

ABSOLUTE CHRONOLOGY FOR THE BEAKER CULTURE SITE OF COVAL SIMÓ (MALLORCA, BALEARIC ISLANDS)

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ABSTRACT. This contribution of the absolute chronology for the Beaker culture presents the results of archaeological research that took place at Coval Simó (Mallorca) between 1998 and 2008. Coval Simó is a rockshelter situated at the summit of one of the mountains that forms part of the northern mountain range of the Serra de Tramuntana. The site provided an exceptional undisturbed context, shielding a small space of only 25 m². Thin sedimentary layers were deposited in a short timespan and later were sealed off by large blocks due to a rockslide falling from the top of the rockshelter. This site has offered significant information related to the occupation of a human group linked to the Bell Beaker culture, and users of other distinctive undecorated pottery vessels. Direct evidence of early island metallurgy was also obtained: smelting slags from local copper minerals. Regarding the methodology used for analysis, short-lived samples were chosen for radiocarbon dating, consisting of bone fragments identified and classified taxonomically. The samples were submitted alternately to two different ¹⁴C laboratories and the obtained results point to a clear horizon for the early human occupation of the site, ranging between about 2300 and 1900 cal BC.

INTRODUCTION

Coval Simó (6°28'18"E, 39°47'23"N) is a rockshelter situated at the summit of one of the mountains that form the northern mountain range system of the Serra Tramuntana (Figure 1), at 930 m asl, oriented to the north. This is currently a rugged area with eroded soils and predominant rock outcrops, although small valleys are nearby, situated at a 20- to 40-min walking distance, with farmland in its surroundings. The cavity itself is located in a well-protected *dolina*—a geological depression typical in karst reliefs—with a special microclimate (Figures 2 and 3). The site is exceptional because it had been sealed off, permitting an undisturbed context in a small space of just 25 m². Thin sedimentary layers were deposited in a short timespan and later were sealed by the large stone blocks, resulting from a rockslide from the top of the rockshelter. It is important to note that the part of the sector that was not covered by blocks had already been excavated (Enseñat 1969). The current research has been carried out specifically in the areas sealed off by the collapse, which were protected from later and eventual alterations.

The proposal to excavate Coval Simó presented the opportunity to investigate a site where incised ceramic (linked to the Beaker group) and *Myotragus balearicus* had been found. The *Myotragus balearicus* was an endemic goat-like species from Mallorca and Menorca that became extinct in the mid-Holocene. It was presumed Coval Simó could potentially shed light onto the evolution of the insular cultural between the first colonization and the early metallurgy. These periods had been defined, at the time, by W H Waldren as the Presettlement Period and Pretalayotic Early Settlement Period (ESP), with two phases designated Neolithic Early Ceramic Phase (NECP) and Early Beaker Phase (EBP) (Waldren 1986; Waldren et al. 2002). However, the first results from Coval Simó showed only the existence of anthropogenic horizons corresponding to an occupation contemporary to the Beaker diffusion (Coll 2000, 2001, 2010). It must be taken into account that the excavation of Coval Simó took place at a time when the island contexts were subject to a thorough review, and that the human occupation in the ESP of Mallorca was also questioned (Lull et al. 1999:15–25; Calvo

et al. 2002:159–65). Some authors questioned even the NECP, arguing that the evidence would be inconsistent and that their absolute dating results were influenced by the “old wood effect” (Alcover et al. 2001:28–30; Ramis et al. 2002:10; Lull et al. 2004:126).

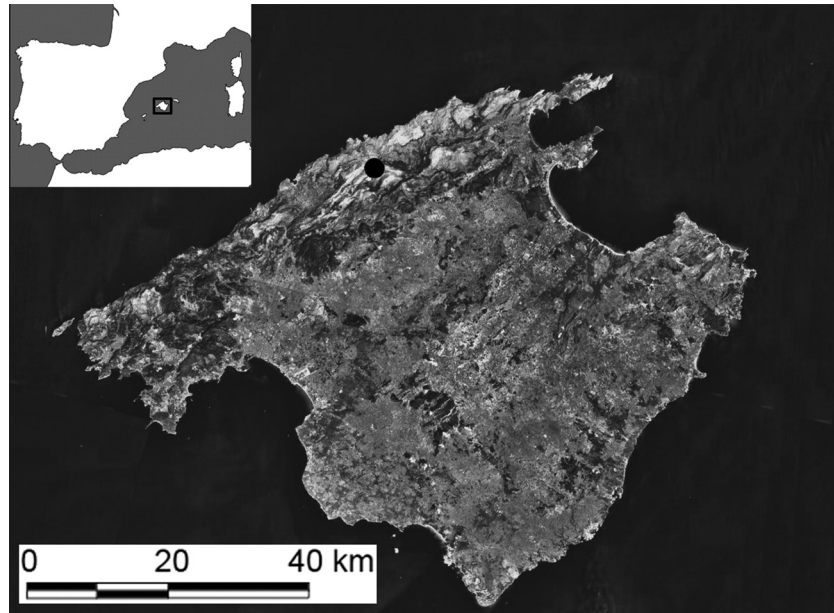


Figure 1 Location of Coval Simó on the island of Mallorca



Figure 2 View of the Coval Simó rockshelter location (circled)



Figure 3 The Coval Simó rockshelter after its archaeological excavation

The Beaker period for the Iberian Peninsula has been established from radiocarbon dates to be between ~3350 and ~1500 cal BC, although the interval ~2800–1500 cal BC is considered more representative due to reliability problems with the record (Castro et al. 1996:107). Different decorative styles have been distinguished among Beaker pottery such as the Maritime and Ciempozuelos styles that developed synchronously at this stage. Also, the Pyrenean-Solomon style (~2100–1550 cal BC), the later Balearic (~2450–1950 cal BC) and the Southeast (~2450–2250 cal BC) styles appear in the final centuries of the 3rd millennium cal BC. Regarding Mallorca, Castro et al. (1996:111) and Micó (2006:430) state that the dates of this timeframe obtained from Son Olesa and Son Matge would place the beginning of an extensive and organized occupation of the Balearic Islands in conjunction with the spread of the Beaker pottery. The Balearic types would resemble those of the Salamó style in its older examples, and the Bois Sacré style, from the south of France, in the later ones. Some authors believe there is no evidence of previous occupations and, according to the evidence available, the first colonization of Mallorca would have happened precisely at this stage (Lull et al. 2004:126–8; Micó 2006:430; Alcover 2008:62). Nevertheless, the absence of Beaker pottery in Menorca (Plantalamor et al. 2012) must be mentioned. From a wider perspective, the first human settlement of the Balearic Islands is considered the result of mainland cultural dynamics deriving from the northwest Mediterranean in the 3rd millennium cal BC (Ramis 2010:64–70).

Controversy has existed for some time on whether the Mallorcan decorated pottery belongs to the sphere of the Beaker world (Enseñat 1962) or is contained in a local phenomenon that has been called the “incised pottery horizon” (Rossello Bordoy 1960; Cantarellas 1972; Veny 1983). This discussion seems duly overcome since the work of Waldren (1987a), recommending the inclusion of Mallorcan decorations (which include incision, print, and stamp) within the Beaker ceramic and its general definition and variety. According to the traditional classification of local researchers, two groups of incised pottery were distinguished: one with variegated and precise decorations, made on

good quality vessels—Incisa A after Rosselló Bordoy (1960) or Incisa I after Cantarellas (1972)—and another type of decoration with simpler and rougher motifs made on coarser clay—Incisa B or Incisa II. The presence of printed decorations, or even their combination with incisions, had been mentioned to exist but was not recorded. Waldren (1987a) exceeded this view, grouping the Mallorcan Beaker into three sets. Early Beaker (Type 1) included impressed corded wares, rod printed, bands, and specimens with dotted punctuated holes covering the entire vessel. A second set, Apogee Beaker (Type 2), comprises incised pottery with finely drawn bands, others with geometric *chess square* decoration motifs and that of *wolf teeth* motifs densely decorated on polygons, alternating with undecorated sides or sometimes combining with zipped dotted prints. A third group, Late Beaker (Type 3), has rougher incised lines with short prints made with fingernails, rods, or canes. This division helps to clarify the picture by providing insight into the complexity of decorative techniques used in ceramics of this stage. It also improves their comparative analysis to external cultural groups to locate the possible origin and cultural affiliation of the local Beaker phenomenon. To do this, the elements present in Coval Simó have been compared with those of southeastern France (Lemerrier 1998, 2000, 2002), and the Pyrenean, Catalan, and Eastern Iberian regions, already identified at the time by Waldren (1987b) as areas of immediate influence on the generation of the Mallorcan Beaker focus.

In 1998, at the beginning of the archaeological excavation of Coval Simó, the need for new strategies was raised, given the chronological problems of the Beaker serialization in Mallorca. At that time, the evolutionary hypothesis proposed the existence of two successive stages in the development of Beaker decorated pottery—group A/I or older and Group B/II or later—had the support of few contexts with ^{14}C absolute chronology for these ceramics. The ^{14}C evidence was limited to a series from the sites Son Matge (Fernández Miranda and Waldren 1979; Waldren 1979) and Son Olesa (Waldren 1987b). Both the contexts and the stratigraphy, plus the nature of the dated samples (charcoal in most cases), showed the need to compare the existing dates with ^{14}C dating in new sites that could offer a more solid basis starting from a more exact absolute chronology strategy based on the following aspects:

1. Location of an undisturbed sedimentary sequence.
2. ^{14}C dating by accelerator mass spectrometry (AMS) only using short-lived samples, especially bone collagen from domestic animal remains identified taxonomically.
3. Sending similar samples to different laboratories alternatively (Beta Analytic and the Royal Institute for Cultural Heritage of Brussels), in order to compare their results.
4. Setting a timeframe based on a wide dated sample group.
5. Obtaining information on the ecological context of the dated samples by accurate pollen, carpological, and zooarchaeological analyses of the sedimentary horizons.
6. Contextualizing associated archaeological culture (lithic industry, metallurgy, ceramic typology, etc.) layer by layer.
7. Evaluating the dating results and their contexts as a whole, considering not only the island framework, but the surrounding Mediterranean cultural context that could influence its development.

STRATIGRAPHY AND CULTURAL CONTEXT OF COVAL SIMÓ

During the excavation of Coval Simó, three different occupation horizons were identified under the collapsed top of the rockshelter (Figure 4). This took place at an unknown moment after the prehistoric occupation of the site, leaving eight huge blocks (SU 8, SU 9, and SU 10), some of

them about $4 \times 2 \times 1.5$ m. Horizon 3 (H3) is found immediately under these blocks and is the most modern chronologically because of the detachment immediacy of the rocks. This horizon constitutes several superimposed levels totaling a thickness of about 22 cm. H2 comprised several sediment layers of about 16 cm thickness. It is separated from the former by the presence of a layer of crushed and deeply leached stones (SU 80). Under this horizon, the first human occupation of the shelter is found: H1 consists of sediment levels that overlap, a thin sterile red clay layer located above a layer of compact crushed gravel layer.

The ceramic assemblages are essentially similar in all three horizons. The pottery is less varied in the lowest horizon (H1), but this assemblage has a small number of specimens. Despite this, H1 shows some low ceramic ware type (pans) that may have been used to toast cereal. Cheese-making vessels as well as containers of various sizes were found in each of the three horizons.

Beaker decorated pottery is found in all horizons but in small quantities. Fragments decorated with printed lanyards (All Over Corded style; Group 1-A1, after Lemerrier 2002:57), rod-printed on lanyard (Group 4, after Lemerrier 2002:64), and incised of several varieties (Group 5, after Lemerrier 2002:71) have been recorded (Table 1, Figure 5). Decorated Beaker pottery represents 2.1% of the total findings in H1 (2/95), 7.2% in H2 (28/387), and 4.6% in H3 (21/454). In total, Beaker decorated pottery accounts for only 4.9% of the recognizable forms (33/672) (Table 2), or 5.7% of the total material (61/1065). Plain pottery fits with the types recognized as typical for the NECP (Waldren 1986) but is also coincident with the so-called Olezian Assemblage (Waldren 1987a), and is found in all horizons of Coval Simó (comprising ~95% of the material). As Lemerrier (2003) noted, Beaker pottery from the Catalonia-Pyrenees-Provence region seems to be perfectly anchored in context with the plain pottery of the local tradition. In our case, this statement has great importance as plain pottery may provide clues to the origin of the continental substrate group that brought them along with decorated Beaker ware. In this sense, larger-sized vessels and the special carinated ceramic ware from Coval Simó show similarities with the Fontbuisse group (Giligny and Salanova 1997; Lemerrier 2003) and the Pyrenean area.

Regarding metallurgy evidence, nine slag glass fragments were found: a faceted oblong core and eight flakes. They are related to the reduction of copper ore (Ramis et al. 2005a,b; Ramis and

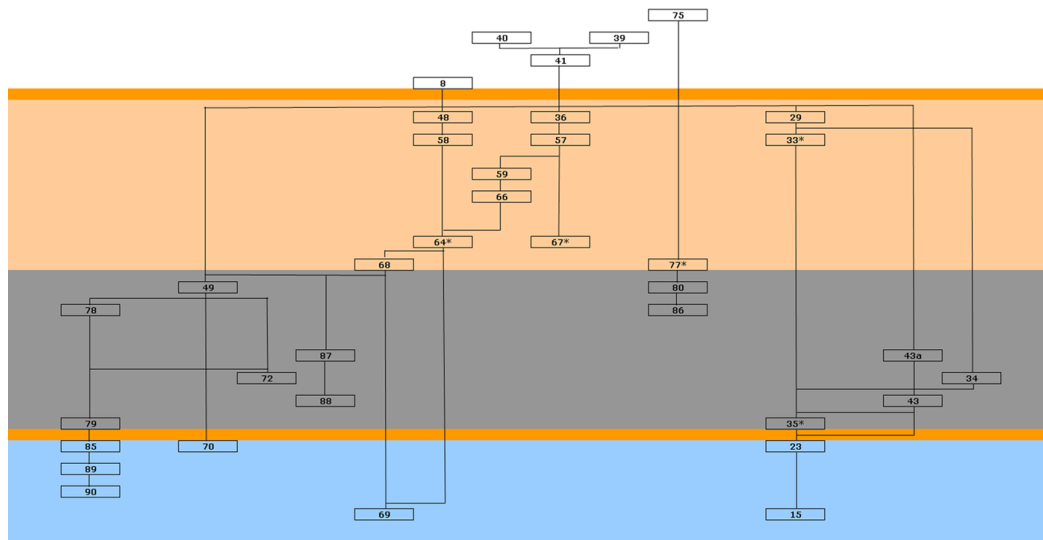


Figure 4 Scheme of the Coval Simó stratigraphy

Table 1 Decoration patterns (after Lemerrier 2002) for each horizon of Coval Simó.

Group	Pattern	Horizon 1 (H1)	Horizon 2 (H2)	Horizon 3 (H3)
4	K10			1 (Undetermined)
5	S1		1 (Undetermined)	1 (Bowl)
5	T2		3 (Spherical)	
5	T3		3 (Bowl)	
5	T3 + U9			1 (Undetermined)
5	U1 + V1	1 (Bowl)		
5	U2	1 (Bowl)		
5	U3		14 (Bowl)	4 (Bowl)
5	U3 + U9			1 (Bowl)
5	U7		2 (Bowl)	
5	U9			3 (Bowl)

Santandreu 2011). The slag is glass with small vacuoles and of a blackish color. Analysis of a slag sample detected the presence of copper nodules in its composition. Copper slags appeared in three horizons—contexts SU 85 and SU72 (H1); SU 80 (H2); and SU 48, SU 68, and SU 77 (H3). It is assumed that the glassy flakes could have been used as sharps. A similar use could be inferred also for the lithic remains—44 flint flakes, 9 fragments with cortex, and 2 pieces of tabular flint. Considering the form of these tabular flints, they seem possibly related to the manufacture of sickles.

Preliminary results of the charcoal and pollen offer a perspective of how the vegetation cover was characterized by dry thermo-Mediterranean or lower subhumid forest (oak type) present in open formations composed mainly of juniper, which seems to reflect the natural stage without human alteration. In terms of fauna, Coval Simó is the Balearic site of this chronology with the largest number of faunal remains cataloged and analyzed (Ramis 2006). The endemic caprine *Myotragus balearicus* is present in prehuman geological levels, but absolutely absent from anthropogenically



Figure 5 Representative samples of decorated ceramic ware from Coval Simó

Table 2 Ceramic types by contextual horizons in Coval Simó.

	Total			Decorated		
	H1	H2	H3	H1	H2	H3
Carinated	7	76	55	—	—	—
Pan	4	5	4	—	—	—
Jar	16	27	60	—	1	—
Bowl	30	60	92	2	14	10
Spherical	5	39	32	—	1	—
Cheese strainer	—	2	4	—	—	—
Globular	1	29	31	—	—	—
Tulip vase	1	22	31	—	—	—
Conic	4	17	18	—	2	3
Glass slags	3	2	4	—	—	—
Total	68	277	327	2	18	13

reliable levels. The domestic animals include cattle, goats, sheep, and pigs, although *Capra* and *Ovis* dominate in comparison to the sporadic presence of *Bos*, which in turn is greater than *Sus*. It must be noted that wildlife remains are very scarce. This leads to the interpretation that probably one of the main roles of this rockshelter was as a refuge for shepherds and their flock of sheep and goats. The site of Coval Simó can be considered part of an extensive exploitation system of the territory, both for finding metal supply sources and for agropastoral practices.

MATERIAL AND METHODS

The strategy followed to obtain an accurate and reliable approach to the chronology of the prehistoric occupation of Coval Simó was based AMS ^{14}C dating of short-lived samples according to their stratigraphic context. All samples consisted of domestic mammal bones identified taxonomically. Ten samples were analyzed. The bone samples were sent to two different laboratories (Beta Analytic, Miami, USA, and the Royal Institute for Cultural Heritage, Brussels, Belgium), in order to compare their results. In the case of samples sent to Beta Analytic, the preparation methods were not described in the reports. The other sample group was prepared at the Royal Institute for Cultural Heritage (Van Strydonck and van der Borg 1990–1991) and AMS dated in the Leibniz-Labor für Altersbestimmung und Isotopenforschung (Nadeau et al. 1998). Collagen for dating was extracted using the Longin (1971) method. An extra NaOH cleaning was added.

In relation to the stratigraphy of the site, most of the samples selected came from the late horizon of the sequence (H3). Two samples were collected from the context SU 48, located immediately under the fallen rocks (SU 8), in order to date the collapse, but both samples had to be discarded. A sample from SU 66 was dated, with an unreliable result. Two more samples from SU 67 were analyzed; one did not yield collagen, but a reliable result was obtained from the other sample. The ^{14}C analysis of H3 was completed by a single dating from each one of the contexts SU 33, SU 64, and SU 77, which gave reliable results. The rest of the analyzed samples came from the horizon H2. In SU 35, located at the bottom of the sequence, two samples were collected: one gave a reliable dating, but the other had to be discarded due to a lack of collagen.

RESULTS

The five reliable dates are presented in Table 3. They have been calibrated using OxCal v 4.2.2 software (Bronk Ramsey 2009) and the IntCal09 curve data (Reimer et al. 2009). The other five analyzed samples had to be discarded due to their poor state of preservation, they gave modern results, or they gave contradictory dates. Samples KIA-14324 (SU 35) and Beta-160144 (SU 67) did

not present sufficient collagen for dating. KIA-15725 (370 ± 25 BP, SU 48) offered a modern result. The layer SU 48 was immediately under the rock SU 8, so that sample could have been infiltrated by surface run-off and postdepositional factors.

Table 3 Valid radiocarbon dating from Coval Simó.

Nr	Context	Age	Calibrated result (2σ)	Dated sample	Collagen (%)	C/N	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)
1	SU 35-G9	Beta-154196: 3760 ± 40 BP	2293–2036 cal BC	Caprine tooth	–	–	–	–
2	SU 64-F7	KIA-15726: 3740 ± 30 BP	2275–2035 cal BC	Caprine tooth	–	3.50	–17.9	–
3	SU 33-G8	KIA-14323: 3670 ± 30 BP	2139–1957 cal BC	Caprine tibia	–	3.25	–22.8	–
4	SU 67-D7	Beta-161787: 3650 ± 40 BP	2140–1916 cal BC	Pig astragal	–	–	–	–
5	SU 77-E5	KIA-29166: 3625 ± 25 BP	2116–1911 cal BC	Cattle tooth	2.29	3.15	–19.9	+4.07

The samples KIA-17391 (SU 48) and KIA-15727 (SU 66) show differences in the publication of their results. The first one was reported as 2435 ± 25 BP (Van Strydonck et al. 2002), while Micó (2005:194) gives the result 3435 ± 25 BP. The second date was originally reported as 2470 ± 30 BP (Van Strydonck et al. 2002), but Micó (2005:193) reported an age of 3470 ± 30 BP. The results reported originally are difficult to accept, because in fact they fall within the Iron Age. Besides, the materials recovered from these strata are not consistent with either dating. So, the possibility of infiltration of the sample from SU 48 has to be taken into account. But the stratigraphic position of the other sample (SU 66) is secure because it was obtained under the structure SU 59, filled by SU 57, which presented high-quality incised pottery as a part of a homogeneous context. Moreover, the reasons for the publication of different results concerning each one of these dates remains unknown. In any case, these last two results had to be excluded from the analysis.

DISCUSSION

The five dates of Coval Simó are placed in a 2σ range of ~2293–1911 cal BC. A clustering of chronological dating in two divisions can be observed, which should indicate the time at which we can prove the occupation of the site, from ~2293–2036 cal BC in the 3rd millennium BC, and the abandonment date prior to the collapse of the rocks, between ~2116–1911 cal BC (Figure 6).

From the ^{14}C results, two sets can be clearly defined. The first comprises Beta-154196 and KIA-15726 (~2300–2050 cal BC), while the second one contains the results of the other samples (~2150–1900 cal BC). In association with the stratigraphy, two main groups are observed. The first (H2) contains Beta-154196 (2293–2036 cal BC, 2σ) belonging to a stratigraphic horizon that consists of a set of 12 stratigraphic units. The stratigraphic deposit beneath it defines another horizon (H1), which contains units where decorated pottery is scarce and only appeared in one level (SU 72) and plain wares re similar to H2. Above, another sequence defines the third horizon (H3) with 12 stratigraphic units whose chronology is fixed by the three more recent dates (~2150–1900 cal BC).

With regard to materials, there are small differences in the pottery represented in each horizon despite the fact their chronological intervals show similar early dating for the two dated horizons. This effect could be due to the transfer of old elements into the levels of H3 horizon. The shallow depth of sediment situated under the level of the fallen blocks, which only reaches ~40 cm for the 27

stratigraphic units of the three horizons, undoubtedly plays an important role in this process. These small (but significant) differences when the three different horizons are compared could reflect further intensification in the use of the site from initial occupation until the rock collapse on top of the rockshelter. The earliest horizon contains few ceramic wares ($n = 95$), so the absence of decorated pottery in many of the levels of H1 cannot definitely be interpreted as identifying the existence of a plain ware horizon, previous to the decorated Bell Beaker style. In this respect, H2 shows only 7.2% of decorated pottery within a relatively large assemblage ($n = 387$), while in H3 ($n = 454$) the proportion of the decorated ceramic ware is even lower (4.6%). There are some differences, however, in the morphologies and decorations of the pottery among these horizons, which could be related to the two accurate chronological sets defined by ^{14}C dating. The first chronological set shows a narrower formal record associated with decorated pottery, basically with the presence of bowls, which expands in the second one with the addition of decorated spherical and conical shapes. The incised decorations are predominant (Group 5, after Lemerrier 2002), but corded wares are also found (Group 1, after Lemerrier 2002) as well as printed decorations (Group 4, after Lemerrier 2002). All of them are present in the same contextual assemblages and, consequently, with an initial chronology within the interval $\sim 2300\text{--}2050$ cal BC. These decoration patterns from Coval Simó show clear similarities compared to the Rhône-Provence, Provence, and the Pyrenees groups.

The decorative sets on Beaker pottery from Coval Simó disagree strongly with the existing proposals of different chronological styles in Mallorca (Rosselló Bordoy 1960; Cantarellas 1972; Waldren 1987a). Decorated pottery examples classified as Incised A/I and B/II or as Early, Apogee, and Late Beaker have been recorded in the same contextual assemblages in Coval Simó, with all falling within the narrow chronological interval of $\sim 2300\text{--}1900$ cal BC.

Currently, in Mallorca the results of Coval Simó can only be compared to S'Arenalet de Son Colom. This is an open-air site with a single occupation horizon (including Beaker pottery) dated to $\sim 2150\text{--}1950$ cal BC (Ramis et al. 2007, 2010; Ramis 2010). These sites provide an accurate view of the cultural context of this period. In addition, two ^{14}C dates were obtained on short-lived samples from the Beaker assemblage of the old excavations of Ca Na Cotxera (Calvo et al. 2002), confirming its contemporaneity with the chronologies defined by the two former sites.

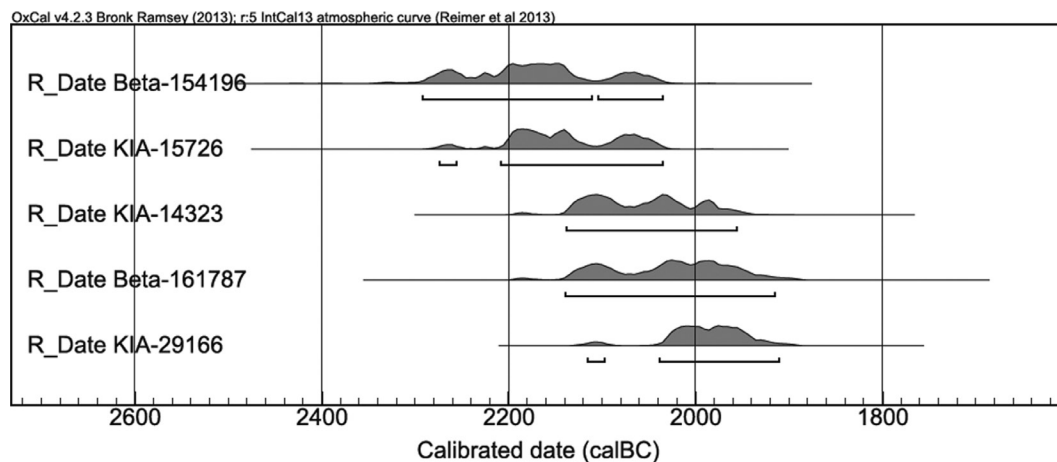


Figure 6 Probability distributions of the ^{14}C dates of Coval Simó

CONCLUSION

The absolute dates obtained in Coval Simó serve to frame accurately the material evidence obtained at the site, which includes Bell Beaker pottery associated with plain ceramics in a wide variety of morphologies. The obtained results point to a clear horizon for the early human occupation of the site ranging between ~2300 and ~1900 cal BC. Moreover, the Coval Simó results help to understand other Mallorcan contexts that lack sufficient reliability, because they came from past excavations with unstratified deposits or with a problematic stratigraphy. The fragmentary prior knowledge had led researchers to make erratic interpretations about the assessment of the remains and material culture. One example had been the separation of plain and incised pottery of the Beaker context in different phases, when in fact they are coeval.

The chronological and material record obtained at Coval Simó evidences that the Mallorcan contexts are placed in the last Beaker wave, with the spread of the so-called regional styles phase, also called Transition Beaker Horizon in the Valencia area (Bernabeu 1984; Juan-Cabanilles 2005). However, the presence of All Over Corded (AOC) Beaker in Mallorca (Son Olesa, Coval Simó), as happens in the Valencia region (Villa Filomena, Cova Merinel de Bugarra) or low Aragón (Masada del Ram), can be considered as a proof of the existence of a “Mediterranean maritime network” (Cura 1987) in the recent phase of the Beaker diffusion that would be parallel to another terrestrial route (Gusi and Lujan 2012). The presence of AOC Beaker does not necessarily indicate an early 3rd millennium cal BC chronology.

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