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Modelling social Change: A microspatial analysis of Punta de Muros (NW Iberia) through Bayesian analysis and household archaeology

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ABSTRACT

The following work is focused on the identification of internal transformations in the fortified settlement of Punta de Muros (Galicia, Spain), one of the hillforts with more information available for the Early Iron Age in the Iberian Peninsula. In this paper, a set of 24 radiocarbon dates is presented to characterise the complete sequence of occupation of the site. This research proposes a correlation between a chronostatistical model through a Bayesian analysis and a morphostructural study of the domestic environment of the settlement.

Thus, the results obtained provide a link between several transformations occurring in Punta de Muros and certain temporal and historical dynamics, which allows for a more reliable approach to the establishment and development of the settlement. Hence, a chronological and a structural contextualisation of the constructive transformations of the settlement will be drawn up, enabling us to understand the settlement during the onset, the development and decay of the fortified habitat in the northwest of the Iberian Peninsula.

1. Introduction

The settlement of Punta de Muros (Arteixo, A Coruña, Spain) is located on a small peninsula in the Atlantic coast (see Fig. 2) with an intense occupational sequence that spans throughout the entire Early Iron Age (hereinafter EIA). The settlement was founded during the emergence of the fortified landscape in the northwest of the Iberian Peninsula (9th –8th centuries BC), which is considered to be the dawn of the first Iron Age societies in this region (González García et al., 2011: 298; Parcero-Oubiña et al., 2020: 160)[2]. The fortification of the inhabited space is not only a key element to define the beginning of the Iron Age (Parcero-Oubiña et al., 2007: 141) but, contrary to what was usual in temperate Europe (with a few exceptions, such as Scotland: Armit, 1990), the fortified village was the exclusive unit of habitation for almost a millennium (González-Ruibal, 2006–7: 160). The fortified landscape marks a break with previous social strategies, defined by an itinerant way of life (Méndez Fernández, 1994), medium and large scale mobility (Cunliffe, 1999), wide circulation of bronze objects (Comendador Rey, 1999), the accumulation of agricultural goods and/or prestige goods (González-Ruibal, 2006-7: 109), or the existence of several cultic activities such as metal deposits. In contrast, a new landscape is structured around conspicuous locations and small fortified settlements (less than 1 ha) with a great defensive potential and wide long-distance visibility (Parcero-Oubiña, 2000: 86-87). These changes implied an effectively sedentary way of life (Parcero-Oubiña and Criado-Boado, 2013) and a significant reduction in the dynamics of mobility and exchange networks related to the Atlantic/Mediterranean world and diverse related cultural and religious phenomena (González-Ruibal, 2006–7: 242). The hillfort, indeed, became a landmark (Parcero-Oubiña and Criado-Boado, 2013) in a fragmented and divided landscape (Fábrega Álvarez, 2005). Likewise, the domestic space was "stonified" and permanent dwellings arose, hinting at a deep change that was followed by a new worldview based on a sedentary way of life (González García, 2017: 302). These dwellings, however, are characterised by their very small size, their arbitrary distribution in the settlement, and the lack of evidence of planning or joint structuring (Parcero-Oubiña et al., 2007: 152).

Despite this remarkable shift regarding the forms of expressing a particular way of life, the persistence of certain cultural patterns from the Late Bronze Age should also be noted, especially in terms of pottery

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[2] Seeking to avoid any possible misunderstanding in this regard, "NW Iberia" is understood as a geographical framework that includes Galicia, the North of Portugal, and the western area of Asturias. It is not intended to be used as a justification of the historical-cultural model of cultura castrexa or "castro's culture" and it does not assume any kind of social and cultural uniformity in the region.

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tradition (Cobas Fernández and Prieto Martínez, 1998: 161) and perishable architecture in domestic spaces (Ayán-Vila, 2012: 393), which are particularly common in inland areas (González-Ruibal, 2012: 262). The social context of these societies has been mostly defined as egalitarian (Sastre, 2008; Sastre and Sánchez-Palencia, 2013), resistant to social change and to intra-community hierarchisation (González-Ruibal, 2006–7: 265; González García et al., 2011: 292-293). In fact, these features defined a noteworthy resistance to social change throughout the entire Early Iron Age that would end after a period of social instability between the 5th and 4th centuries BC, raising more heterogeneous social dynamics across the northwest (González-Ruibal, 2012; González García, 2017).

In chronological terms, a total of 345 reliable dates from 69 excavated sites from the Iron Age were presented in 2009 (Jordá Pardo et al., 2009: 91), rising in 2020 to a total of 457 dates from 76 sites (Jordá Pardo et al., 2020: 45). Although the total number of excavated sites go beyond 150 (Teira Brión and Abal Vidal, 2012), which is a significant number, the total figure of known hillforts is around 3,000 (Nión-Álvarez et al., forthcoming). In the case of the EIA, there are 35 sites dating from this period for the whole northwest (Parcero-Oubiña et al., 2020: 164), though their distribution is not very homogeneous (see Fig. 1). The volume of dates between hillforts can range from 1 to 51, which could lead to an over-representation of settlements such as São Julião that, in addition, show a wide diachronic sequence (Bettencourt, 2000).

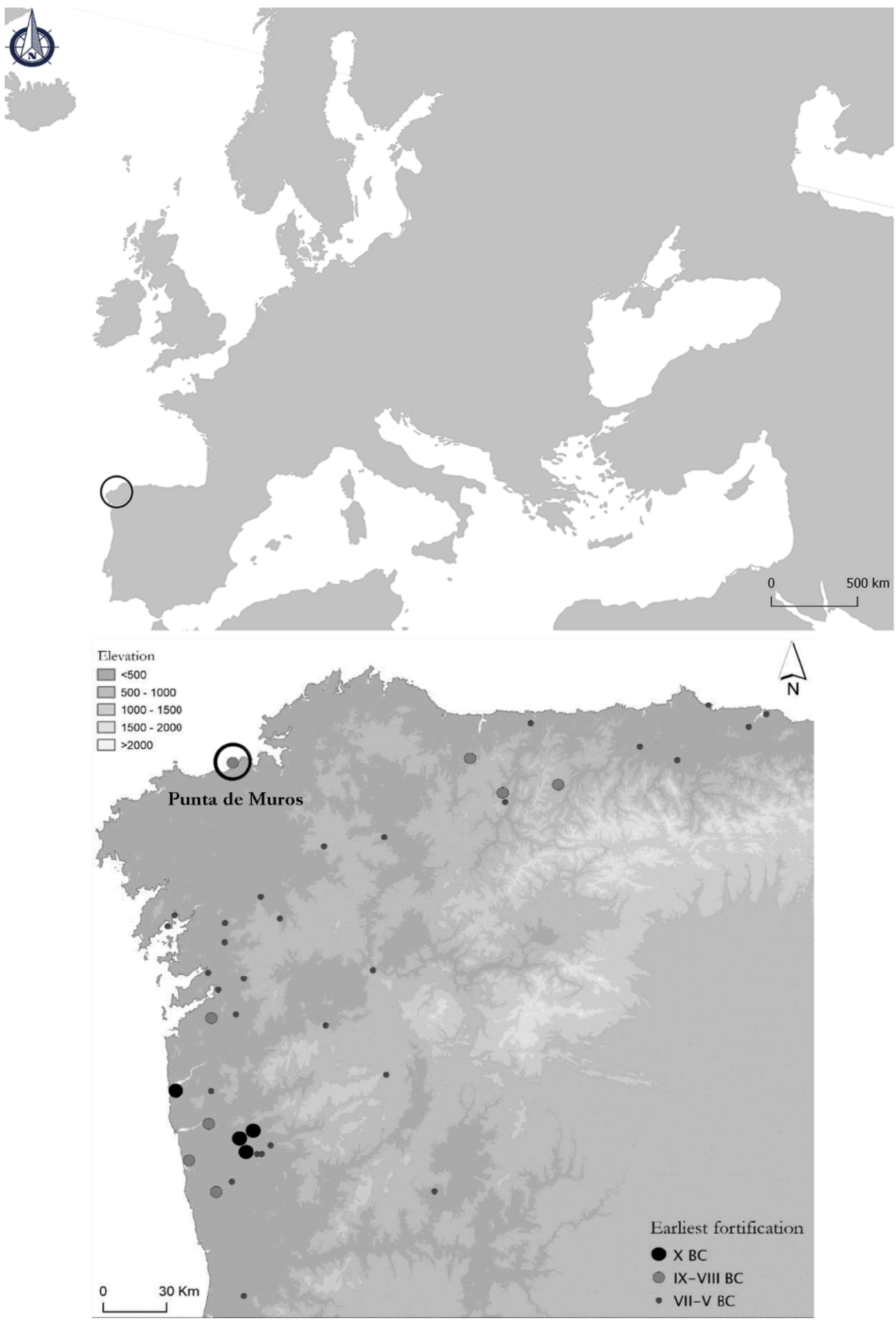

Fig. 1. Location of Punta de Muros within its context (the dots shows hillforts with EIA radiocarbon dates, according to Parcero-Oubiña et al., 2020: 164).

2. Punta de Muros (9th – 5th BC): An outstanding fortified settlement

Punta de Muros was excavated between 2005 and 2006, before the construction of the Outer Port of A Coruña. This intervention has raised several controversies given the subsequent destruction of the site and the unprecedented investment for NW Iberia: the hillfort was completely unearthed, and several studies were carried out, offering an unusual volume of data for a settlement with early chronologies (see Fig. 3). Within this framework, a total of 24 ^{14}C dates have been obtained (Cano Pan, 2012: 96). This dataset, which is useful for a chronostatistical modelling, can be particularly interesting for the analysis of the NW Iberian EIA: according to the available archaeological data, radiocarbon dates allow to sequence the complete occupation of the settlement for almost half a millenium, a unique context for the Iron Age in the northwest (perhaps with exceptions such as San Chuis, although most dates belong to the Late Iron Age: Molina Salido et al., 2011).

Despite its seaside location, its remoteness from natural transit routes, its remarkable defensive potential, and its usual long-distance visibility are consistent with the usual dynamics of the EIA (Nión-Álvarez, 2018: 347). The settlement is defended by a powerful wall nearly 7 m wide, which delimits the inhabited space in the isthmus and stresses its defensive potential. The dwellings have variable morphology and sizes and are characterised by their double-faced stone walls, a common technique in the NW Iberian Iron Age (Parcero-Oubiña et al., 2007). Among other features, one of the most significant features is the identification of a set of spaces that shows the entire operational chain of bronze production (Cano Pan and Gómez Filgueiras de Brage, 2010: 152), suggesting the existence of several areas for the processing and melting of raw materials.

Another significant issue is the appearance of large and complex domestic spaces and the existence of an emerging layout planning, showing an internal configuration of greater complexity than usual (Ayán-Vila, 2012: 393-403; Cano Pan, 2012: 718-740); a phenomenon that contrasts with the general characteristics of this period. Focusing on metal production and monumental architecture, several approaches (Cano Pan and Filgueiras de Brage, 2010; Cano Pan, 2012) have understood Punta de Muros as a "metallurgical and commercial factory" that reflects a highly hierarchised social model (Cano Pan, 2012: 744). However, these approaches have not considered the architectural analysis diachronically, but using a basic examination of the final layout of the settlement and an understanding metalworking as unquestionable evidence of social inequality (a topic that has been strongly contested: Welbourn, 1985; Hingley, 1997; for the case of Punta de Muros see Nión-

Fig. 2. Aerial image of Punta de Muros (Cano Pan, 2012: 102).

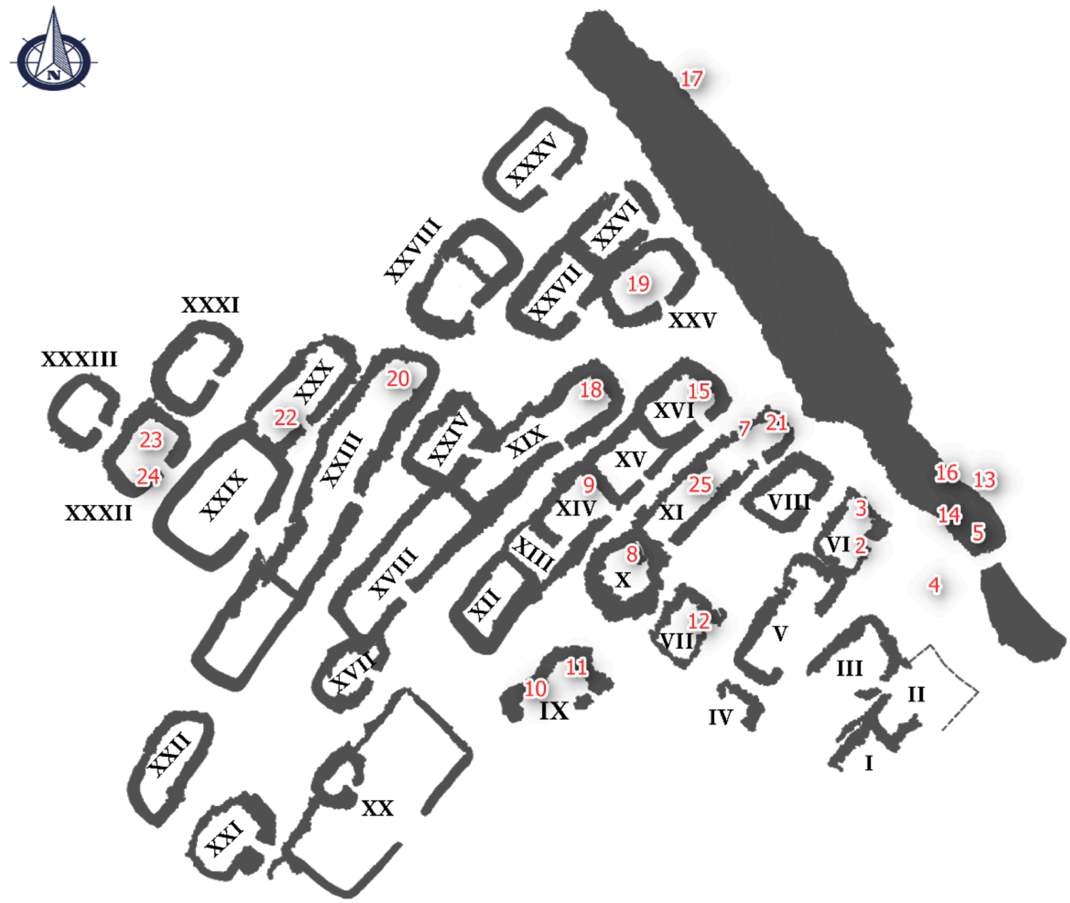

Fig. 3. Location of the[14]C dates of Punta de Muros (numbering according to Table 1).

Álvarez, 2022). These proposals have uncritically considered certain archaeological expressions as coetanous, without reflecting about their temporalities and without considering that the layout of the settlement may portray an architectural palimpsest generated over the course of an intense occupation with diverse phases and dynamics.

This issue raises the need of understanding their chronology in an ordered occupational sequence, aiming to provide a correlation of the architectural transformation of the settlement (especially, these large domestic structures) with reliable chronological information. These data will provide several information to unfold the forms of occupation of the settlement and to assess the scope of its proposed exceptionality.

3. Materials and methods

The proposed methodology presents a twofold approach: first, an archaeological and architectural study of the domestic space of the settlement is proposed, following strategies of household archaeology; second, a Bayesian modelling of the available radiocarbon dates is provided, aiming to identify different phases of occupation and to establish its occupational sequence. The data obtained will lead to a connection between different definitions of the domestic space with the available chronological data, providing robust information to understand the dynamics of occupation of the settlement.

3.1. Archaeological analysis of households

Since the 1970 s, the study of the domestic space has played a central role in archaeological research (Flannery and Winter, 1976; Manzanilla, 1986; Wilk and Rathje, 1982). This is an outstanding field of study for drawing differences between social processes and strategies of inter-community configuration. The house is a key factor in the basic cultural phenomenon that is the humanisation of the landscape (Rapoport, 1969). As such, its value as a social space and its centrality in intra- and inter-family organisation reflects different forms of social organisation (Cutting, 2006: 228).

In this research, the work has been focused on several elements that can provide information about changes and continuities in the internal dynamics of the settlement: the analysis of the household area, the functionality of different spaces, the distribution and accumulation of several objects, and the distribution of the households in the settlement (Steadman, 2015: 225-234). A study of all the domestic units of the settlement has been undertaken, aiming to identify their chronologies (either absolute or relative) and assessing different functionalities according to their material records. Several proxies have been addressed in order to define the main characteristics of the domestic space (area, building complexity, accumulation of storage vessels, presence of storage spaces, and/or specialised productive areas, e.g.).

The data obtained have provided enough information to identify different dwellings and their functional and constructive distribution at an internal level. The results have been contrasted with their stratigraphic sequence and jointly assessed with the chronometric modelling, but not only in general terms: each domestic, stratigraphic, and date context has been analysed within its own context in order to identify each building in a specific phase.

3.2. Chronometric modelling of radiocarbon dates

As mentioned, a total of 24 radiocarbon dates are available for Punta

Table 1
Radiocarbon dates of punta de Muros. Original data (Cano Pan, 2012: 96) have been recalibrated according to the IntCal20 calibration curve (Reimer et al., 2020) in Oxcal (v. 4.4) (Bronk Ramsey, 1995).

	PUNTA DE MUROS							
CODE	N°	DATE (BP)	CAL BC (95 % confidence)	PHASE	SAMPLE LOCATION	LOCATION DETAIL	MATERIAL DATED	PLANT SPECIES
PEC 8343	2	2150 ± 35	231–52 BC		Structure VI	Collapse level	Charcoal	Fabaceae
PEC 8345	3	2480 ± 35	700–547 BCE	1B	Structure VI	Hearth	Charcoal	Quercus sp.
PEC 8347	4	2550 ± 35	796–547 BCE	1B	South Access	Isolated charcoal	Charcoal	Unknown
PEC 8353	5	2495 ± 35	771–544 BCE	1B	Rampart (external area)	Hearth	Charcoal	Unknown
PEC 8354	6	2485 ± 35	699–548 BCE	1B	Rampart (external area)	Hearth	Charcoal	Unknown
PEC 8407	7	2620 ± 40	830–774 BCE	1A	Structure XI-b	Hearth	Charcoal	Unknown
PEC 8425	8	2500 ± 35	773–544 BCE	1B	Structure X	Hearth	Charcoal	Unknown
PEC 8429	9	2710 ± 40	879–793 BCE	1A	Structure XIV	Hearth	Charcoal	Fabaceae
PEC 8432	10	2485 ± 40	773–537 BCE	1B	Structure IX	Hearth	Charcoal	Fabaceae
PEC 8433	11	2460 ± 40	766–519 BCE	1B	Structure IX	Hearth	Charcoal	Unknown
PEC 8441	12	2010 ± 40	103 BCE-121 CE		Structure VII	Isolated charcoal	Charcoal	Unknown
PEC 8444	13	2620 ± 35	827–777 BCE	1A	Rampart (external area)	Isolated charcoal	Charcoal	Unknown
PEC 8446	14	1035 ± 30	955–1045 CE		Rampart (internal area)	Isolated charcoal	Charcoal	Unknown
PEC 8447	15	2480 ± 35	700–547 BCE	1B	Structure XVI	Hearth	Charcoal	Quercus sp.
PEC 8451	16	2375 ± 35	538–402 BCE	2	Rampart (external reinforcement)	Isolated charcoal	Charcoal	Unknown
PEC 8455	17	2555 ± 35	797–548 BCE	1B	External area of the settlement	Isolated charcoal	Charcoal	Unknown
PEC 8486	18	2660 ± 35	887–783 BCE	1A	Structure XIX	Stratum below the hearth	Charcoal	Unknown
PEC 8496	19	2425 ± 35	542–412 BCE	2	Structure XXV	Isolated charcoal	Charcoal	Quercus sp.
PEC 8498	20	2375 ± 35	538–402 BCE	2	Structure XXIII	Hearth	Charcoal	Fabaceae
PEC 8513	21	2480 ± 35	700–547 BCE	1B	Structure XIb	Stratum below the hearth	Charcoal	Quercus sp.
PEC 8529	22	2510 ± 35	778–544 BCE	1B	Structure XXX	Hearth	Charcoal	Fabaceae
PEC 8532	23	2385 ± 35	539–406 BCE	2	Structure XXXII	Hearth (second level of use)	Charcoal	Fabaceae
PEC 8536	24	2480 ± 35	701–547 BCE	1B	Structure XXXII	Hearth (first level of use)	Charcoal	Quercus sp.
PEC 9647	25	2395 ± 35	540–407 BCE	2	Structure XIa	Hearth	Charcoal	Unknown

Table 2
Basic data of the OxCal Bayesian model.

Name	Unmodelled (BC/AD)			Modelled (BC/AD)				
	from	to	%	from	to	%	Agreement	Convergence
Sequence								
Boundary Start 1A				−933	−798	95.4		96.7
Phase 1A								
PEC-8429	−931	−801	95.4	−879	−793	95.4	92.5	99.1
PEC-8486	−900	−789	95.4	−887	−783	95.4	127.1	99.6
PEC-8407	−899	−596	95.4	−830	−774	95.4	118.4	99.9
PEC-8444	−895	−764	95.4	−827	−777	95.4	110.2	99.9
Boundary Transition 1A/1B				−819	−674	95.4		99.7
Phase 1B								
PEC-8455	−805	−548	95.4	−797	−548	95.4	87.3	99.8
PEC-8347	−804	−546	95.4	−796	−547	95.4	91.7	99.9
PEC-8529	−790	−518	95.4	−778	−544	95.4	104.6	99.9
PEC-8425	−781	−485	95.4	−773	−544	95.4	106.2	99.9
PEC-8353	−779	−481	95.4	−771	−544	95.4	107.0	99.9
PEC-8354	−775	−425	95.4	−770	−540	95.4	108.6	99.8
PEC-8432	−775	−422	95.4	−773	−537	95.4	109.7	99.9
PEC-8536	−773	−423	95.4	−771	−536	95.4	109.0	99.9
PEC-8513	−773	−423	95.4	−771	−536	95.4	109.0	99.9
PEC-8447	−773	−423	95.4	−771	−536	95.4	109.0	99.9
PEC-8345	−773	−423	95.4	−771	−536	95.4	109.0	99.9
PEC-8433	−758	−416	95.4	−766	−519	95.4	104.8	99.9
Boundary Transition 1B/2				−617	−442	95.4		99.8
Phase 2								
PEC-8496	−750	−402	95.4	−543	−412	95.4	120.0	99.8
PEC-9647	−742	−393	95.4	−540	−407	95.4	110.8	99.8
PEC-8532	−734	−392	95.4	−539	−406	95.4	104.0	99.8
PEC-8451	−725	−387	95.4	−538	−402	95.4	94.7	99.8
PEC-8498	−725	−387	95.4	−538	−402	95.4	94.7	99.8
Boundary End 2				−533	−344	95.4		98.6
Duration 1A Difference				−2	143	95.4		99.3
Duration 1B Difference				−2	208	95.4		99.3
Duration 2 Difference				−2	151	95.4		99.2

de Muros (see Table 1), carried out at the Angström lab of the University of Uppsala (Cano Pan, 2012: 71). In addition, several thermoluminescence dates have been obtained (Cano Pan, 2012: 971-972); although they could be incorporated into the analysis (Zink, 2015), they have been discarded due to a higher-than-usual error rate (Cano Pan, 2012: 973). At the same time, two dates (PEC-8441 and PEC-8446), recovered in stratigraphic levels with reduced reliability that offered eccentric results, have also been discarded.

Regarding the study period, the remarkable influence of solar affectations of the radiocarbon production rate around 2,450 BP (Van Geel et al., 1998), which are the main cause of the consistent lineality of the calibration curve popularly known as the Hallstatt Plateau, should also be noted. Undoubtedly, this causes a significant effect on chronological, social, and archaeological interpretation at multiple scales (Calvo Trías et al., 2020), even if its consequences have been attenuated (Jacobsson et al., 2017). In this case, several dates are affected by the Hallstatt Plateau, implying a lower precision to define the Phase 1B. Finally, the "old wood" effect should also be considered, as some samples come from plant species with long life spans. However, considering that they are only a minor part and samples of short-lived species give similar dates, this does not seem a biasing factor in the analysis.

Despite these limitations, the available data provided a representative chronostatistical model. A Bayesian analysis, a technique that has been on the rise in recent decades in archaeological research (Bayliss, 2015; Dye and Buck, 2015; Otárola-Castillo and Torquato, 2018) providing remarkable advances and greater chronological precision (even for Iron Age contexts affected by the Hallstatt Plateau: Hamilton et al., 2015; Prieto Martínez et al., 2017), has been chosen. Dating results have been incorporated into Bayesian chronological modelling based on the application of the Markov Chain Monte Carlo (MCMC) simulation, resulting in better estimates for complex model networks with heterogeneous data (Caimo and Friel, 2011). Bayesian models provide a framework within which the assumptions of priors (e.g. stratigraphical position or architectural evidence) are explicitly constructed, while posterior contexts are modelled using probability functions (Hoggarth et al., 2021: 984). The chronological information has been modelled with OxCal (version 4.4: Bronk Ramsey, 1995; 2009), a software developed by the University of Oxford, using IntCal20 as a calibration curve (Reimer et al., 2020). With OxCal, dates were grouped by phases, according to the coherence of archaeological and stratigraphical data available (Nión-Álvarez, 2021: 203-215), being aware of the acceptable threshold for a coherent Bayesian model in OxCal (Am greater than 60) (Bronk Ramsey, 1995). It should be noted that agreement with the model does not necessarily prove that the assumptions are correct, but rather that there is no reason to discard them based on the available data (Culleton, 2012: 1577). The result has confirmed the presence of three chronological phases, which will be discussed below.

4. Results

4.1. Household analysis

The analysis of the first set of households of the settlement (which could be related to Phase 1A) shows a group of dwellings of small size (no larger than 35 m^2, see Table 3). The domestic space is mostly multifunctional, without individualised or compartmentalised spaces. Even craft activities, such as metalworking, are integrated in the domestic space with other tasks (Nión-Álvarez, 2022: 494). Within the group of dwellings from this first phase, structures XIb and XIV are worth mentioning: these households display a reduced presence of storage objects, with a particularly low representativeness compared to Phase 2 (see Table 3). Focusing on the layout, and although there are some aligned dwellings, there is no joint planning of the settlement (see Fig. 4), or not at the extent as will be in Phase 2.

The following Phase (1B), although diachronic, does not show any significant changes at the intra-domestic level. The households of this period reproduce previously described patterns: small size, multifunctionality, lack of compartmentalisation, reduced presence of storage vessels, and a non-structured layout (e.g. Structures VI, X or XVI, see also Fig. 5). A total of 9 dwellings present dates of this phase, which confirms the existence of a chronologically distinguishable but archaeologically and socially uniform occupation phase. It has been understood as a progressive process of demographic growth under the same model of social organisation (Nión-Álvarez, 2021: 186).

Table 3
Data of Phase 1A/1B (above) and Phase 2 (below) dwellings (Nión-Álvarez, 2023: 260).

Domestic Unit	Area (in m^2)	% of storage vessels in overall pottery record	Has dedicated storage space	Radiocarbon Dating
Phase 1A/1b				
III	28.1	21.5		
VI	18.1	7.1		771–536 BCE (PEC 8345)
IX	25.2	5.1		773–537 BCE (PEC 8432)
				766–519 BCE (PEC 8433)
X	21.8	_		773–544 BCE (PEC 8425)
XI(b)	27.5	_		830–774 BCE (PEC 8407)
XII	20.9	0.0		
XIV	27.7	_		879–793 BCE (PEC 8429)
XVI	26.9	33.2		700–547 BCE (PEC 8447)
XXIV	23.4	8.6		
XXV	28.0	0.0		
XXVIII	36.8	29.3		
XXX	34.3	17.7		654–549 BCE (PEC 8529)
XXXII	19.8	5.8		771–536 BCE (PEC 8536)
Mean	26.0	12.4		
Phase 2				
X-XI	68.8	37.5	Yes	540–407 BCE (PEC 9647)
XII-XVI	114.3	27.7	Yes	
XVII-XVIII-XIX-XXIV	154.2	27.3	Yes	
XXII	25.8	_		
XXIII	130.5	58.4	Yes	538–402 BCE (PEC 8498)
XXVIII	36.8	29.3		
XXIX-XXX	108.8	14.8		
Mean	91,3	32,5		

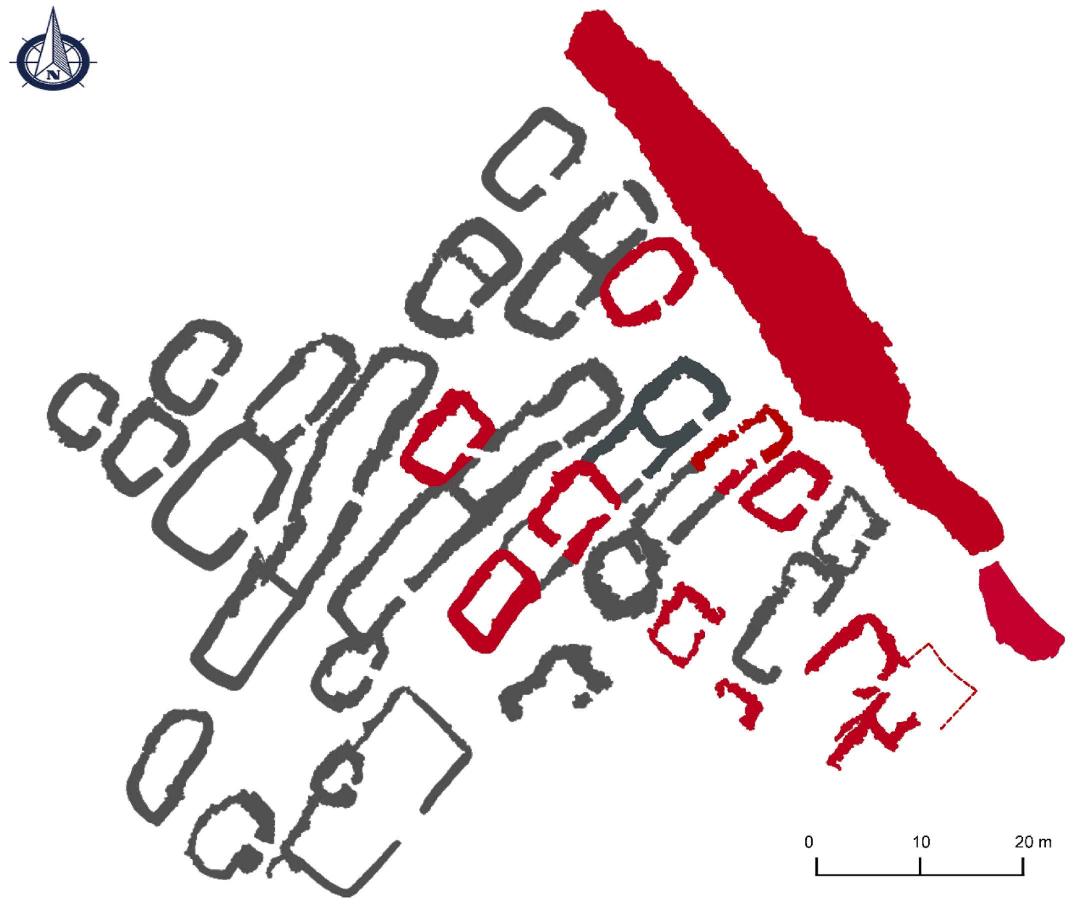

Fig. 4. Occupation during Phase 1a.

This dynamic seems to have undergone a remarkable transformation in the following Phase (2). Small dwellings were replaced by large domestic complexes that tripled or quadrupled their size (although some simple domestic units survived). This reformulation of the domestic space is defined by two different strategies with similar results: the aggregation of simple domestic units in a larger complex (see Figs. 6 and 7) or the *ex-novo* constitution of new monumental domestic spaces (see Fig. 8).

Households of Phase 2 (see Fig. 9) are defined by a noteworthy transformation that implied an increase in their size and internal compartmentalisation. The domestic space acquires bigger space and presents specific areas dedicated to storage, to craft activities such as metalworking (Nión-Álvarez, 2022: 494-495), or to other tasks related to the processing of raw materials or food (Cano Pan, 2012: 355). A greater capacity to accumulate and store goods is also documented. This tendency can be noticed through two main features: the existence of areas exclusively dedicated to storage objects and raw materials within the domestic space and a significant increase (in percentage) in the number of storage vessels. The first issue could be easily observed if we look at the absence of dedicated storage areas prior to Phase 2. The increasing of storage vessels in Phase 2 is also noteworthy: during Phases 1A/1B, the percentage within the households was around 10 %, while in Phase 2 increases almost threefold, with some cases even approaching a 60 % of the full record (Nión-Álvarez, 2023: 259, see also Table 3). These transformations in the domestic sphere raised a well-structured layout with demarcating transit areas.

This process can be identified in two domestic compounds particularly representative of these dynamics. The most enlightening case is provided by the X-XI compound, as it comprises representative dates of the entire sequence of the settlement. Room XIb, a dwelling of about 28 m^2 that reproduces the patterns of the first phase of occupation, was first built. A date in the hearth of the level of use (PEC-8407) allows us to date this building at the beginnings of Phase 1A (830–774 BCE). The dwelling would have remained in use throughout Phase 1B, according to another dating result (PEC-8513) taken from the other hearth of the dwelling (700–547 BCE), which reflects its morphological and constructional continuity throughout this phase. Simultaneously, during Phase 1B, a new dwelling (structure X) was built in a nearby area following the domestic patterns previously mentioned. A ^{14}C dating of the hearth at occupational level (PEC-8425) is coherent with this phase (773–544 BCE) and with the settlement dynamics.

Later, however, the west wall of room XIb was destroyed, creating a new household in which the walls of room XIb were enlarged to adjoin Structure X. At the same time, part of the destroyed wall was reused as an internal compartmentalisation (Cano Pan, 2012: 325). This building process implied the creation of a domestic space of about 70 m^2, concluding a strategy of building aggregation from two simple domestic units into a domestic complex. In this case, room XIa was created by the prolongation of the walls of room XIb towards structure X. XIa's date in the occupation level offers coherent data with Phase 2 (PEC-9647, 540–407 BCE), becoming representative of the architectural reformulation of the settlement.

A second example is structure XXIII, the largest building in the settlement (around 130 m^2). It has one radiocarbon dating (PEC-8498), taken from the fill level of a hearth (Cano Pan, 2012: 90), that is clearly coherent with Phase 2 (538–402 BCE). Built *ex-novo*, it presents a clearly

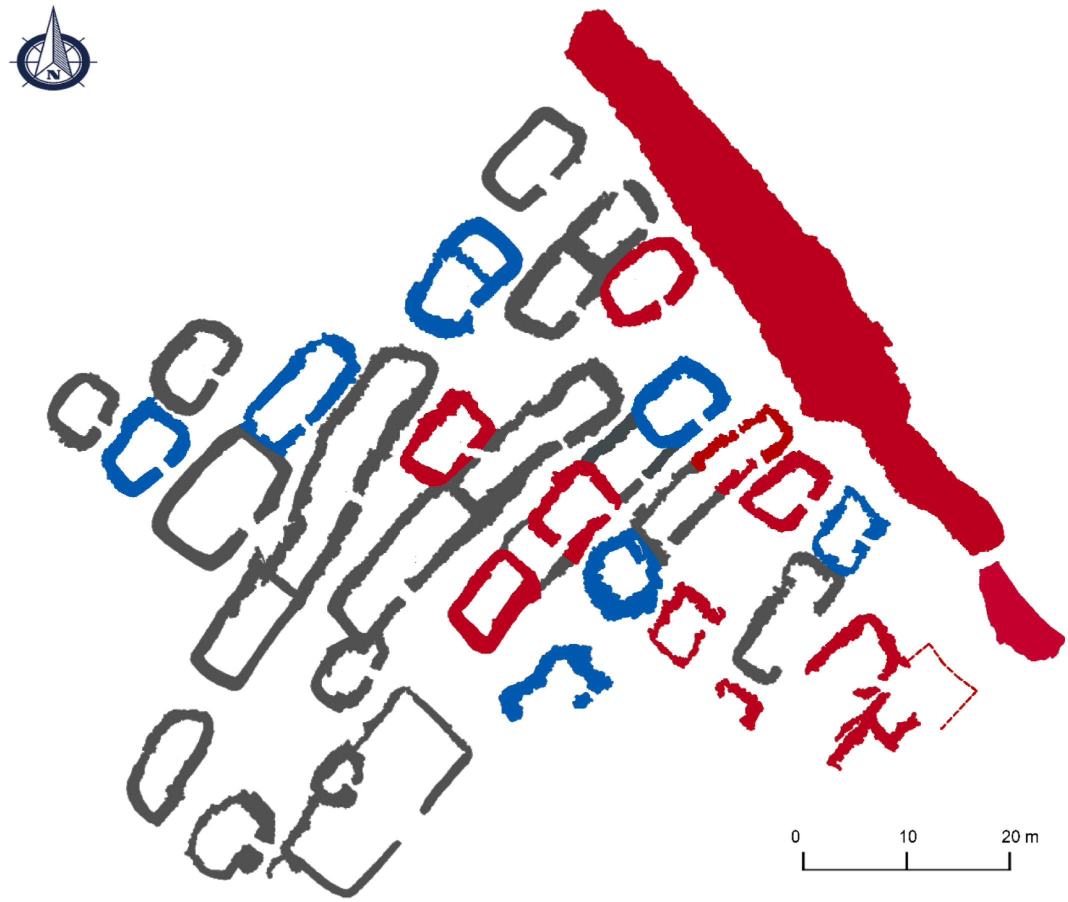

Fig. 5. Occupation during Phase 1a (in red) and new dwellings of Phase 1b (in blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

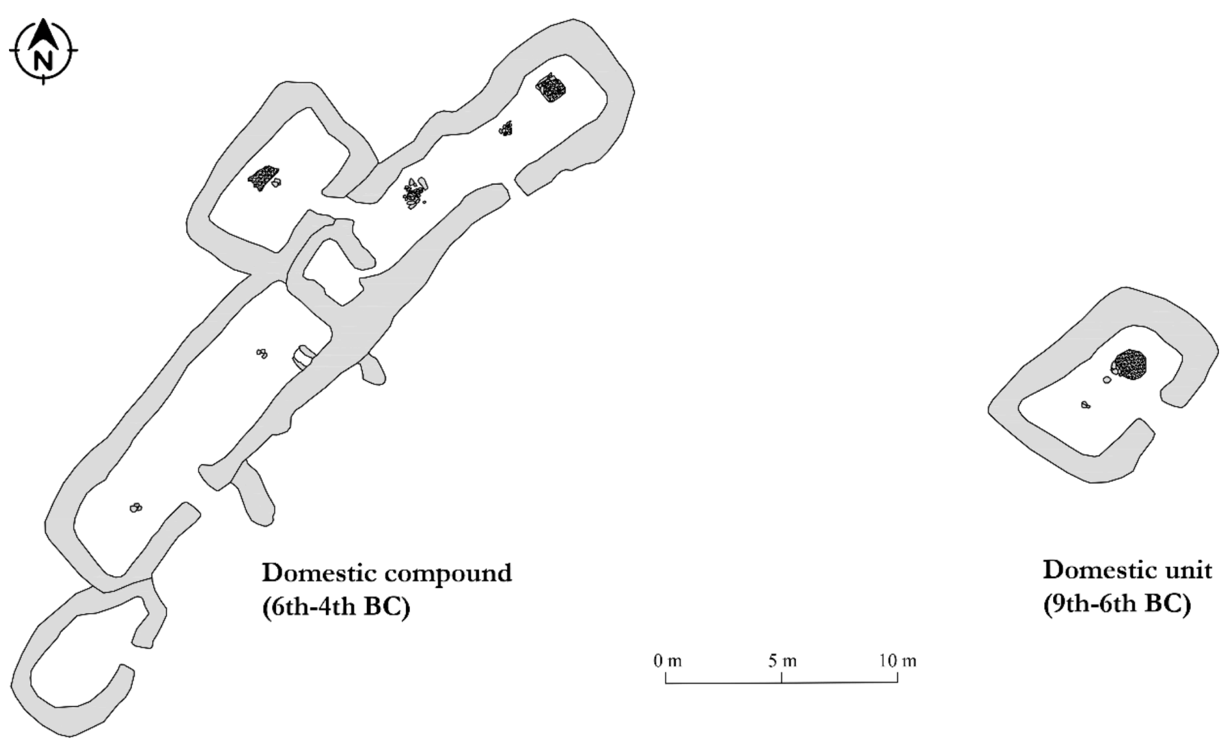

Fig. 6. Comparative between phase 1a/1b and phase 2 dwellings.

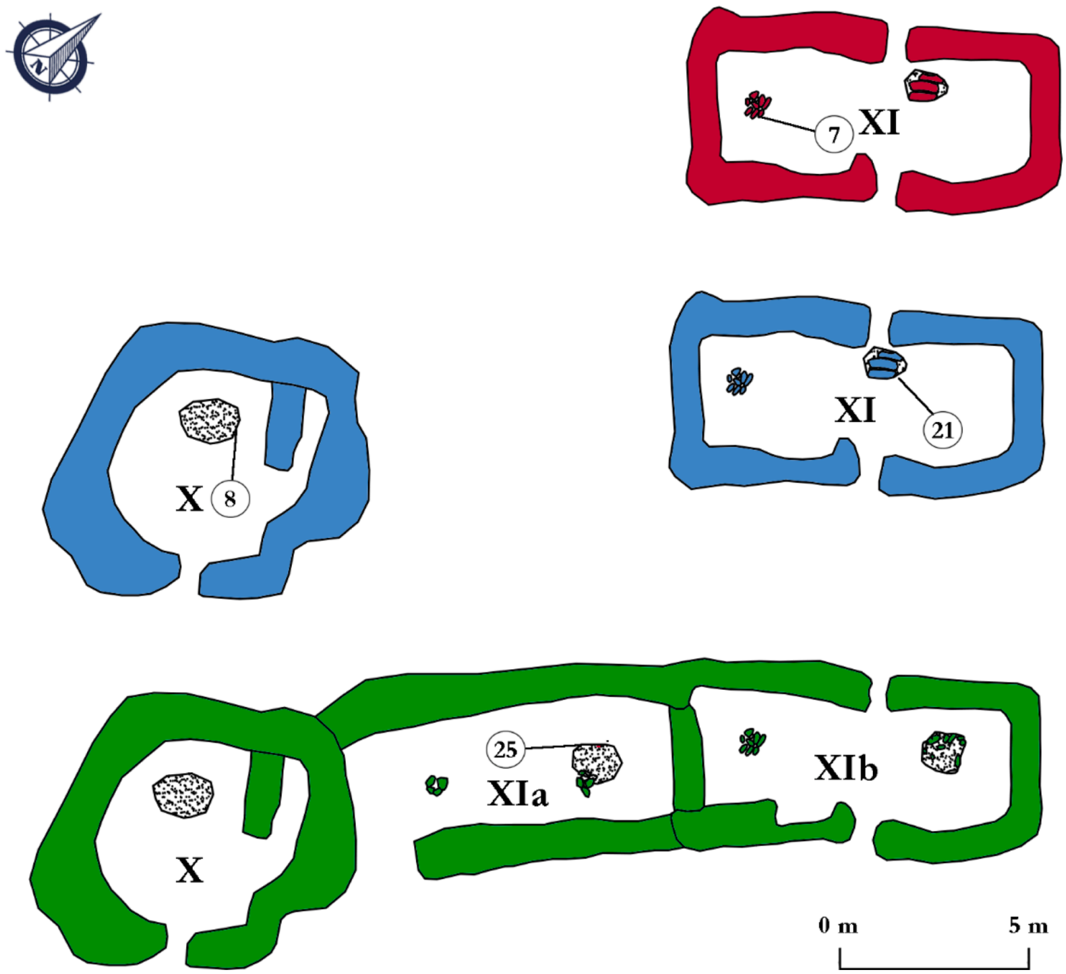

Fig. 7. Transformations of structure(s) X-XI throughout the full occupation of Punta de Muros. Phase 1A in red; Phase 1B in blue; Phase 2 in green; location of ^{14}C dates follow the numbering of Table 1. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

defined functional division, including specific storage and metalworking areas (see Fig. 8) and internal compartmentalisation that may also imply the existence of a courtyard in the southern area as a result of the closure and privatisation of this access (Cano Pan, 2012: 703-705), which underlines the trend towards a complexation of domestic sphere. These two examples are particularly representative of this architectural transformation and their coherence with Phase 2 points out a process of reformulation of the settlement during its last centuries of occupation that may imply a new social and cultural paradigm.

4.2. Bayesian analysis

The Bayesian model obtained with OxCal has provided temporal ranges associated with different phases of the archaeological periods. The results of the Bayesian modelling can be seen in detail in Table 2 and Fig. 10, with potential date ranges calibrated to a 95.4 % probability. For Phase 1A, the model gives a potential start date between 930 and 795 cal BC and a potential end of 820–675 cal BC. Following the results of the Oxcal "Difference" command,[3] it is suggested a span of around 140 years for Phase 1A. As for Phase 1B, the data, as mentioned above, are not particularly precise due to de Hallstatt Plateau issues: the potential start would be between 785 and 575 cal BC, and it would end between 750 and 510 cal BC. According to the "Difference", an estimated span of 210 years is proposed for Phase 1B. In the case of Phase 2, a start date of 560–410 cal BC and an end date of 515–365 cal BC have been obtained. For this phase, "Difference" suggests a duration of around 150 years.

Thus, the beginning of Phase 1A (and, consequently, the onset of the occupation of Punta de Muros) most probably ocurred in the middle of the 9th century BCE (possibly between 860 and 830 BCE) and ended in the second half of the 8th century BCE (maybe between 750 and 720 BCE). That may be considered the start of Phase 1B, whose location "in the middle" of the Hallstatt Plateau only permits placement in a broad chronological moment between the 8th and the 6th centuries BC. However, it should not be troubling to assume a span of, at least, 200 hundred years for this phase, which would fit with the known data and with the start of Phase 2 (a time span between 750 and 700 and 550–500 may be considered, albeit with caution). Finally, Phase 2 probably began in the mid-late 6th century BCE (possibly between 540 and 510 BCE) and ended at the beginning of the 4th century BCE (maybe between 410 and 380 BCE). These three phases show an extended occupation throughout the whole EIA, underlining the analytical value of the ^{14}C dates of Punta de Muros for the understanding of a complete sequence of occupation.

5. Discussion: Modelling time and social change

The results of this work may be of particular interest to understand the internal dynamics of the settlement, but also to obtain a coherent archaeological and temporal sequence that represents the complete span

[3] A specific code including this is provided in the Supplementary Materials.

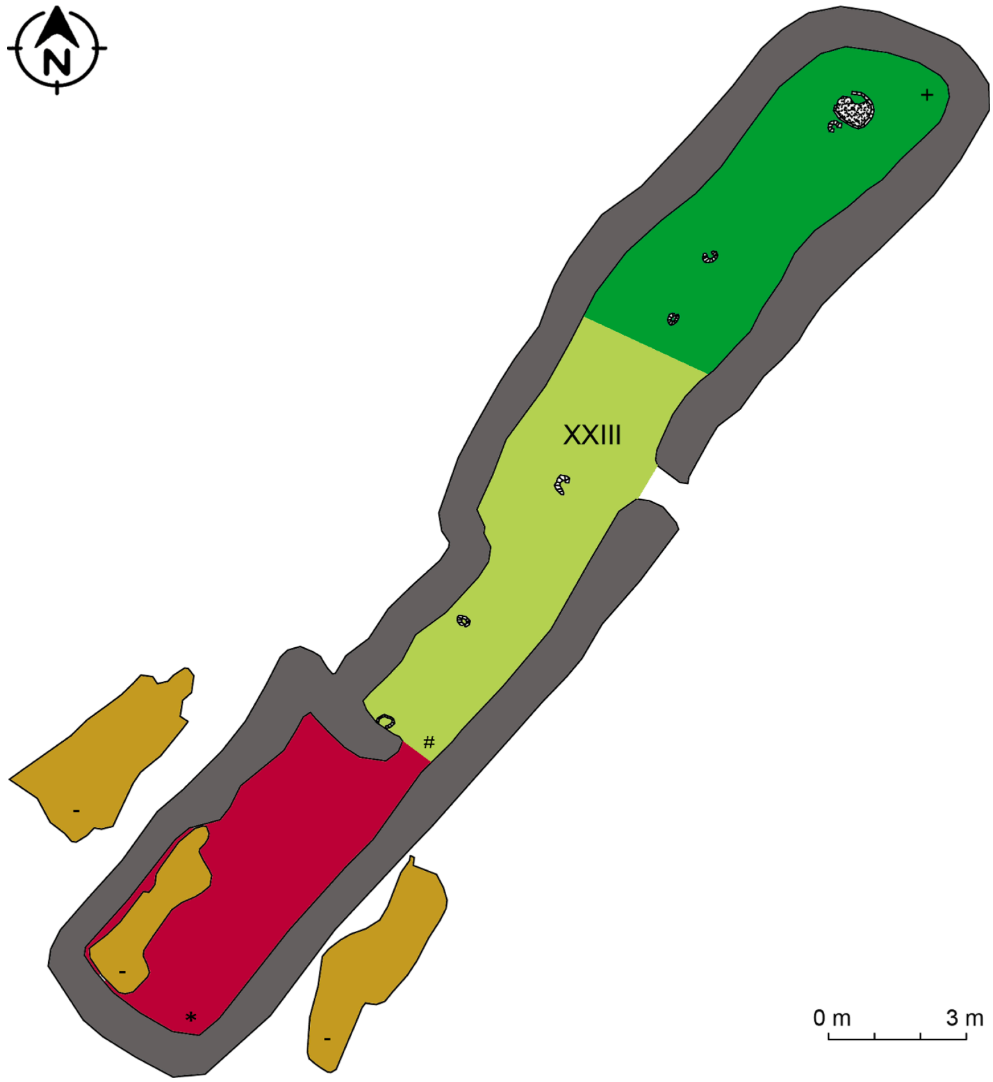

Fig. 8. Structure XXIII of Punta de Muros. Metalworking area in red; storage area in yellow; rest and cooking area in green; metalworking in bronze (Nión-Álvarez, 2022: 496). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

of an EIA settlement in NW Iberia. A diachronic analysis of the architectural and radiocarbon data for each phase shows an early development of a fortified settlements. The fortification of the Iron Age was usually considered to be part of a specific dynamic in the Portuguese Alto Minho and the coastal land of Rias Baixas, starting in 9th century BCE and spreading progressively to other areas (Bettencourt, 2005; Parcero-Oubiña et al., 2020). This work does not reject these statements, but rather suggests the existence of other focus of fortification in the northwest. At the same time, the households of Punta de Muros are coherent with the usual characteristics of the EIA, highlighting the presence of small multifunctional domestic areas without internal divisions. Everything seems to hint at a significant continuity in the domestic sphere since the foundation of Punta de Muros in the 9th century BCE until the end of the 6th century BCE (Phases 1A and 1B).

However, the domestic space of the settlement underwent considerable transformations during Phase 2, which began at the end of the 6th century BCE. Rather than the simple, smaller domestic units of previous phases, large complex households began to develop, with internal compartmentalisation and a functional specialisation of certain spaces and activities. This process, together with other factors, has been understood as part of a significant break with the previous social *ethos* of the settlement in favour of the existence of new strategies of internal inequality. Thus, these complex domestic units represent the emergence of different lineages and/or power groups with greater capacity to influence decision-making in the settlement (Nión-Álvarez and González García, 2023: 66).

Regardless of how to label these internal transformations, it is true that the reformulation of Punta de Muros, until today, has no parallels in NW Iberia. However, it is not an unknown process to other Iron Age European cases: the emergence of greater social complexity between the 6th and 4th centuries BC has already been noticed in several regions. This is the case of the great German Fürstensitze, central sites of considerable extension that were representative of a deep social hierarchisation (Fernández-Götz and Krausse, 2013); the beginning of a gradual process of urbanisation of southeast Gaul communities (Golosetti, 2014); or the change towards individualisation and complexity of domestic units coetaneous to the disappearance of the fortified settlement as a central unit in the Lower Rhine area (Roymans and Gerritsen, 2002).

It is possible, however, to suggest other EIA NW Iberia sites that could fit in similar process of transformation and complexification of domestic units. This is the case of A Cidá (Ribeira), where significant

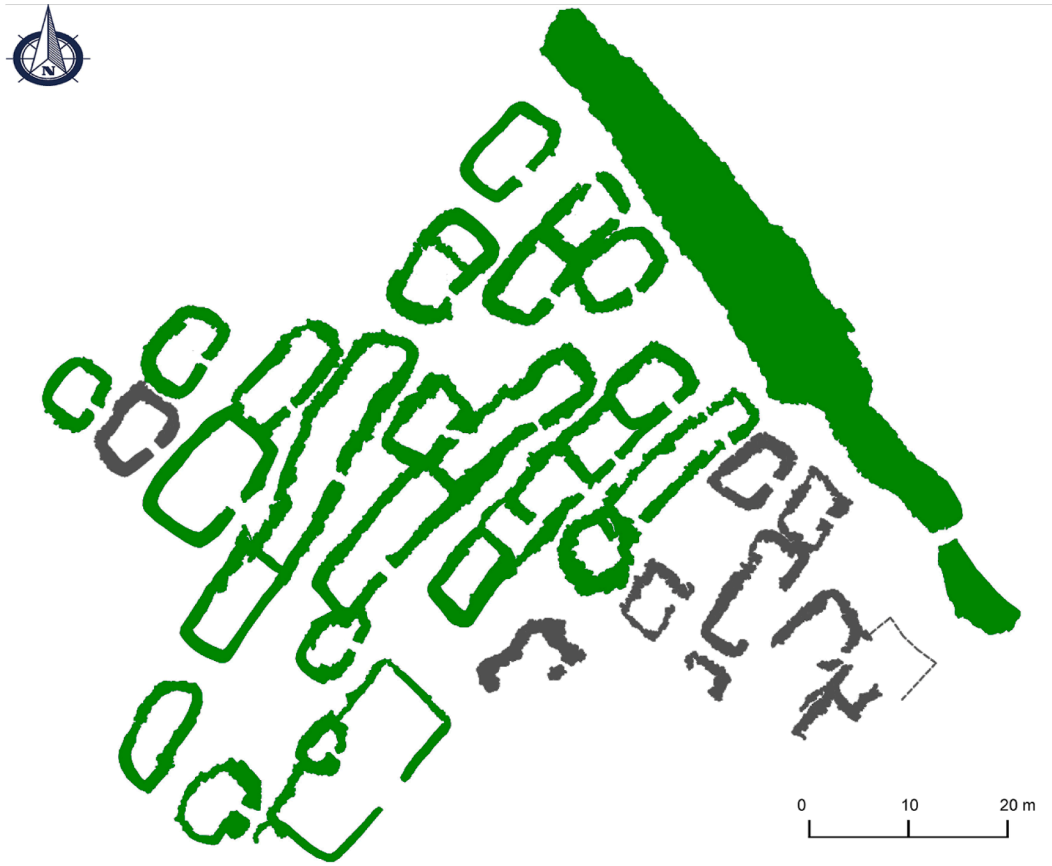

Fig. 9. Occupation during phase 2.

architectural changes could be traced during the EIA (Vidal Lojo and Naveiro López, 2020), although its dating by relative techniques does not permit to go further through its temporalities. If confirmed, the process occurring in Punta de Muros may not be exclusively an anomalous development of one settlement, but rather a localised or regional dynamic. However, more robust information is required to fully understand these dynamics and their regional scope.

6. Conclusion

This paper has approached the hillfort of Punta de Muros combining a Bayesian analysis of the radiocarbon datings with the study of the domestic space from diachronic focus to arrange different phenomena in their temporal axis. The modelling of the chronological information has permitted dating the beginning of the settlement in a particularly early time for the NW Iberia EIA, suggesting the potential existence of a more diverse beginning of the fortified landscape at a territorial level. Furthermore, the existence of a deep transformation of households within the settlement related to Phase 2 (late 6th BC – early 4th BC), according to chronological modelling, has been suggested. These transformations in households are coherent with other transformations in the settlement and represent a deep change in social dynamics without parallels in NW Iberia, providing interesting research perspectives for the study of the transition between the Early and the Middle Iron Ages.

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CRediT authorship contribution statement

Samuel Nión-Álvarez: Conceptualization, Data curation, Methodology, Formal analysis, Investigation, Resources, Visualization, Software.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

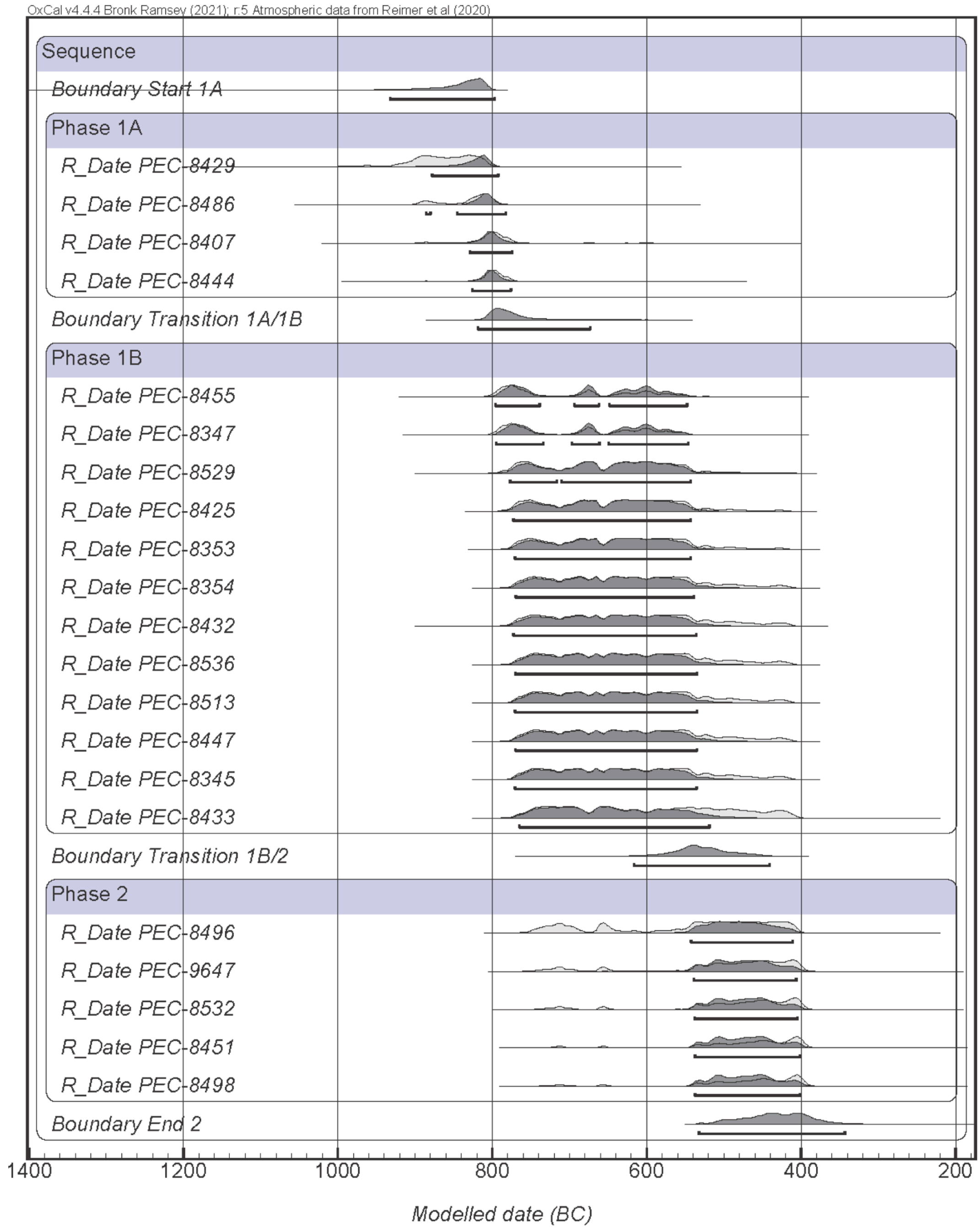

Fig. 10. OxCal chronological model of the proposed archaeological phases.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jasrep.2023.103912.

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