THE ^{14}C CHRONOLOGY OF THE SON MAS SANCTUARY SITE (VALLDEMOSA, MALLORCA, SPAIN)

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ABSTRACT. With >40 ^{14}C dates, mainly on bones and charcoal, the site at Son Mas is the only megalithic sanctuary on the Balearic Islands that has been dated by ^{14}C in detail. Although soil erosion made stratigraphy difficult and the monument was cleaned out regularly during its long use, the results demonstrate that the site was occupied from the Pretalayotic (Chalcolithic) until the Roman period. The aim of this study was not only to date the construction and the use of the sanctuary, but also to correlate this monument, by means of dispersion diagrams, with the other prehistoric sites situated within the same valley. The dates were also used to compare the site with the generally accepted chronology of the Balearic archipelago (Mallorca, Menorca, Ibiza and Formentera).

INTRODUCTION

The Prehistoric Framework of Mallorca

Over the last 25 years, at least five different schemes for the prehistoric chronology of the Balearic archipelago have been proposed (summarized in García Marín 1989). Although in general these chronologies resemble each other, some of them differ in fundamental and critical points.

Generally speaking, the prehistory of the island is divided into four or five periods: The Presettlement period (>5000 BC), the Early Settlement period (5000–3000 BC), the Pretalayotic period (PRT) (3000–1550/1300 BC) and the Talayotic Period (TAL) (1550/1300–123 BC). The latter is often subdivided into four phases depending on the personal interpretation of the researcher. Most chronologies set the boundary between the PRT and TAL period between 1400 and 1300 BC, although some schemes place the arrival of the TAL culture on the neighboring island of Menorca as early as 1550 BC (Plantalamor Massanet and Juan Benejam 1996). The beginning of the TAL Bronze Age is marked by what seems to be the arrival of a new culture, basically different from the previous Chalcolithic–Early Bronze Age PRT. This arrival coincides with the well-documented political and cultural instability in the Mediterranean world of that period.

Waldren (Waldren 1982) is one of the few authors who defines a Posttalayotic (PST) Iron Age that begins at 800 BC. Other authors consider the Iron Age as being part of a later phase of the TAL period. Most archaeologists agree, however, that the transition to the Iron Age took place *ca.* 800 BC.

One important date is the Punic colonization and settlement on Ibiza, one of the other Balearic islands, in the year 654 BC, representing the consolidation and increased influence of the Carthaginians in the archipelago.

The prehistory of the islands ends with the Roman conquest of Mallorca in 123 BC.

Site Description

The Son Mas complex (SMSS) consists of a horseshoe-shaped sanctuary with a concave frontal aspect (Fig. 1) and an apsidal naviform dwelling (Fig. 2). It is located near the present-day village of Valldemosa in a mountain basin called the *Pla del Rei* (Plain of the King) (39°45′N, 6°66′E). The valley (Fig. 3) is surrounded by a mountain range except to the north, where the plain is cut off by a

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Proceedings of the 16th International ^{14}C Conference, edited by W. G. Mook and J. van der Plicht
RADIOCARBON, Vol. 40, No. 2, 1998, P. 735–748

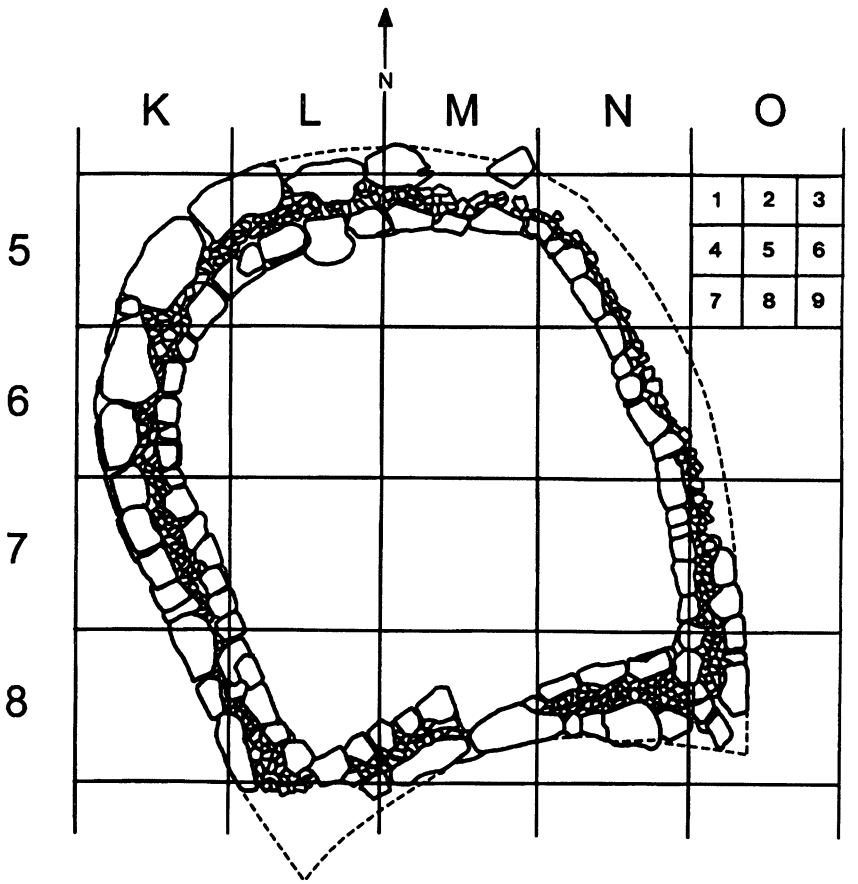

Fig. 1. Plan of the sanctuary at Son Mas (squares = 3 m × 3 m)

400-m-high cliff, overlooking the sea. The sanctuary was discovered in 1987 and has been under investigation since then.

Only eight prehistoric sanctuaries have been found on Mallorca. All have been dated late (500 BC–AD 200) on the basis of the wide range of imported classical pottery and the presence of late indigenous wares. They were thought to be much younger than the numerous ones on the nearby and culturally related island of Menorca.

In the Pla del Rei >28 prehistoric sites are recorded, three of them well documented by ^{14}C. The rock shelter of Son Matge (ABSM) (Stuiver and Waldren 1974; Van Strydonck and Waldren 1990; Van Strydonck and Waldren 1995; Waldren and Van Strydonck 1995), near the pass leading to the central plain of the island, is the first of these. The site was initially used as a habitat and later became a burial site. It consists of a large PST quicklime burial. This practice of inhumation in quicklime is unknown in prehistory except in the Balearics. The second of these sites is the Son Ferrandell-Oleza settlement complex situated at the opposite end of the alluvial basin. This prehistoric complex consists of a PRT open-air settlement (SFO-OS) (Waldren, Ensenyat Alcover and Cubí Grimalt 1994) and nearby a TAL undefended linear settlement (SFO-YS), consisting of five talayots (watchtowers, from the Arabic word *atalaya*) and associated structures. Several phases of successive use and dis-

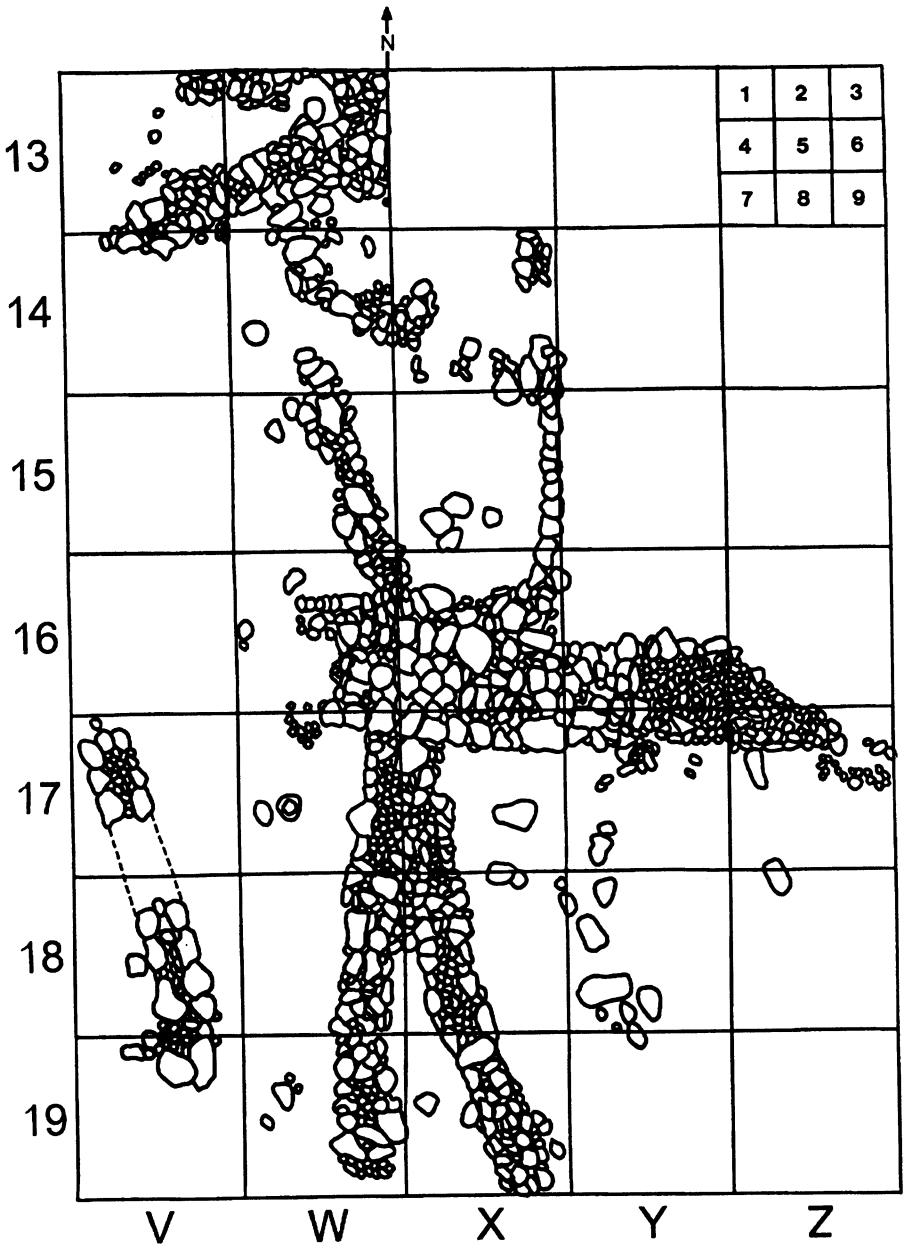

Fig. 2. Plan of the apsidal naviform construction (squares = 3 m × 3 m)

use, from construction to final collapse, can be observed (Chapman, Van Strydonck and Waldren 1993; Waldren and Van Strydonck 1993).

Site Conditions

Although the site has produced a large amount of charcoal, no short-lived plant material (seeds, nutshells, *etc.*) has been found, obscuring the distinction between natural and anthropogenic charred materials. We have good reason to believe that all prehistoric charcoal samples from the site are

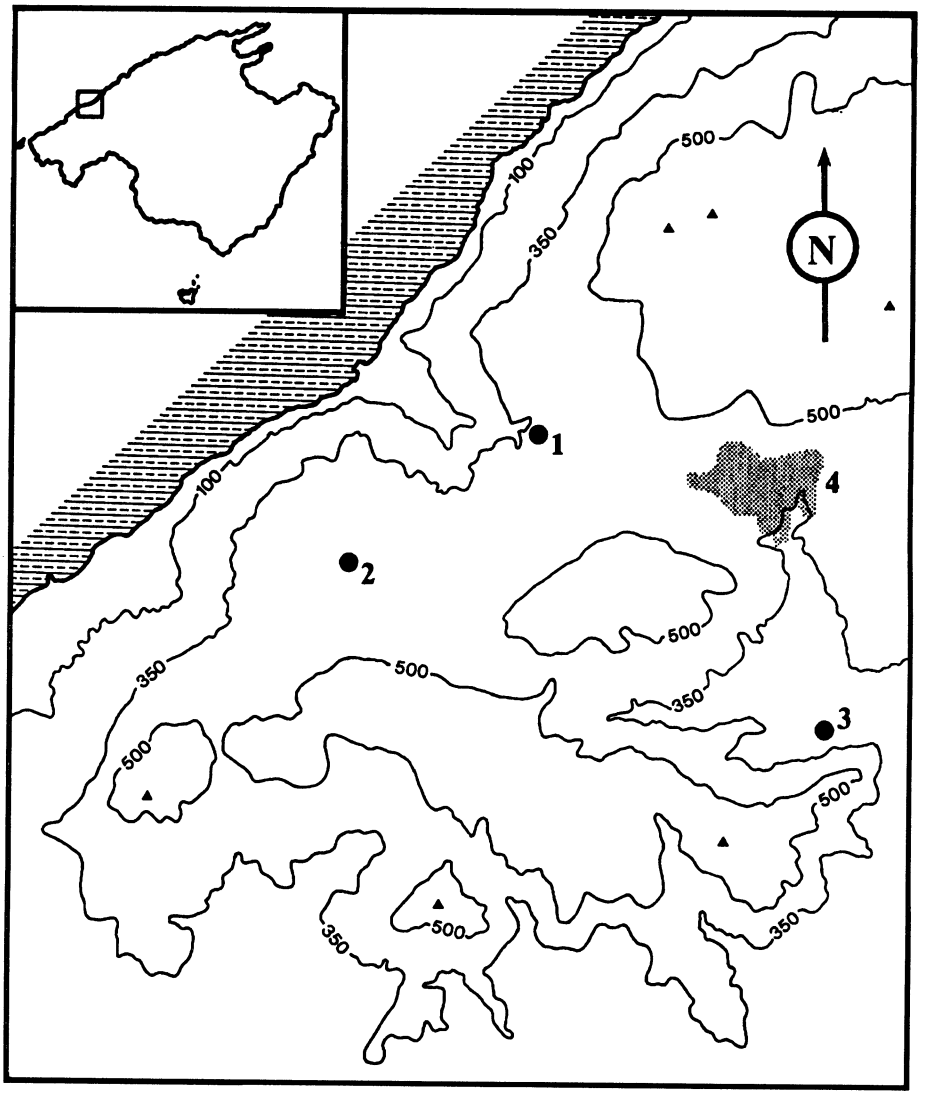

Fig. 3. Location of the sites in the *Pla del Rei*, Mallorca. 1. Son Mas; 2. Son Ferrandell-Oleza; 3. Son Matge; 4. village of Valldemosa.

anthropogenic and not caused by natural fires. Such fires would have left a stratigraphic marker throughout the site. Field wood burning occurs much later, when the site was used for agriculture. Old wood effect is considered to be minor, since no wood from construction elements has been used in the dating project. Many bones, mostly from domesticated animals, were found, some in context with charcoal and pottery.

The heavily eroded terrain offers only poor vertical stratigraphic conditions. Nevertheless, the PRT levels have a different soil type, the *terra rossa* (Butzer 1962, 1964), than the later TAL levels. Heavy plowing and occasionally heavy rain showers may have redistributed some of the charcoal and bone material so that it was redeposited in the crevices of the bedrock. The average difference

between six paired charcoal and bone samples is 80 ± 100 ^{14}C yr. The presence in Table 1 of the level from which the samples were collected is not always diagnostic. Activity zones outside the sanctuary and inside the monument were periodically cleaned throughout prehistoric times, as could be proved by finds out of context. Also, part of the monument's outer and inner precinct walls were dismantled and the stones reused in modern walls.

Results and Discussion

The ^{14}C results together with the sample location are grouped in Table 1. During the 10 yr of excavating and dating of the site, the accuracy of the measurements (both β-counting and AMS) has improved considerably. The large standard deviation of some older results makes interpretation sometimes difficult, especially if the transition from one cultural phase to another is to be established. Furthermore, it is sometimes unclear whether or not paired samples (designated as (a) and (b) in Table 1) are contemporary or simply accumulated in a secondary deposit. To avoid confusion, only those samples that were found in a well-defined context are discussed. The others are used only as a supplement to the dispersion diagram. To avoid artifacts in this diagram, a smoothed calibration curve with a 100-yr moving average was used to build the histogram (Törnqvist and Bierkens 1994).

TABLE 1. Radiocarbon Dates from Son Mas Sanctuary Site

Nr.	Reference*	Description	Quadrant	^{14}C age (yr BP)	$\delta^{13}C$ (‰)	Calibrated range (± 1σ)†
1	UtC-4676	Charcoal	12W.9	3775 ± 35	−25.8	2276 BC (0.26) 2241 BC 2203 BC (0.68) 2136 BC 2068 BC (0.06) 2059 BC
2	IRPA-909	Charcoal, level III	8O.9	3580 ± 70	−25.0	2023 BC (0.09) 2002 BC 1980 BC (0.62) 1872 BC 1840 BC (0.28) 1779 BC
3	IRPA-908	Charcoal, level III dilution: 73.3% sample	9O.5	3570 ± 65	−25.2	2014 BC (0.03) 2008 BC 1976 BC (0.63) 1870 BC 1842 BC (0.34) 1777 BC
4	UtC-2020	Charcoal, level III	7O.7	3510 ± 60	−25.9	1890 BC (1.00) 1743 BC
5	UtC-5892	Charcoal (mixed with bone) and pottery	8J.3(a)	3060 ± 35	−25.6	1390 BC (1.00) 1260 BC
6	UtC-2756	Bone collagen, contact Pretalayotic/Talayotic	6N.5	3020 ± 60	−20.2	1379 BC (0.17) 1346 BC 1317 BC (0.69) 1195 BC 1184 BC (0.11) 1162 BC 1142 BC (0.03) 1136 BC
7	IRPA-1053	Charcoal, level III	6L.4	2990 ± 50	−24.9	1300 BC (0.08) 1283 BC 1267 BC (0.92) 1124 BC
8	UtC-2747	Bone collagen, base sighting rock	12L.5	2970 ± 70	−20.9	1292 BC (0.01) 1290 BC 1265 BC (0.99) 1049 BC
9	IRPA-1094	Charcoal, level III	6L.7	2970 ± 40	−26.1	1259 BC (0.19) 1233 BC 1224 BC (0.81) 1120 BC
10	IRPA-976	Bone collagen, level II	7N.2	2960 ± 60	−20.5	1260 BC (0.15) 1232 BC 1226 BC (0.65) 1113 BC 1101 BC (0.20) 1056 BC
11	IRPA-984	Charcoal, below construction	8L.8	2930 ± 40	−24.5	1198 BC (0.10) 1181 BC 1163 BC (0.15) 1142 BC 1137 BC (0.75) 1035 BC

https://doi.org/10.1017/S0033822200018683 Published online by Cambridge University Press

TABLE 1. Radiocarbon Dates from Son Mas Sanctuary Site *(Continued)*

Nr.	Reference*	Description	Quadrant	^{14}C age (yr BP)	$\delta^{13}C$ (‰)	Calibrated range (± 1σ)†
12	UtC-3044	Bone collagen, level II	6K.6	2880 ± 80	−20.7	1159 BC (0.05) 1145 BC 1132 BC (0.95) 920 BC
13	UtC-5891	Bone (mixed with charcoal) and pottery	8J.3(b)	2875 ± 35	−20.6	1120 BC (0.94) 990 BC 960 BC (0.06) 940 BC
14	UtC-2736	Bone collagen	12J.6	2830 ± 140	−20.5	1190 BC (0.01) 1188 BC 1160 BC (0.04) 1145 BC 1133 BC (0.96) 825 BC
15	UtC-5420	Charcoal inside wall sanctuary	8K.9(a)	2735 ± 30	−24.9	898 BC (1.00) 837 BC
16	UtC-1256	Bone collagen from lower part of level II	8L.5	2700 ± 60	−21.4	899 BC (0.34) 868 BC 863 BC (0.66) 808 BC
17	IRPA-1055	Bone collagen	10S.8	2700 ± 50	−19.4	898 BC (0.32) 873 BC 856 BC (0.68) 808 BC
18	UtC-2759	Bone collagen from crevice	5M.5	2690 ± 70	−20.8	902 BC (1.00) 802 BC
19	UtC-4675	Charcoal associated with human burial	8J.6(a)	2655 ± 35	−25.8	828 BC (1.00) 799 BC
20	UtC-1255	Bone collagen, bottom level II	10L.2	2600 ± 70	−21.2	830 BC (0.52) 759 BC 679 BC (0.09) 655 BC 641 BC (0.39) 549 BC
21	UtC-5428	Bone in wall of sanctuary	8K.9(b)	2590 ± 30	−20.4	803 BC (1.00) 773 BC
22	UtC-4170	Charcoal inside wall	18U.9	2590 ± 50	−24.3	815 BC (0.68) 761 BC 672 BC (0.04) 664 BC 628 BC (0.20) 595 BC 578 BC (0.08) 560 BC
23	UtC-4166	Charcoal in top of layer associated with lead finds	19V.1	2590 ± 35	−25.0	807 BC (1.00) 767 BC
24	IRPA-1051	Charcoal, level III	13U.9(a)	2580 ± 70	−25.2	813 BC (0.38) 759 BC 681 BC (0.62) 546 BC
25	UtC-5421	Bone inside wall sanctuary	7L.7(a)	2580 ± 25	−20.1	799 BC (1.00) 774 BC
26	UtC-4857	Collagen from human phalange found in grave	8J.6(b)	2565 ± 30	−19.9	801 BC (0.82) 762 BC 621 BC (0.18) 600 BC
27	UtC-5374	Charcoal inside wall sanctuary	7L.7(b)	2565 ± 30	−26.6	801 BC (0.82) 762 BC 621 BC (0.18) 600 BC
28	UtC-1002	Charcoal, level III	7N.8	2520 ± 80	−26.3	792 BC (0.17) 752 BC 730 BC (0.83) 529 BC
29	IRPA-1025	Bone collagen, lower level III dilution: 76.17% sample	5L.6	2520 ± 60	−20.9	791 BC (0.18) 753 BC 704 BC (0.82) 531 BC
30	UtC-1257	Bone collagen, level I	6K.9(a)	2510 ± 70	−20.7	784 BC (0.14) 752 BC 730 BC (0.86) 529 BC
31	IRPA-836	Bone collagen under gravel floor in entrance, level II in contact with I	8M.6	2500 ± 40	−19.6	768 BC (0.08) 753 BC 703 BC (0.92) 532 BC
32	UtC-4167	Charcoal in bottom of layer associated with lead finds	19V.1	2490 ± 35	−24.9	764 BC (0.07) 752 BC 726 BC (0.01) 724 BC 715 BC (0.52) 617 BC 604 BC (0.40) 530 BC

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TABLE 1. Radiocarbon Dates from Son Mas Sanctuary Site *(Continued)*

Nr.	Reference*	Description	Quadrant	^{14}C age (yr BP)	$\delta^{13}C$ (‰)	Calibrated range (± 1σ)†
33	UtC-3190	Bone collagen from crevice, level I	16S.2	2480 ± 50	−20.5	764 BC (0.64) 618 BC 603 BC (0.36) 518 BC
34	QL-4264	Charcoal	5L.3	2470 ± 25	−24.8	761 BC (0.54) 673 BC 663 BC (0.14) 633 BC 592 BC (0.04) 582 BC 554 BC (0.22) 513 BC 438 BC (0.06) 424 BC
35	UtC-1258	Charcoal (mixed with bone)	6K.9(b)	2440 ± 90	−23.8	760 BC (0.33) 676 BC 659 BC (0.08) 636 BC 552 BC (0.59) 403 BC
36	IRPA-1066	Bone collagen, level III	13U.9(b)	2430 ± 40	−20.0	752 BC (0.12) 731 BC 723 BC (0.08) 708 BC 528 BC (0.80) 406 BC
37	UtC-5426	Charcoal, (bone) and pottery under wall	13X.4	2430 ± 25	−23.8	520 BC (1.00) 408 BC
38	UtC-3188	Charcoal associated with lead finds	18Y.1	2400 ± 70	−23.7	756 BC (0.27) 688 BC 537 BC (0.73) 393 BC
39	UtC-3933	Potsherd rich in organic plant fibers	16V.2	2390 ± 50	−25.2	749 BC (0.05) 738 BC 524 BC (0.95) 392 BC
40	UtC-1003	Bone collagen, level II	10L.2	2360 ± 140	−21.0	760 BC (0.20) 676 BC 660 BC (0.05) 635 BC 588 BC (0.01) 587 BC 553 BC (0.54) 355 BC 298 BC (0.20) 208 BC
41	UtC-3189	Charcoal in association with lead finds	17Y.7	2240 ± 50	−24.8	371 BC (0.16) 350 BC 314 BC (0.84) 204 BC
42	UtC-1001	Charcoal from middle of level II, under gravel of entrance	8M.6	2220 ± 70	−24.4	367 BC (1.00) 197 BC
43	QL-4200	Bone collagen	7O.7	2210 ± 90	−20.4	380 BC (1.00) 169 BC
44	UtC-3045	Charcoal associated with lead finds	17Y.4	2210 ± 110	−24.3	387 BC (0.93) 155 BC 142 BC (0.07) 119 BC
45	UtC-3046	Charcoal associated with lead finds	18Y.6	2140 ± 70	−25.4	351 BC (0.17) 311 BC 205 BC (0.83) 47 BC
46	QL-4201	Bone collagen	7O.7	2050 ± 150	−21.3	350 BC (0.07) 314 BC 204 BC (0.93) 126 AD
47	IRPA-1026	Lead find context	18Y.2	1960 ± 40	−24.5	10 AD (0.91) 83 AD 103 AD (0.09) 113 AD
48	IRPA-1024	Charcoal, level II dilution: 54.74% sample	8L.3	530 ± 50	−25.0	Medieval

*IRPA: samples prepared and measured at the Royal Institute for Cultural Heritage, Brussels. UtC: samples prepared at the Royal Institute for Cultural Heritage, Brussels and measured at the Van de Graaff laboratory, Utrecht. QL: samples prepared and measured at the Quaternary Isotope Laboratory, Seattle.

†Calibration according to Stuiver and Pearson (1993) and Pearson and Stuiver (1993). Calibration by CALIB (Stuiver and Reimer 1993).

https://doi.org/10.1017/S0033822200018683 Published online by Cambridge University Press

Preconstructional PRT Levels

Samples 2 and 3 come from strata outside the monument that contained large quantities of geometrically decorated Bell beaker pottery and undecorated fine wares (Waldren, Ensenyat Alcover and Morell Orlandis 1988). The presence of these artifacts suggests that the site had a religious character although no constructional elements of that period have yet been found. Together with samples 1 and 4 they establish the PRT phase of the site.

There is an obvious gap (Fig. 4: SMSS) between the PRT dates and the early TAL dates: after 10 yr of excavating no samples with dates falling within this gap of *ca.* 5 centuries have yet been found. This is strong evidence that the site underwent a temporary abandonment.

Comparison with Other Sites in the Pla del Rei

The dates representing the PRT occupation phase of the sanctuary are synchronous with the use of the SFO-OS (Fig. 4: SFO-OS, white curve) along with the ABSM PRT fire levels (Fig. 4: ABSM, white curve).

Comparison with Other Balearic Regions

The interquartile range (2100–1840 cal BC) of the SMSS dates falls well within the interquartile range (2290–1675) of all the valid PRT dates (Castro Martínez *et al.* 1996) from the Balearics. So the dates listed here can be considered typical PRT.

At present it is not feasible to rank PRT monuments (*hipogeos*, megalithic sepulchers, etc.) chronologi-

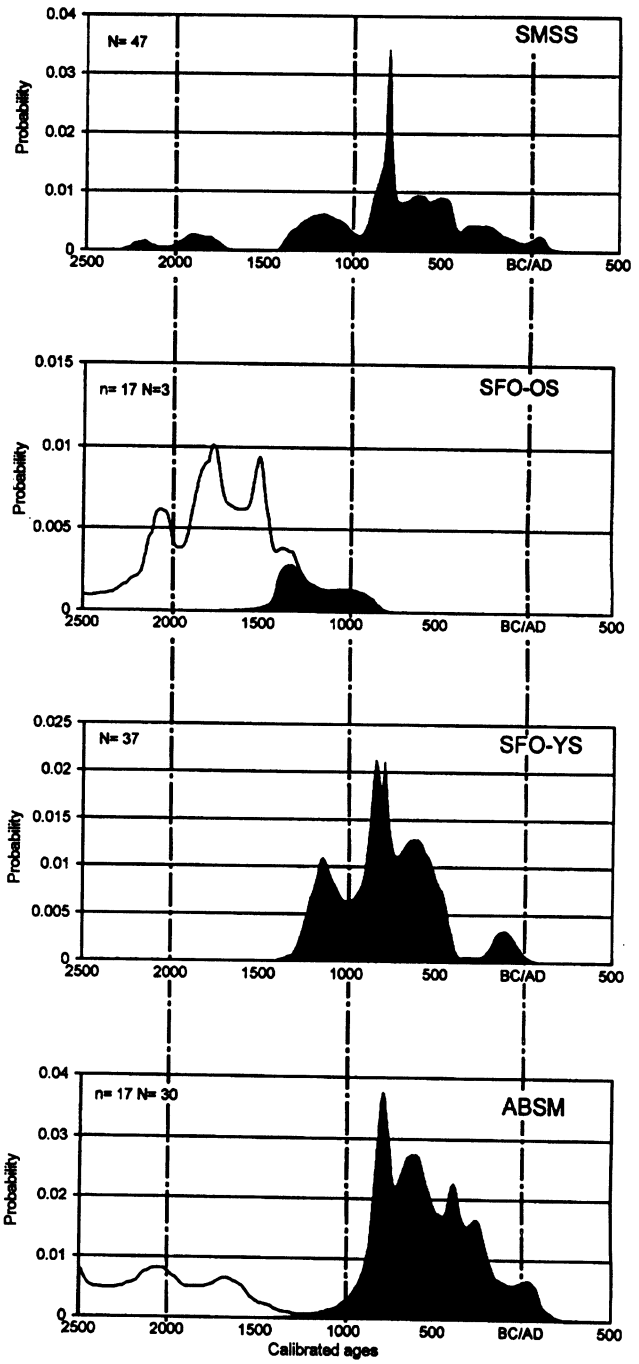

Fig. 4. Summed probabilities (100-yr moving average). SMSS = Son Mas Sanctuary Site, 47 dates; SFO-OS = Son Ferrandell-Oleza old settlement, 17 dates and 3 abandonment dates; SFO-YS = Son Ferrandell-Oleza young settlement, 37 dates; ABSM = rock shelter of Son Matge, 30 dates from Posttalayotic quicklime burials and 17 dates from older periods.

https://doi.org/10.1017/S0033822200018683 Published online by Cambridge University Press

cally in order. This is primarily because there are only a few dates available related to the older phases of these monuments and also because it is sometimes unclear whether or not samples come from levels associated with the initial use or reuse of the monument, as will be discussed further. We have tried, however, to compare the data from some megalithic sepulchers with the data from SMSS. The dates of the megalithic sepulcher of S'Aigua Dolça, Mallorca (3 dates; interquartile range: 1735–1635 cal BC) (Calvo Trias, Coll Conesa and Guerrero Ayuso 1997) and the sepulcher at Montplè, Menorca (7 dates, of which 1 is rejected; interquartile range: 1770–1665 cal BC) (Hedges *et al.* 1996; Plantalamor and Van Strydonck 1997) seem to indicate that these monuments are younger than the PRT phase at Son Mas. The dates from the sepulchers, however, correspond to occupational levels and it is not certain that they represent the initial use and construction phase of these monuments.

Preconstructional/Constructional Levels

Interpretation of the dates from samples found under the monument is not straightforward because they consist either of deposits from a previous occupation phase, possibly laid down some decades before the construction, or of a level laid down immediately prior to or during the construction of the monument. Furthermore, it is known that occupational debris, from older phases, was often used to fill the foundation trenches, and also to level surfaces before construction. Such uncertainties about the origin of the samples make the dating of the construction of the sanctuary difficult.

Samples 7, 10 and 11 are found under the construction and cover a period from *ca.* 1350 to 1000 BC. Outside the monument, a charcoal sample collected near a "sighting rock" (sample 8) gives a date comparable to the preconstructional dates.

What was presumed and now confirmed to be the construction phase is represented by sample 16 and by two samples outside the monument (17 and 20). These dates average at 842 to 802 cal BC (1 standard deviation (σ) range) and 897 to 798 (2σ range).

A burial was found alongside the sanctuary that appears to have been disturbed during the construction of the sanctuary wall. The combined dates from a human phalange and a charcoal sample (sample 19 and 26) yield a date range from 806 to 790 cal BC (1σ range) and 812 to 773 cal BC (2σ range).

To establish a very precise date for the construction of the sanctuary, we collected samples from inside the wall. At two locations, one in the inner and one in the outer wall, both charcoal and bone were found. The samples (25 and 27) from the inner wall, found in association with pottery, have statistically the same age as the bone sample from the outer precinct wall (sample 21). The charcoal sample from that location (sample 15) is somewhat older than the bone (35–115 yr (1σ range)) probably due to a minor old wood effect. The combined date from samples 21, 25 and 27 dates the construction of the sanctuary to the beginning of the 8th century BC (797–782 (1σ range); 800–772 (2σ range)). This result is in agreement with the dates obtained on the disturbed burial and the assumed construction layer. The construction date of *ca.* 800 cal BC implies that the sanctuary was erected during the transition from the TAL to the PST period.

The drop in probability (Fig. 4: SMSS) *ca.* 950–1000 BC suggests that either the site fell into disuse or the surface was leveled and cleaned before construction. However, if a simulation is carried out whereby a deposition is assumed of a ^{14}C sample (with a standard deviation of 50 yr) every 40 yr between 1300 BC and 120 AD, it gives a probability histogram with a similar low probability *ca.* 900 cal BC. This makes it quite possible that the observed probability drop is not caused by an archaeological event but by the distortion of the calibration curve (McFadgen, Knox and Cole 1994).

Archaeological investigation and the pottery inventory seem to suggest that there is continuity from the preconstructional to the constructional phase and the use of the monument.

Comparison with Other Sites in the Pla del Rei

As a result of the ^{14}C analyses, we can conclude that there is an occupation phase in the TAL period prior to the construction of the sanctuary. This phase is contemporary with the abandonment layers of SFO-OS (Fig. 4; black section of SFO-OS) and the initial activity at SFO-YS, prior to the construction of the talayots, as is shown by three unpublished dates from samples excavated from under talayot no. 1 (T1) (Table 2).

TABLE 2. Samples Excavated from Under Talayot 1 at SFO-YS

Nr.	Reference	Description	^{14}C age (yr BP)	$\delta^{13}C$ (‰)	Calibrated ± 1σ range
1	UtC-4363	Charcoal under entrance	2950 ± 25	−24.1	1260 BC (0.06) 1240 BC 1210 BC (0.94) 1110 BC
2	UtC-4575	Bone under entrance	2950 ± 35	−20.4	1260 BC (0.08) 1240 BC 1210 BC (0.92) 1070 BC
3	UtC-4731	Bone under wall	2960 ± 35	−20.6	1260 BC (1.00) 1110 BC

It should be noted that the oldest dates from the lime burial at ABSM are contemporary with the construction date of the sanctuary. This is direct evidence that at least locally a serious cultural change took place *ca.* 800 BC: 1) at the ABSM site a new funeral rite commences, unknown to any other prehistoric culture, and 2) at SMSS a monumental sanctuary is built. The evidence of severe cultural change *ca.* 800 BC can also be useful in defining a hypothesis concerning the construction dates of the five talayots at SFO-YS. Talayots nos. 1 (T1) (Table 3) (Waldren and Van Strydonck 1993) and 4 (T4) (Table 4) (Chapman, Van Strydonck and Waldren 1993) have been studied extensively. The problem with these towers, however, is that several phases of use, destruction and reuse succeed each other, accompanied by the mixing of artifacts from different phases and the cutting of hearths into earlier deposits. Before the dates in Table 2 became available, a preconstruction or construction date of 2929 ± 32 BP was assumed for T1 (Table 3). The sample giving the construction or early occupation date of T1 is not very useful, not only because it has a large standard deviation, but also because the sample came from a fire level immediately outside T1 in direct contact with the base of the building's outer wall and not from the inside of the talayot, so that in a strict sense it does not date the construction of the talayot itself. If we combine the new preconstruction dates of T1 with the dates from the interior occupation, a striking similarity can be seen with the situation at SMSS. The same goes for T4. According to Chapman, Van Strydonck and Waldren (1993) the first phase (Table 4) must be considered as constructional or one of primary use. The majority of the pottery inside T4, however, was PST and only a handful of TAL potsherds were found, indicating its principal use in PST times. Furthermore, phase 1 is synchronous with a preconstruction date of a structure outside T4 (Table 4). The construction date of this structure was dated PST as well. In view of these findings, we tend to interpret phase 1 of T4 as preconstructional.

In summary, we can state that the preconstruction level at SFO-YS is dated at *ca.* 1200–1100 BC and that the initial use of the talayots is almost certainly not before the beginning of the 8th century BC. This does not provide absolute proof for a construction date *ca.* 800 BC, but without further dates from material found inside the walls, it gives the best indication so far of the age and construction of the talayots.

TABLE 3. Samples from Talayot 1 at SFO-YS (after Waldren and Van Strydonck)

Stage	^{14}C age (BP)	No. dates	Calibrated ± 1σ range
Phase 1: preconstruction or construction	2929 ± 32	Avg. of 3 dates	1200 BC (0.03) 1180 BC 1160 BC (0.97) 1040 BC
Phase 2: construction or early occupation. Sample from just outside the monument	2830 ± 100	1 date	1120 BC (1.00) 850 BC
Phase 3: interior occupation / first destruction level	2534 ± 35	Avg. of 3 dates	790 BC (0.27) 760 BC 680 BC (0.73) 550 BC
Phase 4: interior occupation / second destruction level	2496 ± 31	Avg. of 3 dates	770 BC (0.06) 750 BC 700 BC (0.94) 530 BC
Phase 5: interior ultimate utilization level	2100 ± 45	1 date	170 BC (1.00) 50 BC

TABLE 4. Samples from Talayot 4 at SFO-YS (after Chapman, Van Strydonck and Waldren 1993)

Stage	^{14}C age (BP)	No. dates	Calibrated ± 1σ range
Phase 1: construction / primary use	2871 ± 38	Avg. of 2 dates	1120 BC (0.87) 980 BC 960 BC (0.13) 940 BC
Phase 2	2540 ± 45	1 date	800 BC (0.27) 750 BC 680 BC (0.73) 540 BC
Phase 3	2580 ± 60	1 date	820 BC (0.44) 750 BC 680 BC (0.56) 550 BC
Phase 4	2745 ± 38	Avg. of 2 dates	910 BC (1.00) 835 BC
Phase 7: final abandonment	2475 ± 40	1 date	770 BC (0.64) 620 BC 600 BC (0.36) 510 BC
Outside T4			
Preconstructional	2810 ± 70	1 date	1030 BC (1.00) 840 BC
Constructional	2490 ± 80	1 date	770 BC (1.00) 510 BC

Comparison with Other Balearic regions.

Traditionally the monumental boat-shaped *navetas* are considered as transitional from PRT to TAL (Castro Martínez *et al.* 1996). Construction dates for this type of building are not presently available; we only have at our disposal dates from occupational levels from Menorcan navetas (Plantalamor and Van Strydonck 1997) showing that they were already in use in the 9th to 10th century BC and, therefore, must predate the construction of the sanctuary. An unpublished charcoal date (UtC-4859: 2930 ± 35 BP) from an exploration trench at a *naveta* within 500 m from the Son Mas Sanctuary is synchronous with the TAL preconstruction levels at SMSS. The sample originates most probably from an occupation phase, although a larger-scale excavation is necessary in order to confirm this hypothesis.

Before now the only construction dates from horseshoe-shaped sanctuaries in the Balearics have come from the taula sanctuary at Torralba d'en Salord on the island of Menorca. Although both sanctuaries have a somewhat similar ground-plan, they differ fundamentally. The T-shaped taula stone so characteristic of Menorcan sanctuaries is missing on their Mallorcan counterparts. Instead, the Mallorcan sanctuaries have four or more short, cylindrical, stone units placed within the interior of the sanctuary. Waldren (1996), on the basis of ^{14}C analyses, estimates the construction of the Torralba sanctuary at between 900 and 1000 BC. While most of the Menorcan sanctuaries were largely

https://doi.org/10.1017/S0033822200018683 Published online by Cambridge University Press

contemporary in their use at some time over the full scale of their chronology, a wide range of construction dates can be expected. Torralba, regarded as the culmination of this type of construction, is therefore considered as one of the younger ones. Consequently, the Menorcan sanctuaries in general must be considered older than the sanctuary at SMSS although many more sanctuaries should be dated to demonstrate this fully.

PST levels

^{14}C dating confirms that the initial use of the sanctuary is exclusively associated with indigenous ware predating Carthaginian influences. This rules out the Carthaginian involvement suggested by some authors for Mallorcan sanctuaries in general (Guerrero 1983, 1995).

There is strong evidence that the monument was modified or repaired at some time after 400 BC. Sample 42 comes from a stratum associated with the top of the threshold stone at the entrance of the sanctuary; samples 43 and 45 are associated with a modification of the outer east wall.

The apsidal naviform dwelling (Fig. 2) in an area adjacent to the sanctuary appears to be younger than the sanctuary itself. Sample 37 collected from under the dwelling yields a date corresponding to the 5th century BC. Moreover, the activity associated with this naviform dwelling can be accredited to a younger period, as will be discussed below. A rim sherd from a very large vessel found associated with the dwelling was ^{14}C-dated on account of its relatively large amount of chaff (sample 39).

The plateau in the calibration curve reaching from the 8th to the 5th century BC makes it very difficult to distinguish between dates, as no rigid stratigraphic information is available. Pottery becomes a good dating tool for the younger levels, as they contain a great abundance of classic pottery, Greek Attic ware, Roman Campanian and Punic wares. The ultimate occupational phases of the site include first and second century AD Roman *terra sigillate* and kitchen wares and demonstrate the sporadic use of the site into the time of Roman colonization.

Lead Plaque Levels

In the southeastern part of the site, in and around the apsidal naviform dwelling, evidence of a local production of lead cast ornaments was found. Although no moulds were found, sprews, ingots and miscast pieces show that lead casting was done on site (Waldren and Grimalt Cubi 1995). Lumps of lead resulting from casting overspill and flat discs in which the metal had been melted down to form ingots were found on the site. Such ornaments were produced in the form of pectorals, pendants, necklaces, *etc.* These items are restricted to the Balearics and are only frequent in funeral contexts or in production centers. Amongst the pectoral artifacts found at SMSS are four identical pieces. They belong to type Ic according to the classification of Enseñat (Enseñat Enseñat 1976). Identical pieces were also found in Cova de'n Alova, the rock shelter of Muertos Gallard and at ABSM.

Samples 41, 44 and 45 are charcoal samples found in association with the lead objects (interquartile range 320–160 cal BC). Samples 38 and 47 are from two strata laid down immediately before and after the lead objects and confirm the established date range for the on-site distribution of these objects.

Comparison with Other Sites in the Pla del Rei

The lead ornament from Enseñat's type Ic found at ABSM has been dated by two associated charcoal samples (QL-9: 2200 ± 100 BP and QL-1A: 2240 ± 70 BP). The average of both these dates agrees with the SMSS dates for the lead finds. The dates are also confirmed in texts by early historians who record lead mining in the Balearics in late classical times (*ca.* 200 BC–3rd century AD).

Conclusion

We can distinguish different chronological phases at the Son Mas sanctuary site. A Pretalayotic preconstruction phase (2100–1840 cal BC interquartile range) associated with Bell beaker and equivalent fine wares indicates that the site was already used as a ritual area in Chalcolithic times. So far no material has been dated between 3510 ± 60 and 3060 ± 35 BP. This would imply that the site was probably abandoned for several centuries in late Pretalayotic times. A second preconstruction or subconstruction phase, starting in the 14th century BC, precedes the proper construction of the Bronze Age sanctuary. This phase is contemporary with the abandonment levels of the Son Ferrandell-Oleza old settlement and the preconstruction levels at the Son Ferrandell-Oleza TAL younger settlement and is part of the TAL period. The construction of the sanctuary must have taken place *ca.* 800 BC, although several modifications or reparations were carried out during its long history. The sanctuary seems to be younger than its Menorcan counterparts but older than the Talayotic V phase (500–123 BC) to which they are assigned by some authors. The construction of the sanctuary is contemporary with the beginning of the Posttalayotic custom of inhumation in quicklime, and is probably also contemporary with the initial use of the talayots at the Son Ferrandell-Oleza younger settlement. Although most archaeologists do not recognize a Posttalayotic period, and consider the Iron Age as part of a later phase of the Talayotic period, it is clear from this study that, at least in the mountain region of Mallorca, a significant cultural change took place *ca.* 800 BC. This change is, as far as can be seen from the artifacts found at the site, not correlated with the later Carthaginian influence on the archipelago.

The apsidal naviform construction is later than the sanctuary and must be regarded as not earlier than the 5th century BC. Lead cast ornaments were made on site during a period between the 4th and 2nd century BC. These ornaments were also found in funeral contexts in the same valley and elsewhere.

The site was finally abandoned in the 2nd–3rd century BC, according to the pottery inventory.

Acknowledgments

The authors wish to thank M. Stuiver for reporting on the QL dates. M. Landrie took care of the sample preparation and E. Keppens, Vrije Universiteit Brussel, performed the stable isotope measurements. Thanks are also extended to J. Van Strydonck for his help with the Spanish literature.

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