)

tab. 2. Case studies of carving marks that have been documented in Menorcan rock-cut tombs.

On the other hand, the rectangular morphological marks appear indistinctly on the ceiling and on the walls and have homogeneous dimensions in their projection. Examples of this are caves n.2, n.2bis and n.14 in Torrevella d'Avall (Alaior), caves n.6 in Algendar Nou (Ferrerries), n.4 in Sa Cova (Es Migjorn Gran), n.10 in Biniatzem (Es Migjorn Gran), caves n.1 and n.3 in Es Tudons (Ciutadella) or caves n.1, n.2 and n.10 in Cala Morell (Ciutadella).

Based on the aggrupation of the rock-cut tombs by types, I will concentrate here on the explanation of the relationship between the carving marks according to the type of rock-cut tomb. While in the simplest rock-cut tombs (Group I), characterised by smaller volumes without any structural elements, both rounded and rectangular



fig. 4. Carving marks: a-b) Carving marks parallel to the attached pilasters in rock-cut tomb n.14 of Alcaidús de Dalt necropolis; c-d) Carving marks parallel to the wall in rock-cut tomb n.4 of Alcaidús de Dalt necropolis. Own photographs.

carving marks were identified, in Groups II and III only rectangular morphological markings were documented, and they can have different orientations.

If we focus on the interior of the rock-cut tombs related to Groups II and III, we can observe different types of marks depending on the area in which they are located. On the walls and ceiling, we have observed linear and rectangular traces, which show the use of different carving tools. As these are large surfaces, the roughening of the rock was carried out with picks using the perpendicular hammering technique – clearly visible in the traces on the ceiling.

In the case of the walls, different traces are observed, some of which correspond to the same traces observed on the ceiling, but others are also observed in a direction parallel to the wall, so that the striking technique must have been this one; as for the tool used, the documented dimensions (4-5 cm) of the carving traces do not correspond to the width of a straight double-edged carving tool or a carving hammer, so that the tool used could have been a flat-bladed pick or a polka (fig. 4). The change in the technique used to rough the walls shows clear parallels in the quarries: the chisel or carving hammer is usually used for small surfaces, leaving more irregular lines (uneven in length and depth), which in turn alternate with more extensive lines made with a pick (Blondeau, 2020: p. 71). There are also cases, such as the rock-cut tomb n.14 at Torrevella d'Avall, in which longitudinal marks have been documented, the direction and inclination of which seem to indicate the use of some kind of flat-bladed pickaxe.

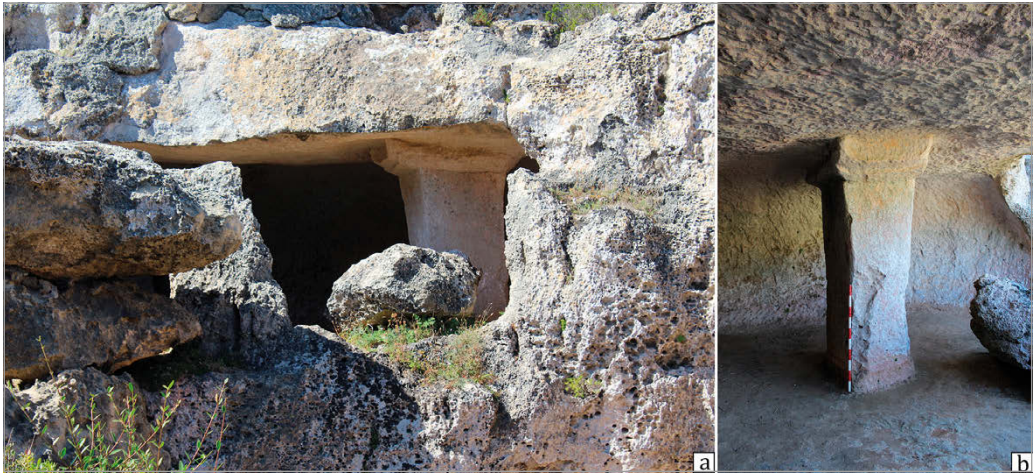


fig. 5. Rock-cut tomb n. 2 of the necropolis of Cala Morell (Ciutadella): a) Exterior view of the rock tomb with the collapsed façade; b) Interior view of rock tomb n. 2 with detail of the central pillar with capital. Own photographs.

On the other hand, we can hypothesise the use of different tools for the finishing of elements such as the pillars and the attached pilasters. As can be seen in the fig. 5, the capitals of the pillars not only have defined right angles, which necessarily had to be pre-determined and marked with a template, but the surface of the stone is completely smooth.

7. Discussion

If we focus on the group of rock tombs belonging to Group I, we can see that the morphology of the carvings in this group tends to be round, the dimensions could not be determined, and they have several directions in which they are oriented, although in some cases they also show rectangular carving marks.

On the other hand, the rock-cut tombs belonging to Groups II and III have morphologically and metrically rectangular carvings. Our hypothesis is that this type of mark could be a chronological indicator in the construction process of the rock-cut tombs. The rounded ones, in relation to the simple-plan rock-cut tombs, could result from the use of stone points, while the rectangular ones could relate to the extended use of iron tools in the carving process. This is something that is also documented in other places, culturally and temporarily different, but more or less related to the same concept of funerary spaces (Porqueddu *et al.*, 2021; Robin & Adams, 2021). In this sense, perhaps some of the rectangular marks present in the rock-cut tombs of Group I can be related to the reuse of the caves over time, thus showing a technological change in the carving of these spaces. In fact, the archaeological artefacts recovered from the rock-cut tombs of groups II and III seem to date these caves from the 7th century and especially in the second half of the 1st millennium BCE (Gornés, 1996: 99).



fig. 6. Carving marks documented on the rock-cut tomb n.14 of the necropolis of Torrevella d'Avall. Own photographs.

There is evidence of the use of these stone tools in a Bronze Age settlement called Sa Mitja Lluna (on the island of Colom, in the north of Menorca), linked to mineral extraction processes. The various archaeological interventions carried out at this site have provided evidence of the autochthonous mining of copper since the Naviform period (Bronze Age) and have allowed researchers to shed light on the production process (Perelló *et al.*, 2014: p. 580). In this sense, stone clubs were used in the extraction of the mineral, some of which show signs of having been sleeved and others of having been used as hand hammers (Hunt *et al.*, 2014: p. 89).

Concerning the use of iron tools, no examples are documented on the island of Menorca, either in domestic or funerary contexts. On the island of Mallorca, however, some tools have been documented, which can provide some chronological information. An example of this is the necropolis of Son Real. Bucket axes and chisels have been documented at this site and have been interpreted by researchers as possible carving tools (Hernández-Gasch *et al.*, 2016: p. 33). In the Son Real necropolis, carving marks have been documented on the walls of the pit-type tombs. These marks were 1 cm wide and the archaeologists correlated them with a specific type of tool, such as the gouge or chisel, present in several tombs of the necropolis (T1, T46, T67 and T83) belonging to Phases I and II, that is, between the 6th and 4th centuries BCE (Hernández-Gasch *et al.*, 2016: p. 33), and also documented in other sites of the same chronological period. In the Son Real necropolis, there are also other types of marks of greater width – 5 or 6 cm – that could be related to the use of heel and ring axes, according to the discovery of a bronze specimen in tomb T61 (Tarradell & Hernández-Gasch, 1998: p. 137).

However, the traces we have documented in the Menorcan rock-cut tombs do not correspond to the use of this type of tool. Likewise, we believe that both the chisels and the bucket axes could be linked to a productive activity related to wood carving or simply have some kind of ritual significance, but we do not believe that they were used for stone carving, due, among other things, to the width of the carving marks



fig. 7. Some examples of the re-use of rock-cut tombs as quarries in recent times: a-b) Examples of stone extraction in rock-cut tomb n.2 of Turmadén des Capità necropolis; c) Example of stone extraction in rock-cut tomb n.2 of Algendar necropolis. Own photographs.

documented: taking fig. 6 as an example, the carving marks are about 4 cm wide and the depth of the visible line is uneven along its length, being deeper in the middle than at the ends.

All of this is intended to highlight the specialised work of stone in the Postalalyotic period and to link it to the productive activities that would characterise the life of this society. One aspect that we have always found interesting is the management of “productive waste”, the management of leftover stone. In certain cultures, such as the Toraja in Sulawesi (Indonesia), it is documented that stones extracted during tomb construction might be repurposed to construct paths along stream banks or reinforce terraces (Robin & Adams, 2021: p. 63). In the Menorcan case, we proposed two options: the extracted stone were either reused as slabs to cover the bodies of the deceased (this is linked to a burial ritual whose process is still unclear), or transported to the settlements and reused in the construction of various buildings⁵.

Such a link between the world of the living and the world of the dead still exists today. Many of the rock-cut tombs are re-used as cattle shelters, others as houses or sheds, and in other cases we also document how blocks were quarried in recent times (fig. 7).

⁵ See the attached video of cave n.15 of the necropolis of Torrevella d’Avall.

8. Conclusions

The study of prehistoric rock-cut tombs on Menorca presents several problems. One of them is the conservation of these spaces, many of which are affected by post-depositional processes (stone erosion and exfoliation, reuse and anthropic modifications).

This paper attempts to approach the knowledge of these burial spaces from a different perspective, looking at how they were built, what techniques and tools were used in their execution. In this sense, based on the necropolis analysed in other works (Carbonell, 2023; 2024), the study has focused on the identification of the carving marks visible in some of them. Since it was not possible to clearly identify the carving marks in all cases, the sample was reduced to 25 study caves belonging to different assemblages or necropolises. As for the carvings in rock-cut tombs, they vary in form and location. Linear marks are found on ceilings, while rectangular marks are found on both ceilings and walls, the latter being more common in structurally complex tombs (Groups II and III).

It should be noted that the study of prehistoric carving marks involves an additional difficulty: the problem of the differentiation of the carving marks due to the persistence of the techniques of stone extraction. The type of picks hardly varies over time. Indeed, the traditional activity of quarrying stones is an excellent example of the survival of techniques and tools until the introduction of mechanical automation. It's not just a curiosity, but proves that stone has played an important role on the island from prehistoric times to the present. Extrapolating C. Salvà's study for the island of Mallorca, the permanence of the quarries has become a symbol of identity (Salvà, 2016). It is part of the landscape and cultural identity of the island of Menorca and reflects one of the most important productive activities of the recent past.

Another aspect that has been proposed in this paper is that the extracted stone was used to construct living structures, mainly domestic spaces, walls and ritualistic enclosures. The visible quarries near the settlements, such as Son Catlar or Torre d'en Gaumés, were used for the extraction of large blocks, orthostats used in the construction of the walls and for the interstate vertical pillars in the walls, which were used to give greater stability to these structures. The stone extracted from the tombs and from the interior of the settlements would have been of medium size and perhaps used as rubble or to raise the perimeter walls.

There is still much to be studied. In this paper we have made a first approach to the study of carving marks and their relationship with the construction processes of these funerary spaces. However, the sample of cases analysed is still insufficient to draw general conclusions. This is therefore a line of research that we will be pursuing in the near future.

Reference list

- Anglada, M., Ferrer, A. & Ramis, D. (2019). Aprofitament de recursos geològics durant la prehistòria de Menorca. In A. Rodríguez Florit, G. X. Pons Buades, & F. de Pablo Pons (Eds.) *Guia de geologia de Menorca: itineraris naturals i culturals* (pp. 187-210). Consell Insular de Menorca, Institut Menorquí d'Estudis.

- Blondeau, C. (2020). Les modalités d'extraction. In P. Rouillard, L. Costa, & J. Moratalla (Eds.) *Des carrières en archipel au pays de la Dame d'Elche (Alicante, Espagne)* (pp. 63-80). Casa de Velázquez.
- Carbonell Pastor, S. (2018). Introducció a la arquitectura funerària menorquina del I milenio a. C. In *Actas XI Jornadas de Jóvenes en Investigación Arqueológica, Tarragona, 9-12 de mayo de 2018* (pp. 115-118). Col·lecció TRAMA, 5. Edicions ICAC.
- Carbonell Pastor, S. (2019). Propuesta metodológica para el estudio de la arquitectura funerària: las necrópolis de hipogeos y sus problemáticas. In E. Cutillas (Coord.) *La Multiplicidad de Enfoques En Humanidades. Actas de Las VIII Jornadas de Investigación de La Facultad de Filosofía y Letras de La Universidad de Alicante (Alicante, 3 y 4 de mayo de 2018)* (pp. 163-170). Publicacions Universitat d'Alacant.
- Carbonell Pastor, S. (2020). Techniques for the Documentation, Registration and Analyses of Rock-Cut Tombs. *Studies in Digital Heritage*, 4(1), 32-50. <https://doi.org/10.14434/sdh.v4i1.30463>
- Carbonell Pastor, S. (2023). *Complejización social y procesos de cambio en el I milenio a.n.e. Un análisis de la sociedad menorquina a partir de su registro funerario*. Doctoral thesis. Universitat d'Alacant.
- Carbonell Pastor, S. (2024). Caracterització arquitectònica dels espais funeraris de Menorca durant l'Edat del Ferro. *Pyrenae*, 55(1), 97-127.
- Costa Ribas, B. & Guerrero Ayuso, V. M. (2002). Balance y nuevas perspectivas en la investigación prehistórica de las islas Pitiusas. In *World Islands in Prehistory: International Insular Investigations. V Deia International Conference of Prehistory* (pp. 484-501). University of Michigan Press. <https://doi.org/10.30861/9781841714738>
- De Cet, M. (2017). *Long-term Social Development on a Mediterranean Island: Menorca Between 1600 BCE and 1900 CE* (Vol. 10 of Human development in landscapes, Universitätsforschungen zur prähistorischen Archäologie). Bonn: R. Habelt.
- Florit Nin, F. & Sauleau Lara, L. (1995). *Pedres de marès. Lithica*. Barcelona: Editorial Lithica i Sa Nostra. Obra Social i Cultural.
- García-López, A. & Martínez, F. P. (2022). El trabajo de la piedra en la Protohistoria balear. Estudio tecnológico y productivo de la arquitectura de Son Catlar (Ciutadella, Menorca). *SPAL*, 31 (2), 75-94. <https://doi.org/10.12795/spal.2022.I31.20>
- Gelabert, S. (2003). La estructura geológica de Menorca: las zonas de Tramuntana y Migjorn. In V. M. Rosselló, J.J. Fornós, & L. Gómez-Pujol (Eds.) *Introducció a la geografia física de Menorca* (pp. 39-48). Monografia de la Societat d'Història Natural de les Balears, 10. AGE.
- Gómez Bellard, C. & San Nicolás Pedraz, M. P. (1988). La Prehistoria de Ibiza y Formentera: estado actual de la investigación. *Trabajos de Prehistoria*, 45, 201-228.
- Gornés Hachero, J. S. (1992). *Análisis funerario de la necrópolis talayótica de Cales Coves, Menorca*. Memòria de llicenciatura inèdita, Universitat Complutense de Madrid.
- Gornés Hachero, J. S. (1994). *Análisis funerario de la necrópolis talayótica de Cales Coves, Menorca*. Memoria de licenciatura inèdita. Universidad Complutense de Madrid.
- Gornés Hachero, S. (1996). Arqueología de la muerte y cambio social. Análisis e interpretació de la necrópolis de Cales Coves, Menorca. *Complutum*, 7, 91-103.
- Gornés Hachero, S., Gual Cerdó, J. & López Pons, A. (1992). Hipogeos talayóticos del Hierro en Menorca. Un problema de cambio y/o respuesta cultural. *Revista de Arqueología*, 33, 77-94.
- Gornés, S., Gual, J. & Gómez, J. (2006). Avanç dels context arqueològics de la cronologia absoluta de l'hipogeu XXI de Calascovas. *Mayurqa: Revista Del Departament de Ciències Històriques i Teoria de Les Arts*, 31, 165-182.
- Gornés Hachero, J. S. & Gual Cerdó, J. M. (2018). *L'hipogeu XXI de la necrópolis de Calascovas*. Serie Monogràfica MATerialidades: Perspectivas actuales en cultura material, 2. Edicions UIB.
- Guerrero Ayuso, V.M., Calvo Trias, M. & Salvà Simonet, B. (2002). La cultura talayótica. Una sociedad de la Edad del Hierro en la periferia de la colonización fenicia. *Complutum*, 13, 221-258.

- Guerrero Ayuso, V. M., Calvo Trias, M., & Gornés Hachero, J. S. (2006a). *Historia de las Islas Baleares. El poblamiento prehistórico de las islas Baleares* (tomo 1). Edicions de Turisme Cultural.
- Guerrero Ayuso, V. M., Calvo Trias, M. & Gornés Hachero, J. S. (2006b). *Historia de las Islas Baleares. Mallorca y Menorca en la Edad del Hierro. La cultura Talayótica y Postalayótica* (tomo 2). Mallorca: Edicions de Turisme Cultural. Illes Balears.
- Hernández-Gasch, J. & Quintana, C. (2013). Cuando el vino impregnó la isla de Mallorca: El comercio púnico-ebusitano y las comunidades locales durante la segunda mitad del siglo V y el siglo IV a.C. *Trabajos de Prehistoria*, 70(2), 315-331. <https://doi.org/10.3989/tp.2013.12115>
- Hernández-Gasch, J., Munar Grimalt, M. & Burgaya Martínez, B. (2016). *Intervenció arqueològica a la necròpolis de Son Real (Cementiri dels Fenicis). Santa Margalida, Mallorca, any 2016. Expedient Patrimoni Històric del Consell de Mallorca: 222/2016.*
- Hunt Ortiz, M. A., Llull Estarellas, B., Perelló Mateo, L. & Salvà Simonet, B. (2014). Aprovechamiento de recursos cupríferos en la Edad del Bronce de Menorca: la mina de Sa Mitja Lluna (Illa d'en Colom). *CPAG*, 24, 19-30.
- Kopper, J. S. & Rossello-Bordoy, G. (1974). Megalithic Quarrying Techniques and Limestone Technology in Eastern. *Journal of Field Archaeology*, 1(1), 161-170.
- Lull, V., Micó, R., Rihuete Herrada, C. & Risch, R. (1999). *La Cova des Càrritx y la Cova des Mussol. Ideología y sociedad en la prehistoria de Menorca*. Barcelona: Consell Insular de Menorca.
- Perelló Mateu, L., Llull Estarellas, B. & Hunt Ortiz, M. A. (2014). Minería histórica y prehistórica en Illa d'en Colom (Mahón, Menorca). In *Actas Del XV Congreso Internacional Sobre Patrimonio Geológico y Minero (XIX Sesión Científica de SEDPGYM, Logrosán)* (pp. 569-588).
- Pérez-Juez, A. & Goldberg, P. (2018). Evidence of quarrying at the iron age site of torre d'en Galmés, Menorca, Spain. *Boletín Geológico y Minero*, 129(1-2), 353-370. <https://doi.org/10.21701/bolgeomin.129.1.014>
- Plantamor, L. (1991). *Arquitectura prehistórica i protohistórica de la isla de Menorca*. Conselleria de Cultura, Educació i Esports, Govern Balear.
- Plantamor Massanet, L., Tanda, G., Tore, G., Baldaccini, P., Del Vais, C., Depalmas, A., Marras, G., Mameli, P., Mulé, P., Oggiano, G. & Spano, M. (1999). Cap de Forma (Menorca): la navigazione nel Mediterraneo occidentale dall'età del Bronzo all'età del Ferro: nota preliminare. *Antichità Sarde*, 5, 11-160.
- Plantamor Massanet, L., Pons Machado, O., & Herranz Febrer, M. (2007). Museu de Menorca. Projecte Forma 2000. Excavació del pati de la Cova N. 7. In *L'Arqueologia a Menorca: Eina per al coneixement del passat* (pp. 111-124). Consell Insular de Menorca.
- Pons, G.X. & Gómez-Pujol, L. (2003). Introducción al medio físico de Menorca. In V.M. Rosselló, J.J. Fornós, L. Gómez-Pujol (Eds.) *Introducción a la geografía física de Menorca* (pp. 1-30). Monografía de la Societat d'Història Natural de les Balears, 10. AGE.
- Porqueddu, M.-E. (2018). *Bâtir sous terre: Architectures et techniques des sépultures collectives hypogées de Méditerranée occidentale à la fin de la Préhistoire*. Doctoral thesis. Aix-Marseille Université/ Università degli Studi di Sassari
- Porqueddu, M.-E. (2023). Savoir-faire and technical environment: rethinking the emergence of rock-cut tombs in the Neolithic Mediterranean. In *From Quarries to Rock-cut Sites. Echoes of Stone Crafting*. Sidestone Press. <https://doi.org/10.5964/lbg20ace>
- Porqueddu, M.-E., Bailly, M., Margarit, X., Fallavollita, P. & Melis, M. G. (2021). From Surfaces to Tools: Traceology and Experimental Analysis of Digging Techniques of Mediterranean Rock-Cut Tombs. In C. Sciuto, A. Lamesa, K. Whitaker, & A. Yamaç (Eds.), *Carved in Stone. The archaeology of rock-cut sites and stone quarries* (pp. 9-22). BAR International Series: Vol. 3054.
- Porqueddu, M. E., Sciuto, C. & Lamesa, A. (2023). Reconsidering the Chaîne Opératoire: At the Crossroad Between People and Materials. *Open Archaeology*, 9(1). <https://doi.org/10.1515/par-2022-0296>

- Ramon, J. (2017). Pecios y ¿colonias? Materiales púnicos en las Islas Baleares. In F. Prados, H. Jiménez & J. J. García (Coords.) *Menorca entre fenicios y púnicos* (pp. 41-84). Publicaciones del CEPOAT.
- Robin, G. & Adams, R. (2021). Creating a Rock-Cut Tomb in Traditional Tana Toraja (Sulawesi, Indonesia): An Ethno-Archaeology of Stone Economy and Ritual. In C. Sciuto, A. Lamesa, K. Whitaker, & A. Yamaç (Eds.) *Carved in Stone. The archaeology of rock-cut sites and stone quarries* (pp. 49-67). BAR International Series: Vol. 3054.
- Salvà Matas, C. (2016). Cartografía de la Memoria. Lectura de los rastros de paisaje de las canteras de marès de Mallorca. *Labor & Engenho*, 10(1), 60-73. <https://doi.org/10.20396/l&e.v10i1.8644330>
- Salvà Matas, C. (2021). *La memòria d'un paisatge gravat: les pedreres de marès, empremta territorial del paisatge identitari de Mallorca*. Tesis doctoral. Universitat Politècnica de Catalunya, Departament d'Urbanisme i Ordenació del Territori.
- Tarradell i Mateu, M. & Hernández-Gasch, J. (1998). *Son Real. Necrópolis talayótica de la edad del hierro. Catálogo e inventarios (Arqueomediterrània): Vol. II*.
- Veny, C. (1974). El conjunto de cuevas artificiales de Biniparratx (Menorca). In *Prehistoria y arqueología de las Islas Baleares: VI symposium de prehistoria peninsular* (pp. 181-208). Universitat de Barcelona, Instituto de Arqueología y Prehistoria: Caja de Ahorros y Monte de Piedad de las Baleares.
- Veny, C. (1982). La necrópolis protohistórica de Cales Coves (Menorca). *Bibliotheca Praehistorica Hispana*, 20. Editorial CSIC.

