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RADIOCARBON DATING OF A LATE ANTIQUE NECROPOLIS FROM FELANITX (MALLORCA, BALEARIC ISLANDS)

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ABSTRACT. The excavation of a building in the village of Felanitx in the eastern part of the island of Mallorca (Balearic Islands) has revealed the existence of a small necropolis. The inhumations did not provide grave goods except for a bronze belt buckle for which the typological study suggests a Late Antique chronology. The stratigraphical sequence however seems to suggest a possible evolution of the space across time since some graves are cut by others. In order to obtain an absolute date for the necropolis and to verify if there are chronological differences between the graves, a total of 6 human bones samples have been ^{14}C dated by AMS. The results of the radiocarbon dating confirm a Late Antique chronology (4th to 7th century AD) for the graves but do not suggest a chronological evolution. Despite the fact that the knowledge of the necropolis is still fragmentary, the results are extremely important because they provide an absolute date for a Late Antique necropolis in the Mallorcan rural area.

KEYWORDS: cemetery, dating, human remains, island.

INTRODUCTION

The Balearic Islands are located off the coast of the Iberian Peninsula in the Western Mediterranean and occupied a strategic position along the ancient maritime routes that connected Italy with Hispania and Africa with Galia. In the 4th century AD, the Balearics became an independent province within the Roman Empire, and the vast period of transformation into the Medieval Ages was marked by successive Vandal (AD 455), Byzantine (AD 534), and Muslim (AD 902/903) conquests of the islands (Amengual 1991–1992). Until relatively recently Late Antiquity was one of the lesser known periods in the history of the Balearics, but over the last few decades growing interest in Late Antiquity has allowed major advances in the knowledge of this period, which was marked by significant transformations of old Roman structures and the spread of Christianity. While it is true that significant progress has been made in the study of the early Christian churches (e.g. Ulbert 2003; Cau et al. 2012, 2013), pottery assemblages (e.g. Cau 2003; Cau et al. 2014) and settlement patterns (e.g. Mas Florit and Cau 2011, 2013; Mas Florit and Cau Ontiveros 2019), the excavation and analysis of rural necropolises is lacking. Study of early Christian necropolises is largely focused on the cemeteries linked to rural early Christian churches (e.g. Navarro 1988; Riera 2009). Currently, as it relates to the island of Mallorca, there are no studies of necropolises at rural sites, although it is worth noting that this could be influenced by the fact that only a few rural sites have been partially excavated (e.g. Orfila 2009; Palomar et al. 2013; Mas Florit et al. 2015). Field survey, occasionally combined with geophysical prospection, however, has helped identify other potential rural sites (Mas Florit et al. 2018).

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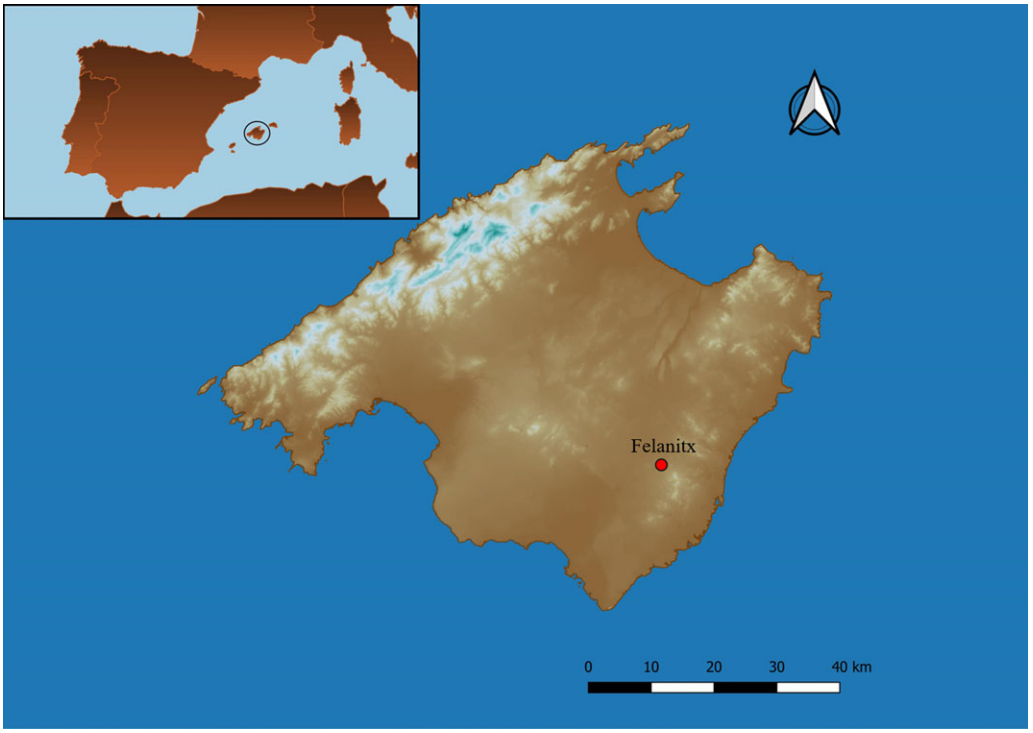

Figure 1 Location of Felanitx in Mallorca in the Balearic Islands (Spain) in the Western Mediterranean.

The village of Felanitx lies in a rural area in the eastern part of the island of Mallorca and is home to approximately 17,000 inhabitants (Figure 1). There is evidence of prehistoric and Roman occupation, including one of the few examples of Roman rural *villae*—called Can Maiol—partially excavated only a few miles away from the current village (Orfila 1993). The centre of the village has also revealed evidence of Roman activity, although the nature and extent of the Roman settlement is still difficult to establish due to a lack of systematic investigation.

A rescue excavation brought about by major renovations of one of the buildings in the village (in the 4th of *31 de març* street) documented a stratigraphical sequence with several phases, which included evidence of the Roman past. Notably, the ceramic materials recovered from different pits included large quantities of common and cooking wares, some of which presented clear signs of over-firing. This suggests the nearby presence of a ceramic workshop dated to the Early Roman period which was possibly connected to a Roman *villa* or some other form of rural settlement. In this excavation, the remains of 17 different graves were also identified. The typology of the graves and a revision of the stratigraphical sequence suggests a Roman or late antique chronology for the graves. The inhumations did not provide grave goods except for a bronze belt buckle for which the typological study undoubtedly suggests a late antique chronology.

The stratigraphical sequence suggests the possibility that the space evolved over time since some graves were cut by others. Additionally, the use of a single grave with several inhumations was investigated. In order to obtain an absolute dating for the necropolis and to verify if there are chronological differences among the graves, a total of six human bone

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samples have been radiocarbon dated by AMS. Given that late antique rural necropolises in Mallorca are understudied (Navarro 1988; Riera 2009) and that very few examples have been radiocarbon dated (Cau et al. 2014), this investigation filled crucial gaps in our knowledge of this topic.

THE NECROPOLIS

The excavation revealed that much of the plot was altered due to construction linked to modern features such as cisterns, septic tanks and sewers, although underneath a necropolis of inhumation burials (Figure 2) was uncovered which cut the natural terrain and layers from the Roman period. The stratigraphical sequence outlines four main different phases. Phase 4 is represented by contemporary construction dated to 1945 with different renovations throughout the 20th century. A second phase (Phase 3) was probably linked to a leveling of the area and its use as a cultivation field between the 16th and the 18th centuries. Phase 2 corresponds to the necropolis of inhumation burials presumably related to the late antique period. Finally, Phase 1 is the Roman occupation with important ceramic deposits mostly dated to the 2nd century AD, including, as we have already mentioned, common and cooking ware wasters from a pottery workshop that was presumably located in the vicinity, likely belonging to a Roman *villa*.

Phase 2, the necropolis containing a total of 17 graves, is the focus of this article, of which 12 graves were excavated (Figure 2). Of these, number 13 and 14 were documented in the stratigraphic profile of a cesspool, number 15 in the stratigraphic profile of the elevator hole and number 16 and 17 at the boundaries of the excavation area of the site. In the case of graves 16 and 17 a full excavation was not possible; however, during the cleaning of the profiles of tombs number 14 and 15, some skeletal remains were recovered that have been included in the anthropological study.

The graves consist of long pits in the ground with the head normally wider than the foot, and probably covered with flagstones suspended in a lateral step, as it can be clearly seen in Grave 1 for instance (Figure 3). In this particular case, the perimeter was also delimited with an alignment of small stones. It is possible that the flagstones of many graves were destroyed when this area of the village was used as a cultivation field in the past. The graves located towards the northeast were also poorly preserved due to the construction of the contemporary building. In general, the skeletons appeared in a poor state of preservation. Graves 2, 3, and 7 were not completely excavated as they continued underneath the limits of the building. Other graves were damaged by recent structures and layers (Graves 4, 5, 8, and 9).

The orientations of the graves were predominantly NW to SE (Graves 2, 3, 6, 7, 8, 11, 12) and SW to NE (Graves 1, 4, 5, 10). Individuals all appear buried in supine decubitus position with the lower limbs extended. The upper limbs appear mostly extended along the body, although there are also cases in which one or both hands rest on the pelvis. As far as the type of burial is concerned, these are individual tombs with the exception of tombs 7 and 8, which are multiple burials containing 2 and 8 individuals, respectively. In Grave 6, the skeleton was relatively well-preserved, and it seems to belong to an infant (SU 1016). Grave 7 is a collective grave with a minimum of two individuals consisting of a juvenile individual buried in supine position (SU 1024) and deposited at the bottom of the grave, and an infant inhumation (SU 1023) with the head over the pelvis of the first individual and the limbs extended towards the lower part of the grave. The bones appeared in a good state of preservation. Grave 8 was also a collective burial

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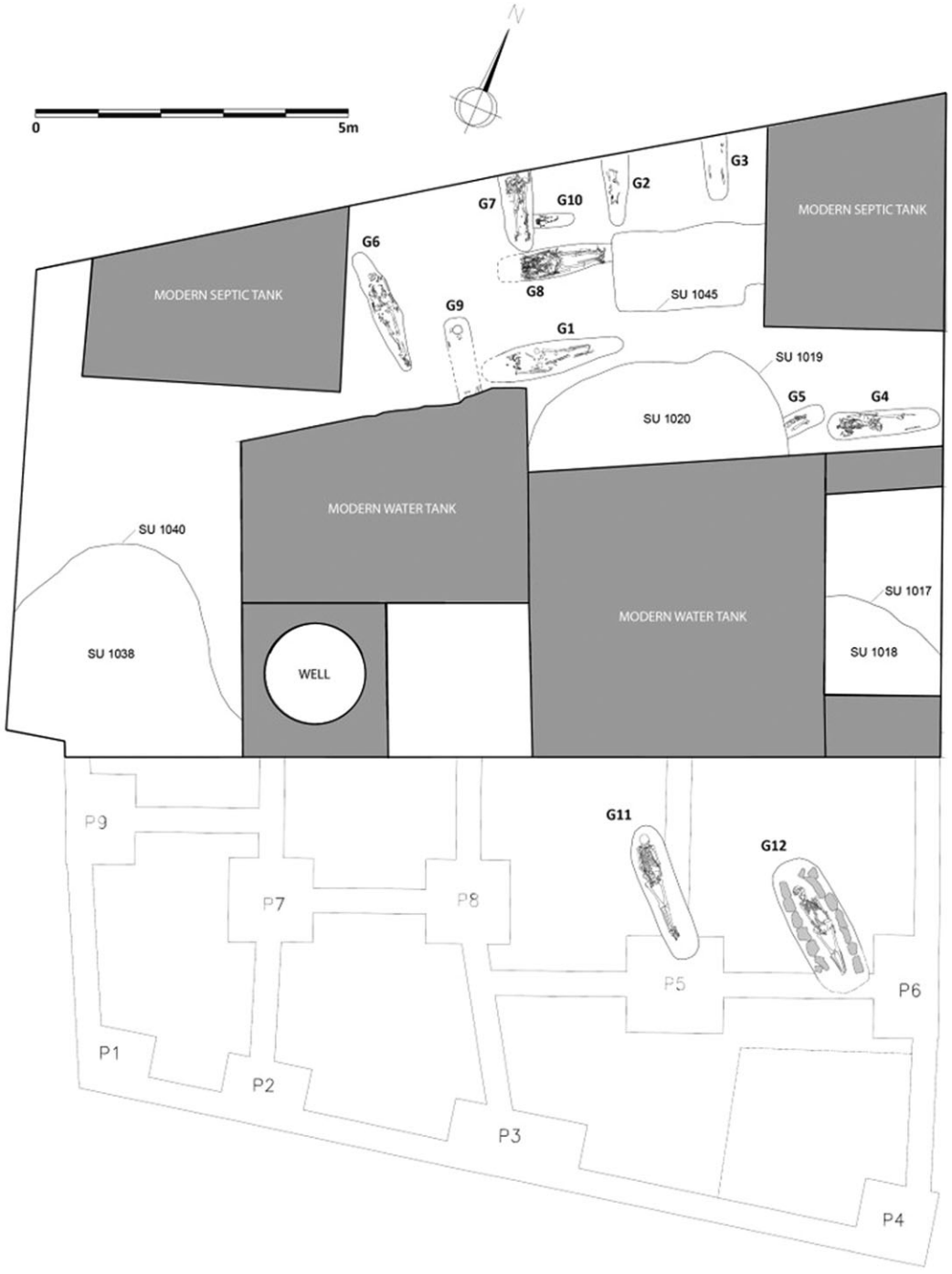

Figure 2 Plan of the excavations of the building with the necropolis in the center of Felanitx.

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Figure 3 Grave covered with flagstones.

with a minimum number of 8 individuals (Figure 4). Located in the upper part of the grave was a perinatal semi-articulated but incomplete individual (SU 1041). Below there was an infant/juvenile individual articulated but again incomplete (SU 1027). Next the skeleton of an adult individual, probably a male, was found in good condition (SU 1042). Finally, lying at the bottom of the grave was another individual partially articulated (SU 1043). The rest of the individuals, up to eight in number, were identified after the excavation following an anthropological study, and were represented by only a few bones. During the excavation of the fill of Grave 4 a white *tessera* from a mosaic was recovered. In general, there were no grave goods except for a belt buckle found in Grave 8 that was relatively well-preserved.

Physical anthropology reveals that of the 17 documented tombs remains have been recovered in 14 of them, and a total of 22 individuals have been studied. By sex, 6 female individuals, 5 male, and 11 indeterminate have been documented, most of them being sub-adult individuals. The morphology of the skull and postcranial skeletons correspond to a Mediterranean-type population. The most abundant pathologies are those related to age (degenerative), some arthropathies and dental diseases, as well as some traumas. The number of individuals from the Felanitx necropolis is low, so it is not sufficient enough to provide conclusive data on some aspects of this population.

MATERIALS AND METHODS

A total of six human bone samples from six different individuals coming from four different graves were selected for radiocarbon dating. The archaeological information of the samples under examination is provided in Table 1. All samples come from inhumation burials. The selection of the samples was made following the stratigraphical sequence of the site to verify whether or not these were synchronous burials, and considering also the state of preservation of the inhumations. In this way, we selected three individuals (SU 208, 625, and 1013) from three different graves (Grave 1, 5, and 12 respectively). In addition, with the specific aim of investigating if there were meaningful differences in the date of the

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Table 1 Main archaeological information of the necropolis, indicating those that have been radiocarbon dated. Sample characteristics.

Grave	SU	Orientation	Age	Sex	NMI
1	208	SW–NE	Adult	Indeterminate	1
5	1013	SW–NE	Juvenile	Indeterminate	1
8	1043	SW–NE	Adult	Female	8
	1041		Fetus (38–40 weeks gest.)	Indeterminate	
	1027		Infant I (5 years)	Indeterminate	
12	625	NW–SE	Adult	Female	1

Figure 4 Detail of Grave 8 collective.

inhumations found in the multiple burial (Grave 8), we sampled three bones from three different individuals buried in the same grave, considering its relative physical position inside the grave and the state of preservation.

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The samples were ^{14}C dated by AMS at the Dating Laboratory of the Royal Institute for Cultural Heritage, KIK-IRPA (RICH) in Brussels, Belgium (Boudin et al. 2015). They were subjected to a pretreatment to eliminate all exogenous contaminants like chemical compounds of different age or contamination due to handling after the exhumation of the material and to retrieve the pure collagen of the bones used for dating. The superficial adhesions and the patina covering the surface of the bone fragments were removed with a metal brush and the remains of adhesive were removed by abrasion. Then the bones were fragmented in a longitudinal axis to remove soil and other impurities from the inner part. Finally, the material was ground to a granulometry of less than 250 μm.

The bone material was treated with hydrochloric acid 1% to eliminate the bone mineral fraction and potential carbonates from groundwater. An additional wash with 1% NaOH to remove humic acids was carried out. The hydrolysis was applied at 90°C for 10 hours at pH3 (Longin 1971). The samples were dried by freeze-drying and the C:N ratio was measured.

Hereafter, samples were transferred into quartz tubes with CuO and Ag and combusted to CO_2. Graphitization of CO_2 was carried out using H_2 over a Fe catalyst. Targets were prepared at the Royal Institute for Cultural Heritage in Brussels (Belgium) following Van Strydonck and Van der Borg (1990–1991) and dated by AMS using a MICADAS (Boudin et al. 2015). A small part of the collagen sample was used for C:N ratio using a Thermo-Flash EA/HT elemental analyzer (Thermo Fisher Scientific, Bremen, Germany). Standards used were IAEA-N1, IAEA-C6, and internally calibrated acetanilide. The analytical precision was smaller than 0.25‰ for both $\delta^{13}C$ and $\delta^{15}N$ values, based on multiple measurements.

RESULTS OF THE ^{14}C DATING

Although bone collagen is not susceptible to carbon exchange with the environment, sometimes the formation of humic-protein compounds is possible. Due to the fact that the humic acids from soils normally exhibit a different age with respect to the bone, this could result in a rejuvenation or ageing of the results and, consequently, a corruption of the radiocarbon result. In addition, as it is well-known, the probability of a humic acid protein complexation increases with the degree of decay of the bone, which is evident with a low content of collagen (Boudin et al. 2017).

Since the collagen content in the dated bones is low (Table 2) (well preserved bones have a collagen content above 2%), it was necessary to test the bone quality by measuring the C:N ratio (Van Klinken 1999). For well-preserved fossil bones the collagen C:N ratio must be between 2.9 and 3.6 (de Niro 1985), while fresh bone collagen has a C:N ratio of 3.1:3.2. The table shows that the experimental value and the C:N ratio referring to material does not exceed the critical interval (Table 2), which demonstrates the absence of humic-protein compounds in the collagen used for dating and provides greater confidence in the accuracy of the data for the radiocarbon dates obtained. It has to be noted, however, that De Niro's criterion holds for the C:N ratio in the case of stable isotope studies, but radiocarbon analyses are much more sensitive to contamination. RICH-22367 yielded very few collagen (< 0.1%, out of 3 g bones). The collagen was white and fluffy and indicates good quality.

The stable isotope data are represented in Table 2. The average $\delta^{13}C$ and $\delta^{15}N$ values for this dataset are respectively –18.5 ± 0.4 and +11.1 ± 1.1. This result is comparable with the average values ($\delta^{13}C$ –19.2 ± 0.5 and $\delta^{15}N$ 11.1 ± 1.1) for late prehistory (the last 5 centuries BC) (Van Strydonck et al. 2005). The results are also comparable with the Medieval Christian sites (Van

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Table 2 Calibration of the radiocarbon dates.

Sample no.	Lab no.	Age (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	%C	%N	% collagen yield	Calibrated age OxCal v 4.3.2
UE-1027 Grave 8	RICH-23354	1518 ± 30	–18.1	+11.4	3.2	18.7	6.9	1.49	68.2% probability 439 AD (2.1%) 443 AD 474 AD (6.8%) 486 AD 535 AD (59.4%) 598 AD 95.4% probability 428 AD (27.7%) 495 AD 507 AD (67.7%) 611 AD
UE-1041 Grave 8	RICH-22359	1538 ± 30	–18.6	+12.1	3.3	26.6	9.3	1.65	68.2% probability 432 AD (40.7%) 490 AD 532 AD (27.5%) 566 AD 95.4% probability 427 AD (95.4%) 589 AD
UE-1043 Grave 8	RICH-22360	1623 ± 30	–19.0	+10.8	3.3	23.9	3.3	3.36	68.2% probability 391AD (42.5%) 431AD 492AD (25.7%) 530AD 95.4% probability 355 AD (1.6%) 365 AD 381 AD (93.8%) 538 AD
UE-1013 Grave 5	RICH-22361	1385 ± 31	–18.1	+12.1	3.2	39.1	14.3	4.40	68.2% probability 633 AD (68.2%) 657 AD 95.4% probability 604 AD (95.4%) 677 AD
UE-208 Grave 1	RICH-22366	1447 ± 31	–18.1	+11,0	3.2	20.3	7.3	1.70	68.2% probability 593 AD (68.2%) 645 AD 95.4% probability 562 AD (95.4%) 653 AD
UE-625 Grave 12	RICH-22367	1382 ± 30	–19.0	+9.0	3.2	32.6	11.8	n.a.	% probability 637 AD (68.2%) 668 AD 95.4% probability 606 AD (95.4%) 679 AD

n.a; = not anlayzed. Note: %collagen yield of RICH-22367 could not be analyzed. There was little collagen and in order to radiocarbon date, the collagen was dissolved in water and transferred as a liquid into the combustion tube, dried in a desiccator and combusted for graphitization.

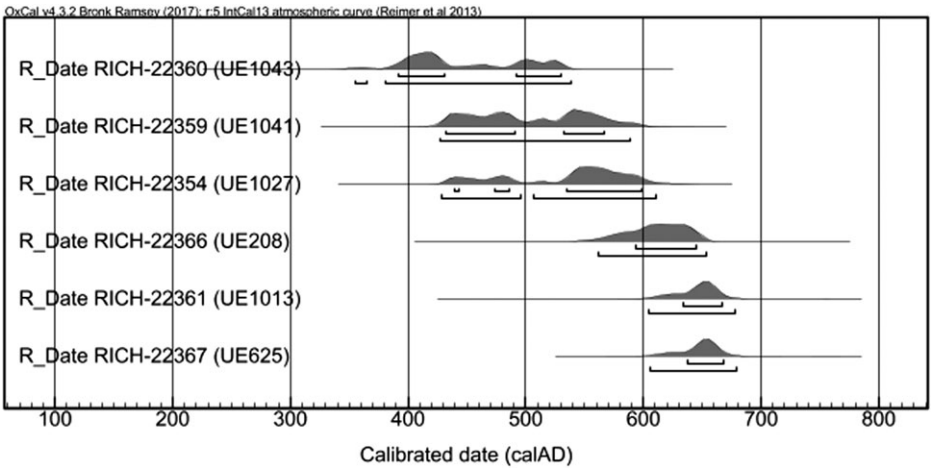

Figure 5 Radiocarbon dates calibrated AD.

Strydonck et al. 2018) although the $\delta^{15}N$ value is somewhat higher ($\delta^{13}C$ –19.0 ± 0.7 and $\delta^{15}N$ 10.3 ± 1.2). In no way the data suggest any reservoir effect due to consumption of marine food that could have altered the radiocarbon results (Cau et al. 2017).

The radiocarbon dates are also represented in Table 2. In addition, the calibrated dates are shown in Figure 5. Calendar ages were determined using OxCal v 4.3.2 program (Bronk 1995, 2001) with the terrestrial calibration curve IntCal13 (Reimer et al. 2013).

The six dates form a continuous series with overlapping probability distributions. Due to some small wiggles in the calibration curve the oldest calibrated dates cover a wide time range of about two centuries which makes these dates less precise. In order to estimate the duration of the necropolis usage the ^{14}C data were put in a sequence to estimate the boundaries using OxCal v 4.3.2 (Figure 6). Hereby, the difference of the boundaries was calculated showing an occupation of 365 cal years with 95.4% probability (Figure 7).

DISCUSSION AND CONCLUDING REMARKS

The results of the radiocarbon dating on the six bone samples provide an absolute chronology for different inhumations of the necropolis found in the village of Felanitx in Eastern Mallorca in what probably was a rural necropolis. As we have seen, studies of late antique necropolises on the island of Mallorca are scarce and to date only a few examples have been radiocarbon dated. Knowledge about rural necropolises comes mainly from those related to early Christian rural churches (Riera 2009; Cau et al. 2014), with the exception of a radiocarbon date obtained from a burial found at the Roman villa of Sa Mesquida (still unpublished). This is the first set of samples from a necropolis probably related to a Roman rural site with evidence of occupation during Late Antiquity that we are aware of in Mallorca. In the western Mediterranean, the presence of burials in different parts of a *villa* is a well attested phenomenon (Chavarría 2007) during Late Antiquity and this could well be the case of these graves found in Felanitx.

The necropolis was built over an area of a Roman site that during early Roman times was used as a pottery workshop that produced cooking and common ware pottery. According to the ^{14}C

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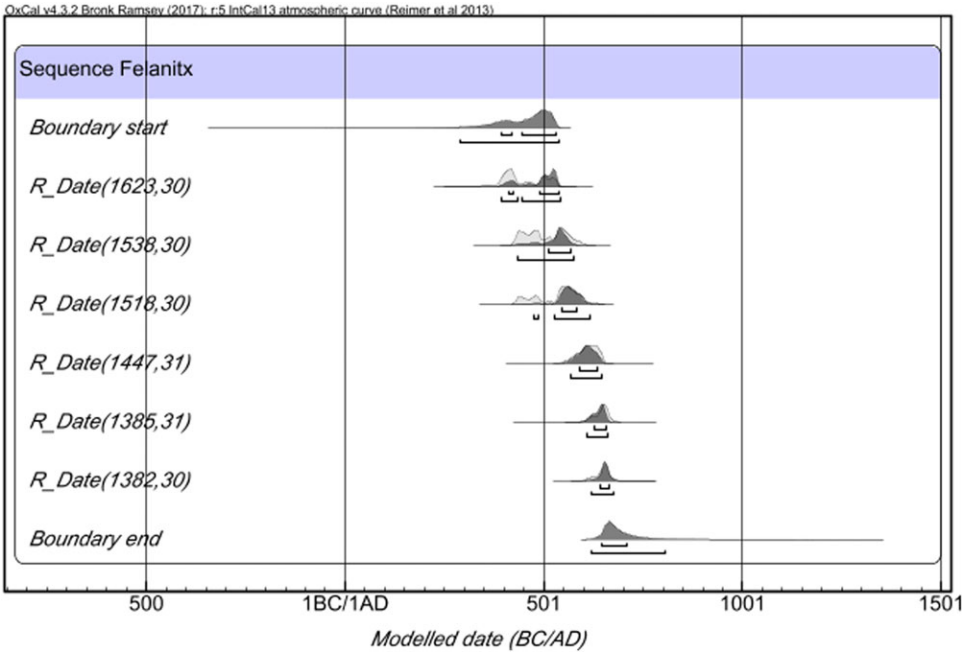

Figure 6 The radiocarbon dates of the necropolis of Felanitx in a sequence using OxCal v 4.3.2.

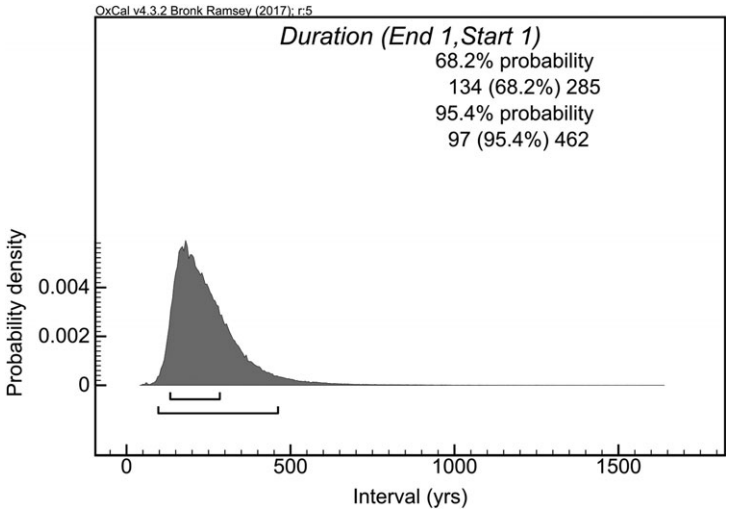

Figure 7 An estimation of the duration the necropolis of Felanitx using OxCal v 4.3.2.

dating results, the samples form a continuous series and are dated between the 4th to the 7th century AD. This wide chronology coincides with the archaeological material, but unfortunately is not very useful in historical terms. The presence of a Byzantine bronze belt buckle inside of Grave 8 points towards a late antique dating for the grave. This piece can

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be classified as a Bologna E7/E8 type buckle dated to the first half of the 7th century or possibly to the second half of the same century (Schülze-Dörrlamm 2002, 2009). Although the belt buckle cannot be related in particular to any of the individuals analyzed in the collective grave, the dating is within the timeframe proposed for all the samples which have been radiocarbon dated.

Samples RICH-22366 (SU 208) from grave 1, RICH-22361 (SU 1013) from grave 5, and RICH-22367 (SU 625) from grave 12, reveal a more precise dating into the seventh century, but it is difficult to propose different phases as the radiocarbon dates form a continuous series. It is important to highlight that three individuals with a poorer chronology (US1043, US1041, and US1027) were buried in the collective grave (G8) and their deposition seems contemporary to one another. Could this collective deposition have been related to a disease or another traumatic event?

All the aspects of funeral ritual at this necropolis correspond to the established Christian canons of the era. Further work is still needed: by increasing the number of samples from other rural necropolises around the island we will be able to obtain an integrated and more precise dating of the rural necropolises and better understand the evolution of the rural sites during Late Antiquity.

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