

# PROVENANCE OF SOME ANCIENT MARBLES FROM EL PLA DE SES FIGUERES (CABRERA, BALEARIC ISLANDS, SPAIN)

A. Álvarez, I. Rodà, M. Riera Rullan, A. Gutiérrez García-M., A. Domènech and H. Royo

## Abstract

El Pla de ses Figueres is an archaeological site located next to the harbour of Cabrera, a small island of 1836 ha situated in the south of the Balearic Islands group. Several field surveys and archaeological excavations have brought into light the important human occupation of this place between the 5<sup>th</sup> and the 7<sup>th</sup> centuries AD. At the pieces of land excavated so far, a salting (food-processing) area, a possible workshop for the production of purple and a necropolis have been identified. An attempt to identify the provenance of a few marble fragments found during the latest excavations has been undertaken by means of direct and microscopic (petrographic) observation and cathodoluminescence (CL) analysis. The results point to the presence of both imported and Hispanic marbles at this small island: next to the Docimeion and grecco scritto mensae and basins, a shapless fragment of marble probably from the Almadén de la Plata, in southern Spain, has been identified.

## Keywords

Marbles, Balearic Islands, necropolis, Bizantine monastery, petrography, cathodoluminescence.

## Pla de Ses Figueres and its context

In this work we present six fragments of objects made with white and coloured marbles that were found in this site thanks to the excavations undertaken within the project funded by the Town Council of Palma de Mallorca during the last 10 years in order to retrieve, consolidate and put into display the Bizantine monastery at Cabrera (“Recuperació, consolidació i museïtzació del

monestir bizantí de l'illa de Cabrera”). This project is lead by Maria Magdalena Riera Frau and Mateu Riera Rullan, and in the last four years has also been sponsored by the Ministry of Environment (Ministerio de Medio Ambiente) through the National Park of Cabrera (Parc Nacional de Cabrera).

Pla de ses Figueres is an archaeological site located next to the harbour of Cabrera, a small island of 1836 ha and situated in the south of the Balearic Islands (Fig. 1). It starts right at the present coastline and it extends at least 150 m inland. It is situated at the area where most of the land suitable for cultivation of Cabrera is. The typical vegetation of the area consists of Mediterranean scrub, which is highly affected by agricultural activities that took place until to a relatively recent time. In order to exploit the soil for agriculture, it was necessary to built farm terraces to level the ground and increase the arable area.

The existence of this site was first acknowledged by M. Trias when he mentioned the presence of important remains of “a big village” at the port of Cabrera where *Terra Sigillata* pottery was found out of context (on surface) (Trias 1974, 38). Following this, during the summer of 1979 Dr. Víctor Guerrero recorded “ceramic remains essentially fragments of *Terra Sigillata Clara D*<sup>1</sup> and early Christian lamps, among the ruins near the roadstead of the current harbour” (Guerrero 1985, 148). Although these two authors do not specify more than the location of these remains, as we know so far, everything suggests that both referred to what we know as the site of Pla de Ses Figueres.

In 1992, Maria José Hernández and Drs. Margarita Orfila and Miquel Àngel Cau published a new study of the site (Hernández *et al.* 1992, 213-222). In it, three new areas were put into light. One was related to “a possible salting (food-processing) factory”, called Sa Plageta,



FIG. 1. Cabrera and the Balearic Islands. Design: UDG-ICAC.

1. This type of African *Terra Sigillata* is the most common one during the 4<sup>th</sup> to 7<sup>th</sup> centuries.

where a total of 12 possible, cut into the rock or built with stones and mortar and coated with *opus signinum* deposits of various sizes were identified. All of them were close to one another, and right in the shoreline (Hernandez *et al.* 1992, 216-217). The other two areas, called Es Povet and Camí Can Feliu, considered as “possible villages”, were located a little more inland. No building structure could be identified there (Hernandez *et al.* 1992, 200) but abundant pottery sherds dating between the 6<sup>th</sup> and 7<sup>th</sup> centuries AD were collected on the surface (Hernandez *et al.* 1992, 220).

Finally, in the mid 90s, along the tasks of cataloguing archaeological areas for the review of the General Urban Plan of Palma (“Pla General d’Ordenació Urbana de Palma”), it was possible to protect the entire extension of Pla de Ses Figueres, which embraced the three areas exposed by the mentioned authors, i.e. Hernandez, Cau and Orfila (Riera Rullan 2001, 68-71; 2002, 24-66; 2005b, 191-206). In fact, one of the tasks undertaken within the project has been the exhaustive survey of the site of Pla de Ses Figueres in order to find its limits with as much detail as possible. In addition, six archaeological test pits have been undertaken. Thanks to all these works, we are able to define in a fairly approximate way the extension of the site as it was in ancient times (Riera Rullan 2009a, 40-41) (Fig. 2).

The high amount of 5<sup>th</sup>- to 7<sup>th</sup>- centuries pottery found on surface in an area of dispersion of about 10 ha is certainly surprising. The common presence of cooking wares, fine wares and large containers seem to indicate the existence a group of dwellings or houses at the area that has been interpreted as a possible monastery where a monastic community inhabited during the Late Antiquity (Riera Rullan 2001, 71-72; 2002, 111-115; 2005a, 2008). Indeed, the presence of a monastic community is mentioned by Pope Gregory the Great at the Epistle XIII, 47, which dates from 603 AD (Amengual 1991, 382 - 398 and 528-529; Riera Rullan 2002, 16-18 and 110; Riera Frau and Riera Rullan 2005a, 190).

Nevertheless, the presence of earlier Roman remains at Pla de Ses Figueres is worth mentioning. Among them, a fragment of an honorary or funerary plaque (Riera Rullan *et al.* 2004; Riera Rullan and Ramis 2008, 22), of the 1<sup>st</sup> or 2<sup>nd</sup> century AD and made of sandstone, stands out; it reads:

∩  
P · IVLIO · [---]  
EROTI+ [---]  
+++ [---]  
[-----]

Currently, besides the salting factory already mentioned (Hernandez *et al.* 1992; Riera Frau and Riera Rullan 2004), we can confirm the existence of a possible workshop of purple production (Riera Frau and Riera Rullan 2005b, 2005c) and of an accumulation of shells of purple dry murex (*Murex species*) (Riera Rullan 2009b,

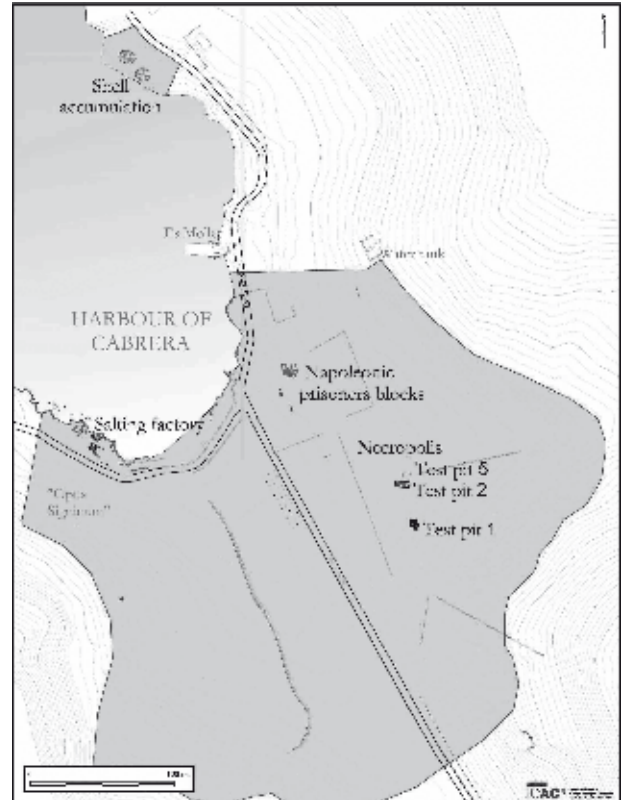


FIG. 2. Pla de ses Figueres. Design: UDG-ICAC.

40, 95 and 96; 2010, 593) which all seem to have been in use during the Late Antiquity. Also, it is interesting to note that a necropolis closely linked to the monastic community of Cabrera has been identified (Riera Frau and Riera Rullan 2005c; Riera Rullan 2009a, 78-88; 2009b, 99-101; 2010).

### The marbles and their study

The six fragments here presented have the traits and facture typical of ancient times and were recovered at the same site: one within the salting workshop (E0042-06-37-11) and the other five near the necropolis (Fig. 3). Unfortunately, they were all found at surface levels or contexts of contemporary date, which makes it difficult to propose a date for them.

Its presence at Pla de Ses Figueres is nevertheless interesting as there are no marble outcrops at the island and, therefore, they must have come from other places through maritime commerce or distribution. To determine whether they came from nearby areas (i.e. the Iberian Peninsula) or further away places might give some more light to the understanding of the monastic community that received and used them. Hence, this very preliminary study was focused on determining their provenance.

The methodology used was based on two types of observations: the characterization of macroscopic (stereomicroscope) and analysis by optical microscopy (pet-

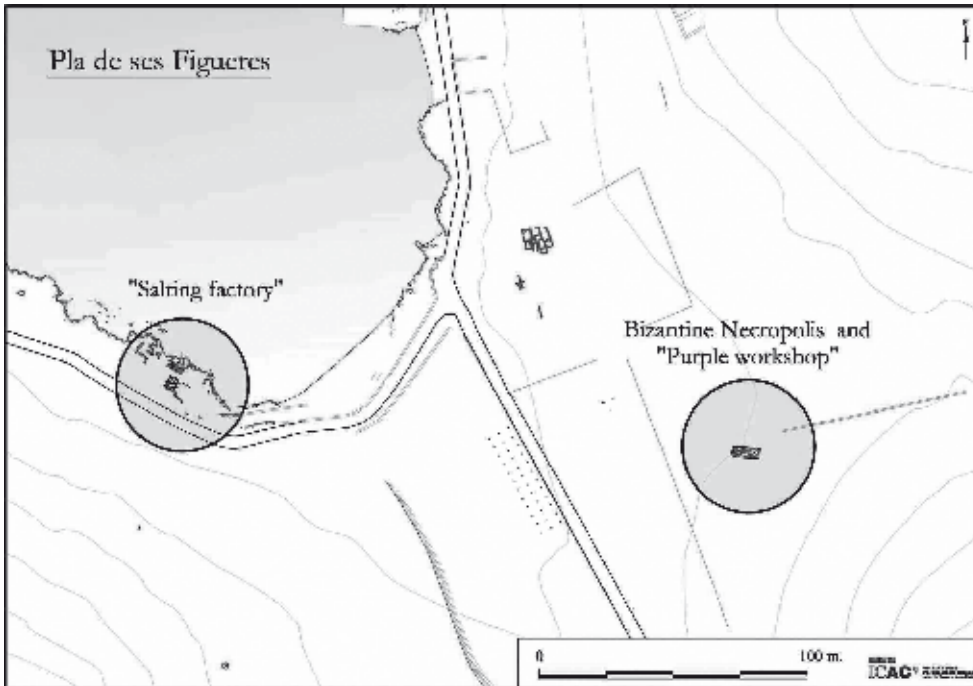


FIG. 3. Areas of Pla de ses Figueres where the marble fragments were found. Design: UDG-ICAC.

rographic microscope)<sup>2</sup>. Nevertheless, their response to the cathodoluminescence (CL) analysis was also considered. Provenance determination is based on the petrographic comparison to our own samples collection<sup>3</sup> and CLmicrofacies were checked with those available applied to several classical quarrying areas in Greece, Italy and Turkey (Barbin *et al.* 1989, 1991, 1992a, 1992b) and in Hispania (Lapiente *et al.* 2000; Lapiente and Blanc 2002; Alvarez *et al.* 2009b).

The set of marbles can be divided in two groups: the first one includes those for which a macroscopic observation was enough to identify them, while those marbles for which a petrographic analysis was necessary form the second one. The fragments included in this second group are white marbles, while the other ones present some macroscopic traits that enable a macroscopic identification.

### Description of the marble fragments

#### Group 1

**E0042-06-P** and **E0042-06-06**: The first one is a *mensae* fragment with two mouldings. It is 8,8cm long; 6cm wide; and 2,6cm maximum high. The second one is a shapeless fragments of 3,8cm long; 2,5cm wide; and

1,02 cm high (Fig. 4). They are both elaborated with a white, medium grain size marble with small, irregular and short veins of grey/dark grey colour. Their traits strongly point at it being grecco scritto marble, which probably comes from near Annaba, Cap de Gard, Algeria<sup>4</sup>.

#### Group 2

**E0042-07-370**: Shapeless fragment. It is 11,7 cm long; 9,8 cm wide; and 3,6 cm high (Fig. 5). It is a white marble of medium- to large-grain size with a very homogeneous appearance (with no shades, veins or other traits). The petrographic analysis of this marble shows that it is a coarse to medium-grained marble and MGS of 2,3 mm; with a carbonate composition and heterogranular, seriated grains. The calcite crystals have amoeboid shapes and irregular boundaries (the contacts between the grains are very imprecise). There are signs of curving of the twinned crystals planes as well as of intergranular reaction (microgranulation). Also, a slight orientation of the crystals can be observed at this sample. Small grains of quartz are present in association with the fine fractionated calcite crystals (Fig. 5). Its cathodoluminescence has homogeneous distribution with orange colour and high intensity luminescence, bright limits but not completely around the crystals, and a few areas with higher

2. The equipment used to carry out the macroscopic observations is a binocular microscope ZEISS Stem 2000-C equipped with light arms ZEISS KL1500LCD. The preparation of thin sections was carried out at the Preparation of Thin Sections Laboratory, Department of Geology at the Universitat Autònoma de Barcelona (UAB). To perform the microscopic observations and descriptions, a polarized light microscope NIKON Eclipse 50iPOL was used. The microphotographs were undertaken by using a camera NIKON COOLPIX5400 coupled to the previously mentioned microscope via an adapter Lens NIKON COOLPIX MDC. An Optical Cathodoluminescence CL8200 MK5 connected to a polarized light microscope NIKON Eclipse 50iPOL has been used to perform the cathodoluminescence analysis.

3. LEMLA (Laboratory for the Study of Marbles and other Lithic materials in Antiquity) of the Universitat Autònoma de Barcelona (Spain).

4. Nevertheless, the recent discoveries on a possible Ephesian origin of grecco scritto presented at this same Conference and recently published might modify this assumption (Attanasio *et al.* 2012; Yavuz *et al.* 2011).

5. The correspondence is especially strong with sample 5415 of LEMLA.



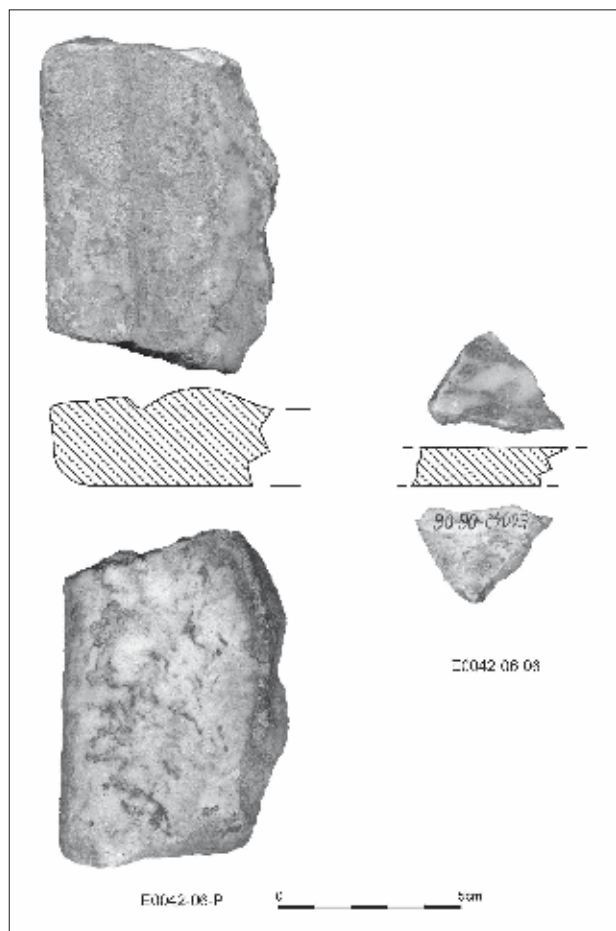


FIG. 4. Marble fragments E0042-06-P and E0042-06-06. Design: Mateu Riera.

luminescence related to recrystallization processes. It has no luminescent points corresponding to small crystals of quartz.

All these elements point to the marbles from the area of Almadén de la Plata (Sevilla, Spain). Their main characteristics, medium- to coarse-grained, MGS of 2,0 mm, carbonate composition, presence of quartz, microstructures of deformation and CLmicrofacies as those described in Lapuente *et al.* (2000), perfectly match the traits shown by this sample. The petrographic comparison of this sample with reference samples from the quarries of Almadén de la Plata<sup>5</sup>, reinforces this interpretation.

**E0042-00, E0042-PF-94 and E0042-06-37-11:** The first fragment (E0042-00) belongs to a circular or globular basin. Its dimensions are: 11,5 cm long; 10,8 cm wide; and 6,5 cm high. In its central part is 2,4 cm thickness, although it is 3,4 cm thick in the extreme

part (Fig. 6). The second one (E0042-PF-94) is a fragment of a *mensae* with a molding. It is 5,3 cm long; 7,9 cm wide; and 1,8-2,6 cm high (Fig. 7). The third one (E0042-06-37-11) is also a *mensae* fragment but it shows a certain curvature and has three moldings. It is 10,7 cm long; 9,8 cm wide; and 1,9-3,2 cm high (Fig. 8).

They were all elaborated with white, medium-grained marble<sup>6</sup>. The petrographic analysis of these fragments shows that they were all calcitic marbles of a heterometric (fine to medium-grained) seriated granulometry; with a MGS of 1,3, 0,8 and 1,3 mm respectively. The calcite crystals have rectilinear borders but an irregular shape. They present polysynthetic twinings which are slightly deformed in samples E0042-00 and E0042-PF-94 while sample E0042-06-37-11 does not show any deformation. Also, one of them shows some triple points of recrystallisation (E0042-PF-94). The crystals do not present a preferred orientation. Scattered, small, rounded grains of detrital quartz can be observed (Figs. 6, 7 and 8). Their cathodoluminescence is heterogeneous. There are areas with dark red colour and medium intensity luminescence while other areas show red colour and medium-high intensity luminescence. Distribution of the luminescence is related to recrystallization processes. They also show several partial relict dark shadows in crystals.

It is a marble of calcitic composition which does not seem to have an Hispanic origin by visual examination. In fact, both its main traits as well as the comparison with samples from the major quarries used in Antiquity, strongly indicate that this marble belongs to that of Docimeion (current Iscehisar), near Afyon (Turkey)<sup>7</sup>.

## Conclusions

The marble objects found at Pla de Ses Figueres were produced in three different types of marble. Even though they were all foreign to the island of Cabrera, it is worth stressing that they are all geographical areas very distant among them.

The techniques applied<sup>8</sup> so far suggest that one of them could have been elaborated in marble from Almadén de la Plata, which crops out at Los Covachos mountain range and nearby hills (especially at Castillejos) of the Sierra Norte, in Sevilla (southern Spain) (Beltrán *et al.* 2012; Beltrán and Rodríguez 2011; Ontiveros *et al.* 2012). Even though it is not the only white marble exploited at the Baeticae province of Hispania, the

6. In sample E0042-00, scattered large to very large grains were also visible but they seem to belong to a recrystallized calcite vein.

7. The correspondence is especially strong with sample AFI-10058 of the Laboratory of the Achaemetric Studies Unit (Unitat d'Estudis Arqueomètrics) of the ICAC.

8. Although petrographically it matches with Almadén de la Plata features, we must be cautious about this provenance as: a) it is a very small sample from which it is difficult to infer the real macroscopic features of the marble, b) it comes from a contemporary-date context and c) no other evidences of the arrival of this marble at Cabrera have been found. Therefore, further analysis must be applied in order to confirm this provenance.

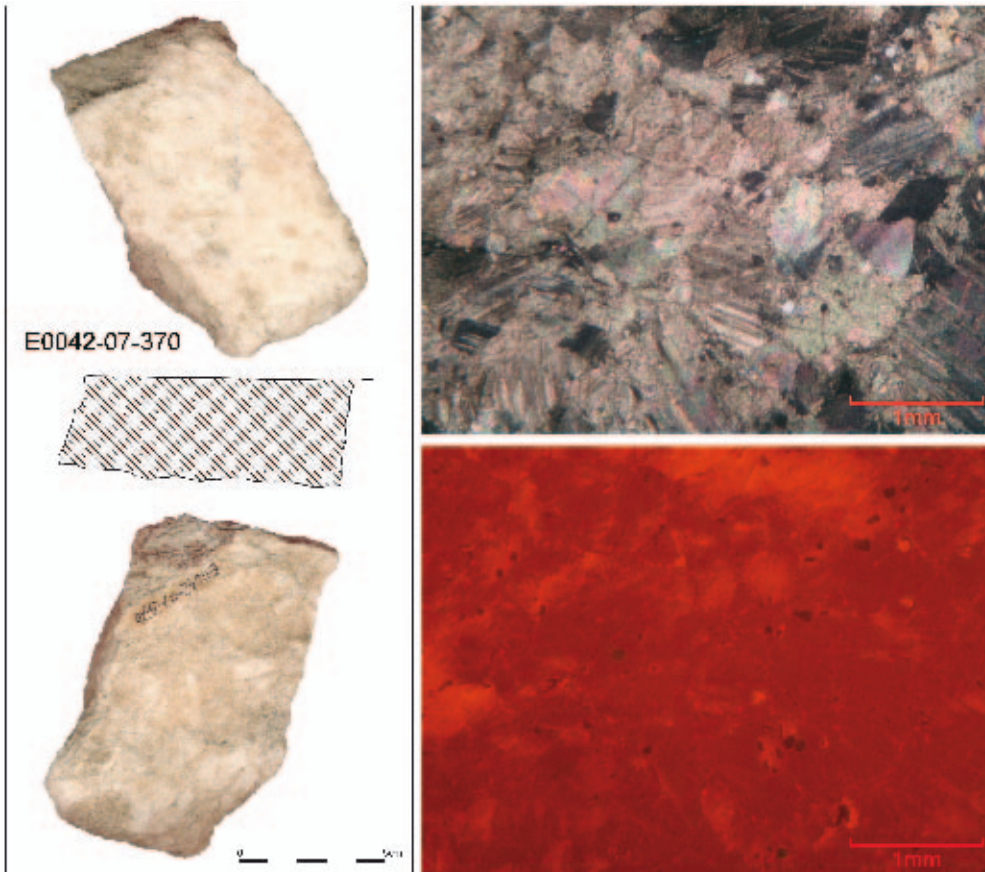


FIG. 5. Marble fragment E0042-07-370: macroscopic (left) and microscopic (right, above) features and cathodoluminescence response (right, below). Design: Mateu Riera. Photos: UEA-ICAC.

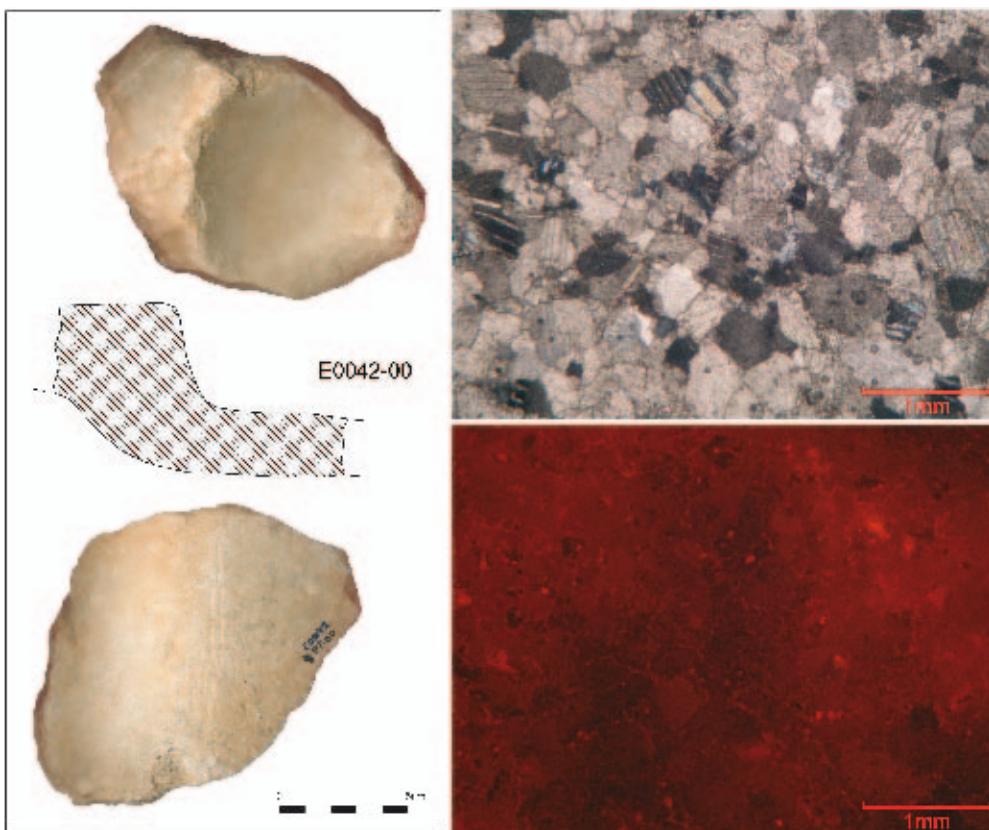


FIG. 6. Marble fragment E0042-00: macroscopic (left) and microscopic (right, above) features and cathodoluminescence response (right, below). Design: Mateu Riera. Photos: UEA-ICAC.



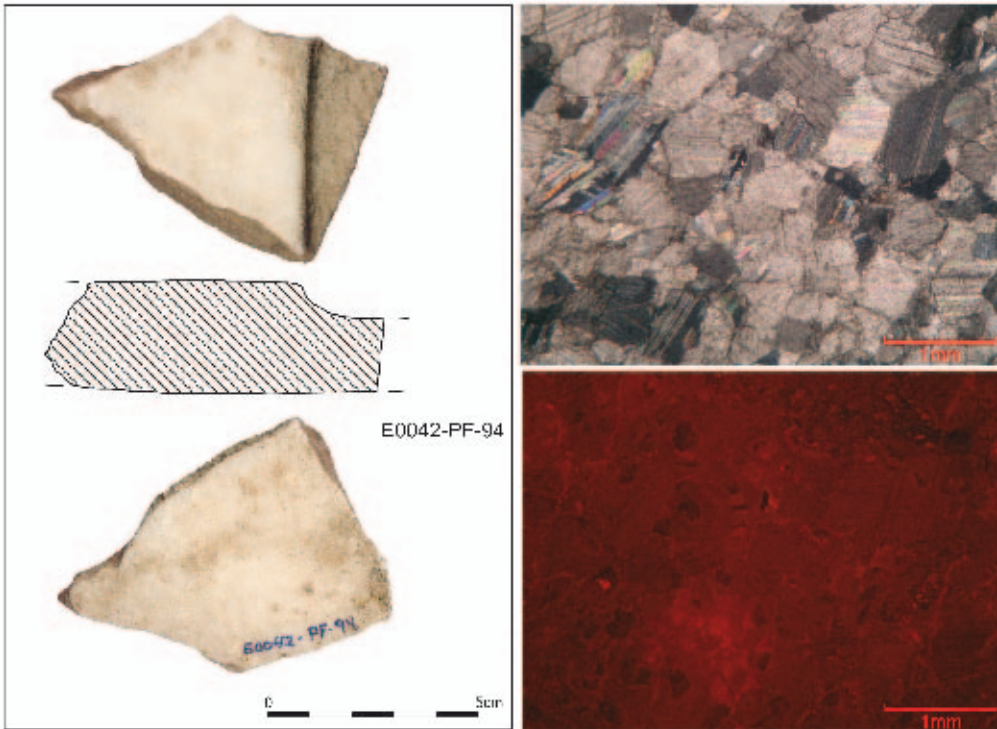


FIG. 7. Marbre fragment E0042-PF-94: macroscopic (left) and microscopic (right, above) features and cathodoluminescence response (right, below). Design: Mateu Riera. Photos: UEA-ICAC.

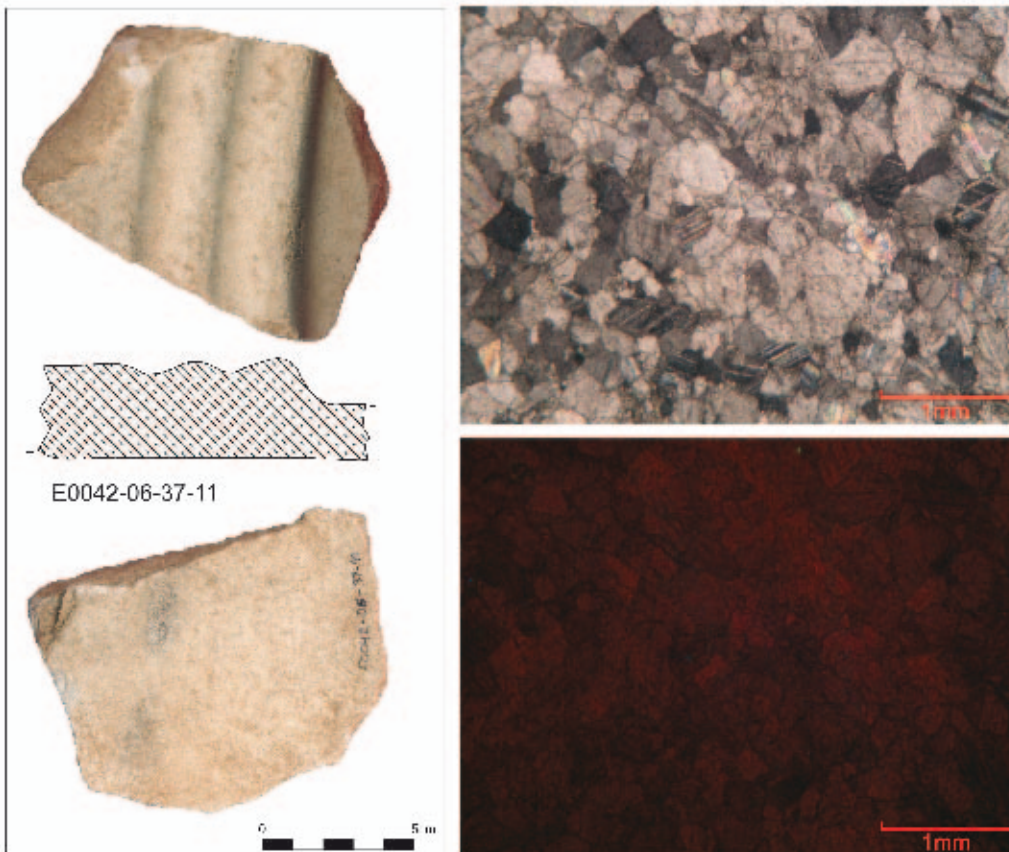


FIG. 8. Marbre fragment E0042-06-37-11: macroscopic (left) and microscopic (right, above) features and cathodoluminescence response (right, below). Design: Mateu Riera. Photos: UEA-ICAC.

currently available evidence strongly points at the fact that it was one of the major Hispanic marble resources in use in Roman times. Indeed, this marble was exploited from as far back as Late Augustan times and it was widely used throughout southern Spain; examples of its use in sculptures, architecture and epigraphy can be found at Italica (modern Santiponce), Hispalis (modern Sevilla), Corduba (modern Cordoba), Carmo (modern Carmona), Mulva (Villanueva del Río y Minas), Astigi (modern Écija), Baelo Claudia (Bologna, Cadiz) (Álvarez *et al.* 2009b, 24). Nevertheless, its use further away from its place of origin has been also attested, not only at other parts of the Iberian Peninsula (Segóbriga) but also in northern Africa<sup>9</sup> (Álvarez *et al.* 2009a; Beltrán *et al.* 2010, 64). This wide distribution, which was possible thanks to its location near a navigable river (the Baetis, modern Guadalquivir) which made it easy its integration into broad trade routes, and the identification of a *statio serrariorum Augustorum* at Almadén de la Plata (*CIL* II 1131 = González 1991, 390) confirms the importance of this material in Hispania. Therefore, although further evidence (either from analysis and/or the archaeological record) is needed to support it, our sample seems to put forward the possibility of this marble arriving to the Balearic Islands.

On the other hand, objects made with marbles from the eastern Empire also arrived at Cabrera. The fact that two *mensae* and a basin made of white marble from Docimeion (modern Iscehisar), near Afyon (Turkey) is worth highlighting. The case of the two fragments of greco scritto, a *mensa* and a shapeless piece, is somehow controversial in view of the new data on the existence of the extraction of greco scritto type marble at the area of Hasançavuslar, near the ancient town of Ephesos (Turkey). Although these fragments were easily identified macroscopically as greco scritto, the assumption of them being from Cap de Garde, near ancient Hippo Regius (Algeria) is not so straightforward (cf. Pensabene 1976, 177-190; Gnoli 1988, 261; Borghini 2004, 237; Antonelli *et al.* 2009, Hermann *et al.* 2012), especially after the fact that new archaeometric data demonstrates that most of the greco scritto marble originated from Ephesos and not from north African quarries (Attanasio *et al.* 2012; Yavuz *et al.* 2011).

As already mentioned, the lack of a stratigraphic context or other dating evidence for these fragments is an important drawback to attest the time of which these marbles arrived at Cabrera. However, all the data from Pla de Ses Figueres we have so far suggests that the vast majority, if not all of them, were in use during the Late Antiquity.

Other than that, we might highlight the following aspects. Firstly, three examples from the six under study are Docimeion marble. As already stated in the literature, the circulation of this material through the territories of the Roman Empire was very wide and the eastern coast of the inland Spain is not an exception. Next to it, greco scritto marble is the most attested, with a *mensae* and a shapeless fragment (E0042-06-P and E0042-06-06)<sup>10</sup>. And last but not least, there is one single fragment of possible Almadén de la Plata marble; if this provenance is confirmed, it will significantly add to the maritime distribution of this marble (i.e. not only to closer coasts, as the northern African one, but to further away places).

In the second place, the import of different varieties of marbles of different provenances is a further demonstration of the importance of the Cabrera archipelago within the shipping routes in Antiquity (Riera Rullan 2002, 60-10; 2005b, 177-180). Thus, we can infer that in spite of its very small size, Cabrera was part, either direct or indirect, of the Mediterranean marble trade network during Late Antiquity.

Furthermore, one issue that remains unsolved is whether these *mensae* or the basin, as well as a small column made in marble from the latest excavations campaigns which is currently under study, could have been part of some kind of building of the monastic community of Cabrera that was destined to worship.

Finally, even though by now they are merely working hypothesis and more data is needed (not only from the analysis but also from the field archaeology) to achieve solid and further considerations, it is still important to highlight the existence of such small but significant assemblage.

## References

- ANTONELLI, F.; LAZZARINI, L.; CANCELLIERE, S.; DESSANDIER, D. 2009: "Minero-petrographic and geochemical characterization of 'greco scritto' marble from Cap de Garde, near Hippo Regius (Annaba, Algeria)", *Archaeometry* 51/3, 351-365.
- ÁLVAREZ, A.; CEBRIÁN, R.; RODÀ, I. 2009a: "El mármol de Almadén de la Plata y los marmora importados del foro de Segóbriga", in NOGALES T.; BELTRÁN, J. (eds.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania romana*, Roma, 101-120.
- ÁLVAREZ, A.; DOMÈNECH, A.; LAPUENTE, P.; PITARCH, À.; ROYO, H. 2009b: *Marbles and Stones of Hispania (exhibition catalogue)*, Institut Català d'Arqueologia Clàssica, Tarragona.

9. As Prof. E. Papi presented at the Conference *Marmora Baeticae et Lusitaniae* held in Sevilla and Mérida in 2006 in his lecture "*Marmora Mauretaniae Tingitanae*".

10. The possibility of them belonging to the same object cannot be dismissed, and moreover, it must be remembered that they were found at the same area of the site. Greco scritto has been identified at several sites of the eastern coast of Spain such as the towns of Tarraco and Carthago Nova as well as the Roman villae of Els Munts and els Antigons, near Tarraco, or Can Modolell, near Iluro (Álvarez *et al.* 2006; Otiña 2002; Álvarez and Mayer 1998; Soler 2005). Examples of the use of greco scritto in further away from the Spanish coast are the examples of the roman villae of La Vega (Bazalote, Albacete) and Santa Rosa (Corduba) (Gutiérrez Deza 2005; Sarabia and Muñoz 2005).

- ÀLVAREZ, A.; GUTIÉRREZ GARCIA-M., A.; PITARCH, À. 2006: *Informe de l'inventari preliminar dels materials lapidis procedents de la Vil·la dels Antigons (Reus, Baix Camp)*, Tarragona [Unpublished report].
- ÀLVAREZ, A.; MAYER, M. 1998: "Aproximació als materials lapidis decoratius presents al jaciment de Can Modolell (Cabrera de Mar, Maresme). Estudi volumètric i comparatiu", in: *De les estructures indígenes a l'organització provincial romana de la Hispania Citerior. Jornades Internacionals d'Arqueologia Romana*, Barcelona, 43-49.
- AMENGUAL, J. 1991: *Els orígens del cristianisme a les Balears*, Palma.
- ATTANASIO, D.; YAVUZ, A.B.; BRUNO, M.; HERRMANN, J.J.Jr.; TYKOT, R.; VAN DEN HOEK, A. 2012: "On the Ephesian origin of the greco scritto marble", in this volume.
- BARBIN, V.; RAMSEYER, K.; DÉCROUEZ, D.; HERB, R. 1989: "Marbres blancs: caractérisation par cathodoluminescence", *Comptes Rendus de l'Académie des Sciences Paris*, t. 308, série II, 861-866.
- BARBIN, V.; RAMSEYER, K.; BURNS, S.J.; DÉCROUEZ, D.; MAIER, J.L.; CHAMAY, J. 1991: "Cathodoluminescence signature of white marble artefacts", *Materials Research Society Symposium Proceedings* 185, 299-308.
- BARBIN, V.; RAMSEYER, K.; FONTIGNIE, D.; BURNS, S.J.; DÉCROUEZ, D. 1992a: "Differentiation of blue-cathodoluminescing white marbles", in: WÄELKENS, M.; HERZ, N.; MOENS, L. (eds.), *Ancient Stones: Quarrying, Trade and Provenance*, Acta Archaeologica Lovaniensia Monographiae 4, Leuven, 231-235.
- BARBIN, V.; RAMSEYER, K.; DÉCROUEZ, D.; BURNS, S.J.; CHAMAY, J.; MAIER, J.L. 1992b: "Cathodoluminescence of white marbles: an overview", *Archaeometry* 34, 175-183.
- BELTRÁN, J.; LÓPEZ ALDANA, P.; LÓPEZ, J.M. 2010: "La cantera romana de "Los Covachos" (Almadén de la Plata, Sevilla). El uso del láser-escáner con un objetivo arqueológico", *VAR. Virtual Archaeology Review* 1/2, 63-66.
- BELTRÁN, J.; RODRÍGUEZ, O.; LÓPEZ ALDANA, P.; ONTIVEROS, E.; TAYLOR, R. 2011: "Las canteras romanas de mármol de Almadén de la Plata (Sevilla)", in: GARCÍA-ENTERO, V. (ed.), *El marmol en Hispania: explotación, uso y difusión en época romana*, Murcia, 239-256.
- BORGHINI, G. (ed.) 2004: *Marmi antichi*, Roma.
- CIL II = *Corpus Inscriptionum Latinarum* vol. II.
- GNOLI, R. 1988: *Marmora Romana*, Roma.
- GONZÁLEZ, J. 1991. *Corpus de inscripciones latinas de Andalucía. I: Sevilla. II*, Sevilla.
- GUERRERO, V. M. 1985: *Indigenisme i colonització púnica a Mallorca*, Ses Salines.
- GUTIÉRREZ DEZA, M.I. 2005: "El opus sectile de la Villa de Santa Rosa, Córdoba", *Anales de Arqueología Cordobesa* 16, 55-64.
- HERNÁNDEZ, M<sup>a</sup>.J.; CAU, M.A.; ORFILA, M. 1992: "Nuevos datos sobre el poblamiento antiguo de la isla de Cabrera (Balears). Una posible factoría de salazones", *Saguntum* 25, 213-222.
- HERMANN, J.J.Jr.; ATTANASIO, D.; TYKOT, R.H.; VAN DEN HOEK, A. 2012: "Characterization and distribution of marble from Cap de Garde and Mt. Filfila, Algeria", in this volume.
- LAPUENTE, P.; BLANC, PH. 2002: "Marbles from Hispania: scientific approach based on cathodoluminescence", in: HERRMANN, J.J.Jr.; HERZ, N.; NEWMAN, R. (eds.), *ASMOSIA 5: Interdisciplinary Studies on Ancient Stone*, London, 143-151.
- LAPUENTE, P.; TURI, B.; BLANC, PH. 2000: "Marbles from Roman Hispania: stable isotope and cathodoluminescence characterization", *Applied Geochemistry* 15, 1469-1493.
- ONTIVEROS, E.; BELTRÁN, J.; TAYLOR, R.; RODRÍGUEZ, O.; LÓPEZ ALDANA, P. 2012: "Petrography and elemental geochemistry of the Roman quarries of Los Castillejos and Los Covachos (Almadén de la Plata, Seville, Spain). Outcrops and semi-elaborated products", in this volume.
- OTIÑA, P. 2002: "Los materiales lapídeos de la villa de Els Munts (Altafulla)", *Butlletí Arqueològic (Reial Societat Arqueològica de Tarragona)* V (24), 111-130.
- PENSABENE, P. 1976: "Sull'impiego del marmo di Cap de Garde. Condizioni giuridiche e significato economico delle cave di età imperiale", in: GUERRINI L. (ed.), *Scritti in memoria di Giovanni Becatti. Studi Miscelanei* 22, Roma, 179-190.
- RIERA FRAU, M. M.; RIERA RULLAN, M. 2004: "Campanya d'excavacions arqueològiques de 2003 en la 'factoria de salaons' del Pla de Ses Figueres (Cabrera, Balears). Les troballes d'època antiga", *Butlletí de la Societat Arqueològica Lul·liana* 60, 337-372.
- 2005a: "El monasterio de la isla de Cabrera", *Mallorca y Bizancio. Cuadernos de historia* nº 2, 189-200.
- 2005b: "Un possible taller de producció de porpra de l'antiguitat tardana al Pla de ses Figueres (illa de Cabrera)", *Butlletí de la Societat Arqueològica Lul·liana* 61, 377-390.
- 2005c: "Excavacions arqueològiques a la necròpolis de l'antiguitat tardana del Pla de ses Figueres (illa de Cabrera): Campanyes 2003-2004", *L'Antiguitat clàssica i la seva pervivència a les illes Balears, XXIII Jornades d'Estudis Històrics Locals*, Palma de Mallorca, 501-514.
- RIERA RULLAN, M. 2001: "L'ocupació de Cabrera: Segles V-VII", in: PONS, J.M.; RIERA FRAU, M.M.; RIERA RULLAN, M., *Història i Arqueologia de Cabrera*, Palma Ciutat Educativa. Col·lecció Eines 6, Palma de Mallorca, 65-72.
- 2002: *El monestir de Cabrera a l'Antiguitat Tardana*, Universitat Autònoma de Barcelona. [MA dissertation]
- 2005a: "La ceràmica del Pla de ses Figueres. Noves dades del monestir de l'illa de Cabrera (Illes Balears)", *VI Reunió d'Arqueologia Cristiana Hispànica*, Barcelona, 195-203.
- 2005b: "Excavacions arqueològiques a l'illa de Cabrera (Illes Balears). Recerques sobre la comunitat monàstica de l'Antiguitat Tardana", *Butlletí Arqueològic de*



- la Reial Societat Arqueològica Tarraconense*, Època V, núm. 27, 175-219.
- 2008: “Dades arqueològiques dels monjos de Cabrera”, *Cabrera. Els tresors de l'illa*, Palma de Mallorca, 23-26.
  - 2009a: *Investigaciones arqueológicas sobre el monasterio de época bizantina del archipiélago de Cabrera (siglos V a VII d. C.)*, Madrid.
  - 2009b: “Enterramientos de la Antigüedad Tardía en las islas de Cabrera y Mallorca”, in: LÓPEZ QUIROGA, J.; MARTÍNEZ TEJERA, A. M. (ed.), *Morir en el Mediterráneo Medieval. Actas del III Congreso Internacional de Arqueología, Arte e Historia de la Antigüedad Tardía y Alta Edad Media peninsular (17 y 18 de Diciembre de 2007)*. BAR International Series 2001, Oxford, 99-151.
  - 2010: “Pla de ses Figueres (isla de Cabrera – Balears)”, *El tiempo de los “bárbaros”. Pervivencia y transformación en Galia e Hispania (ss. V-VI D.C.)*, *Zona Arqueològica* 11, 591-594.
- RIERA RULLAN, M.; RAMIS, D. 2008: “La prehistòria i l'Antiguitat clàssica”, *Cabrera. Els tresors de l'illa*, Palma de Mallorca, 15-22.
- RIERA RULLAN, M.; SÁNCHEZ LEÓN, M.L.; FÀBREGUES POMER, M.; GARCÍA RIAZA, E. 2004: “Dues inscripcions d'època antiga de l'illa de Cabrera (arxipèlag de Cabrera, Illes Balears)”, *Butlletí de la Societat Arqueològica Lul·liana* 60, 325-332.
- RODRÍGUEZ, O.; BELTRÁN, J.; LÓPEZ ALDANA, P.; ONTIVEROS, E.; TAYLOR, R. 2012: “The Almadén de la Plata quarries (Seville, Spain): new data from the recent archaeological interventions”, in this volume.
- SARABIA, J.; MUÑOZ, F.J. 2004-2005: “Los mármoles de La Vega (Balazote, Albacete). Tipos y morfología”, *Lucentum* 23-24, 157-163.
- SOLER, B. 2005: “Una sistematización del empleo del marmor y su comercialización en Carthago Nova”, *Mastia* 4, 29-64.
- TRIAS, M. 1974: “Una campanya a les illes de Cabrera”, *Endins* 1, 33-55.
- YAVUZ, A.B.; BRUNO, M.; ATTANASIO, D. 2011: “An updated, multi-method database of Ephesos marbles, including white, *greco scritto* and *bigio* varieties”, *Archaeometry* 53/2, 215-240.