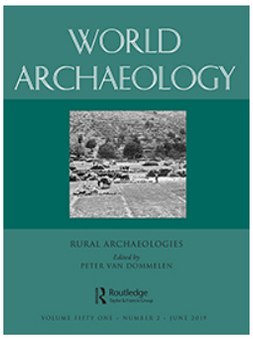

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ARTICLE

Weaving rural economies: textile production and societal complexity in Iron Age south-western Iberia

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ABSTRACT

Studying textile production in the middle Guadiana basin between the seventh and fifth centuries BC, this article reveals the significance of textiles for the development and change of economic complexity in rural societies in Iron Age south-western Iberia. Textiles were at the very heart of the economic transformation of the area in this period. The functional properties of textile tools and their implications for manufacturing different types of threads and woven textiles show that in the seventh and sixth centuries BC the production of textiles was household-based and mostly for self-consumption. From the late sixth century and especially in the fifth century BC, however, the increasing specialisation of textile production and the appearance of workshops heralded new economic relations. By examining textile production and artisans' skills and knowledge, this study reconsiders our understanding of craft production, societal change, and economic complexity among the rural societies of Iron Age Iberia.

KEYWORDS

Western Mediterranean; Iron Age; Iberian Peninsula; craft specialisation; textile production; rural economies

Introduction

Rural economies have fuelled their metropolitan counterparts until the twentieth century in western countries, and still do so in many regions of the world (van Voss, Hiemstra-Kuperus, and van Nederveen Meerkerk 2010). Female labour, particularly in textile production, has been crucial in those economies, transforming raw materials from farm to finished or semi-finished products, through skills and time, as well as providing household income.

This article focuses on rural economies and female labour, highlighting their significance for the broader economic role and social implications of the production and consumption of textiles in Iron Age Iberia. It analyses textile manufacture at four sites dated to the seventh and sixth centuries BC – El Palomar, Escuela de Hostelería de Mérida, Cerro Manzanillo, and Medellín–, and at two additional sites dated to the sixth and fifth centuries BC – La Mata and Cancho Roano. They are all located in the Middle Guadiana region (Figure 1). This study combines different lines of evidence and investigation such as textile tools, faunal, palynological and archaeobotanic studies to reveal the significant role of textile production for rural economies in Iron Age south-western Iberia.

The present paper argues that studying textiles shows their significance as a driving economic force that shaped rural social life. The analysis reconsiders the interrelations between domestic and

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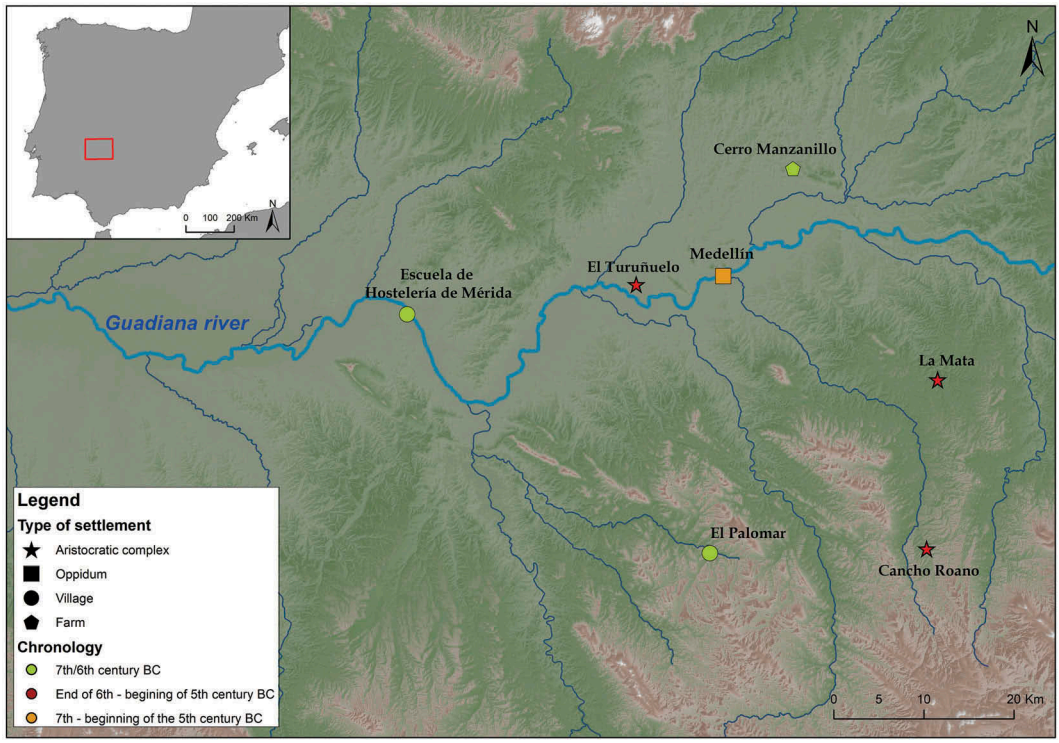

Figure 1. Main sites mentioned in the text (Author: Alejandra Galmés).

workshop settings as sites of craft production, as well as the high degree of complexity and economic standardization that characterized and transformed rural societies in Iron Age Iberia. A study of textile production thus enables us on the one hand to address economic complexity and social change in rural societies. On the other, it also shows the sophistication and exchange of artisanal knowledge regarding the manufacturing of textiles in a rural region during the seventh and fifth centuries BC.

The rural and outside worlds

The middle Guadiana basin was mostly rural until the arrival of the Romans and the emergence of the first cities (Rodríguez and Pavón 2007). The Iron Age in this area was nevertheless a period of transformation, as the sixth century BC saw the construction of large country estates. The buildings excavated at Cancho Roano, La Mata and, most recently, Casas del Turuñuelo present one or two floors and a complex internal layout defined by numerous rooms and a big courtyard, including residential, productive and ritual areas. Current interpretations view these sites as aristocratic residences (Rodríguez, Pavón, and Duque 2018), monumental complexes (Jiménez-Ávila 1997), or sanctuaries (Celestino 2001; Celestino and López-Ruiz 2016), which controlled the surrounding grounds and cultivated lands, including most likely the nearby population.

Recent studies have shown that it is important to examine how those buildings relate to other sites in the area (Rodríguez, Pavón, and Duque 2004a; Sevillano et al. 2013) and in the preceding

Figure 2a. Standardised spindle whorls from Cancho Roano (Picture: Author).

period (Rodríguez, Duque, and Pavón 2009), although the latter aspect remains largely under-investigated (but see Rodríguez, Duque, and Pavón 2009; Jiménez-Ávila 2017).

The largest site in the region is Medellín, which is dated to the seventh century BC, and interpreted as a central place that controlled the smaller villages and farms nearby (Rodríguez, Pavón, and Duque 2004b, 584–585; Pavón and Rodríguez 2007; Sevillano et al. 2013; Jiménez-Ávila 2017, 77–78, 100). The settlement, located on a hill, has only been partially excavated because a medieval castle sits on top of it. The necropolis of Medellín was excavated in the 1980s and yielded over 200 tombs, containing local and foreign grave goods imported from Phoenician and local settlements in Andalusia and central-southern Portugal (Almagro et al. 2008).

The rest of the sites excavated or surveyed in the area are small villages or farms. In the first group, Escuela de Hostelería de Mérida and El Palomar are small villages that comprise several residential structures, in which people mostly carried out household activities (Jiménez-Ávila and Ortega 2001; Jiménez-Ávila and Heras 2017). Archaeologists have identified storage rooms, pottery kilns, and metalworking areas in each of these villages that could maintain a small to medium community.

Farms, smaller in scale and scope, are widespread across the Middle Guadiana region (Sevillano et al. 2013). Their economy was based on agricultural production and storage, with large quantities of stone mills for grain processing and amphorae, food preparation and consumption, and less so pottery and textile production. One of the best-known farms is Cerro Manzanillo (Rodríguez, Duque, and Pavón 2009).

In the sixth century BC, large country estates appeared in the Middle Guadiana region. Cancho Roano, La Mata and Casas del Turuñuelo, as mentioned before, are the three excavated building complexes of the almost 13 similar sites recorded in the region (Celestino and López-Ruiz 2016, 212). Archaeologists have brought to light large storage rooms full of amphorae, numerous textile tools, cooking and tableware, including banquet pottery and metal sets, and numerous foreign products – ivory plaques, jewellery, precious ceramics and metal objects; but also intensive pottery and metal production in areas close to the main building.

The Middle Guadiana region thus provides a compelling case study for a diachronic analysis of textile manufacture and labour in Iron Age rural Iberia, from the seventh to the fifth centuries BC, especially regarding different modes of household and workshop production.

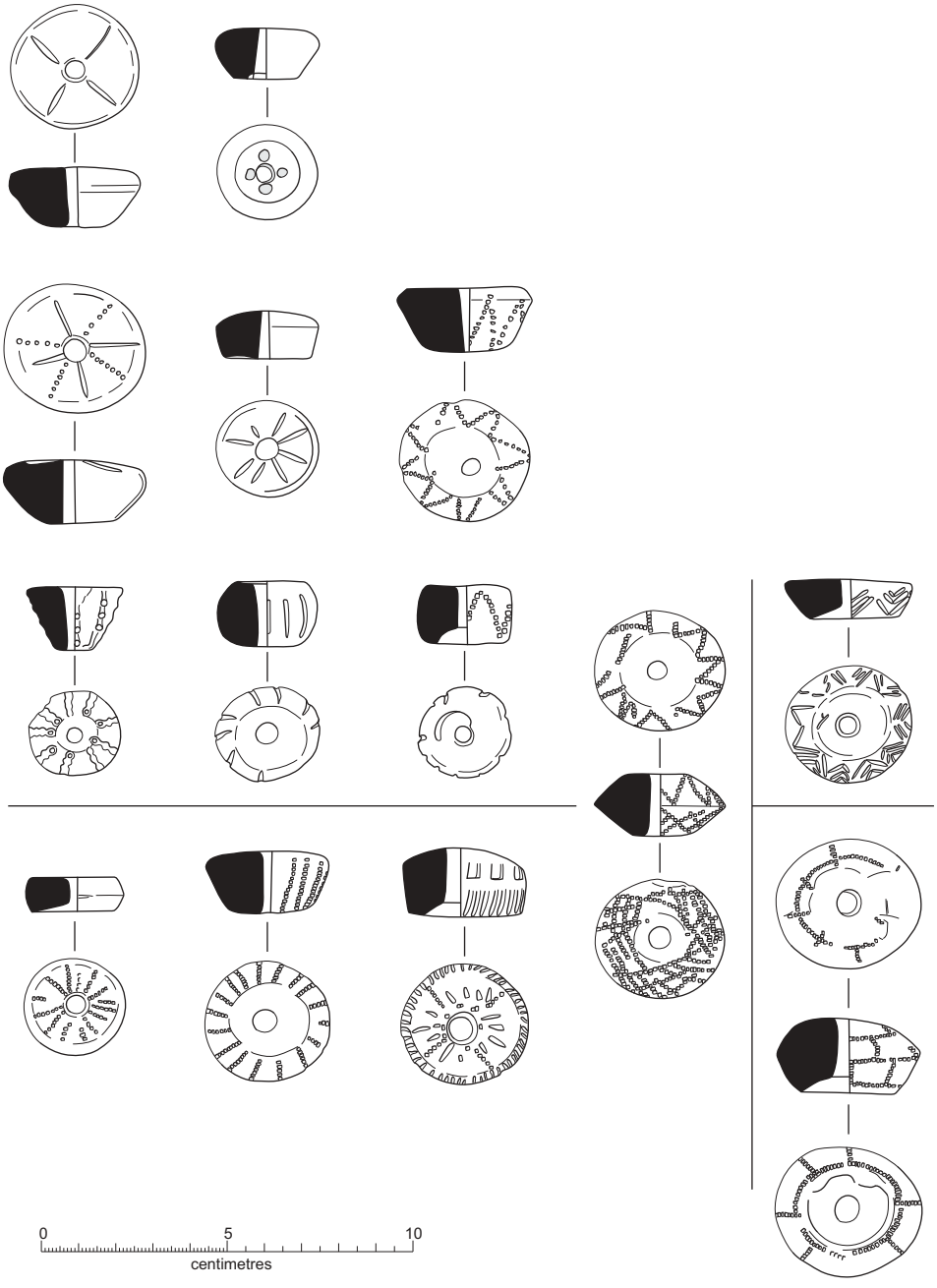

Figure 2b. Spindle whorls from Cancho Roano with incised decoration (Author: Vicki Herring, after Berrocal 2003, 236 fig. 9).

Figure 2c. Spindle whorl from Escuela de Hostelería de Mérida (EHM) decorated with incised chevrons (Author: Javier Heras).

Reconsidering the interrelations of household and workshop production

A study of textile production in Iron Age south-western Iberia needs to reflect on the socio-economic implications of household and workshop craft production. Households are the most important social units in human history, and their study in archaeology started in the 1970s (Wilk and Rathje 1982; Wilk and Ashmore 1988; Allison 1999).

Traditionally, archaeologists have distinguished between household and workshop production, associating household-based production with a subsistence economy that is generally not full time, and that requires the economic interdependence of people living together (Netting, Wilk, and Arnould 1984; Hirth 2009, 10; Douglass and Gonlin 2012, 10–11). In many societies, household members may undertake additional tasks not directly involved in the subsistence of the household such as the production of craft goods that can be exchanged for subsistence goods, and that can diversify domestic economic strategies, especially during agricultural downtimes (Arnold 1985, 225–231; van der Leeuw 1977; Hirth 2009, 20–21). Household production is thus different from workshop-based craft production, in which artisans produce goods for local and exchange networks' demand and to control the distribution of their goods (Brumfiel and Earle 1987; Costin 1991).

There has been a tendency in archaeology towards separating specialised craft production from household-based activities (Allison 1999, 8; Hendon 1996, 49; González et al. 2007), as if specialised production could take place only in workshops. This is surprising when considering that household weavers were registered as 'professional weavers' in the late eighteenth and nineteenth centuries US archival records (Mohanty 2006, 111). This biased interpretation derives not only from a traditional disregard for domestic – and usually female – activities, but also from the fact that

specialised craft production has had a prominent place in archaeological studies of complex societies and early states (Childe 1950; Arnold 1985; Brumfiel and Earle 1987; Hruby and Flad 2007; Ross and Steadman 2017).

Specialisation is, according to Costin (1991, 4, 2015), a differentiated and regularized production system in which a limited number of artisans produce goods for a larger group of consumers who do not produce those products themselves. The presence of craft workshops indicates specialisation, and is traditionally considered as a sign of greater social and economic complexity than when pottery, metal or textile is manufactured in the domestic domain.

The traditional emphasis on workshop-based production is particularly reductive when we consider that household production has been the main source of income for most households until at least the nineteenth century in most areas of the world. It has also commonly coexisted with workshop-based production, especially that of textile (Lampe and Jackson 1982: 144–145, 244–247; Tsurumi 1990; Hafter 1995; Jones and Stallybrass 2000; Li 2009).

The production of textiles is easily identifiable in the archaeological record when spindle whorls and loom weights are recovered. Recognizing the existence of a workshop, however, is more complicated. Many textile workshops and domestic spaces were almost indistinct until very recently. The accommodation of a loom or a spinning wheel, for instance, necessitated only a tiny transformation within a room or the seasonal conversion of a house area into a textile workshop when there were no agricultural tasks (Mohanty 2006, 107–115; Nevell 2008). Those types of arrangements leave few archaeological traces, making it very difficult to distinguish between the household and workshop modes of production.

In archaeology, a workshop mode of textile production is assumed when the number of spindle whorls and/or loom weights is unusually high. For example, Cutler, Nosch and Andersson Strand (2013) recognized a specialised workshop at Bronze Age Malia where over 600 loom weights were found. Burke suggested the existence of several workshops at Gordion in Turkey, dated to the ninth century BC, where over a thousand spindle whorls and loom weights were recovered (Burke 2005). Finally, Gleba argued for the existence of textile workshops at Poggio Civitate in Italy in the seventh century BC, where over 1,000 textile tools have been excavated (Gleba 2007).

In Iron Age Iberia, there is only one textile workshop identified so far and dated to the third century BC at Coll del Moro in Tarragona, where 107 loom weights were found in a room in connection with retting installations with flax remains (Rafel 2007, 118–119). Archaeologists recognized the importance of spinning and weaving at Cancho Roano, but did not classify it as a workshop (Berrocal-Rangel 2003; Almagro et al. 2011).

An important parameter for identifying workshops is scale (Costin 1991, 15–16), which involves the organization of the productive unit and the number of individuals working in the production of textiles in our case. Textile manufacture requires, first, the production of raw materials in order to process the fibres that will be used for making different type of cloth and tapestry. In Iron Age Iberia, raw materials were mostly flax and sheep wool (Alfaro 1984; Jover and López 2013; Marín-Aguilera et al. 2019), which require different ways of processing and therefore distinct forms of labour organization. In what follows I will briefly detail the archaeological evidence for the production of textile fibres in the Middle Guadiana region before zooming in on textile manufacture and organization.

The production of raw materials

Archaeobotanical and palynological studies have not found traces of the cultivation of flax (*Linum usitatissimum*) in any of the excavated sites (Hernández 2008; García, Ramos, and Vázquez 2009; Duque and Pérez. 2009). But flax fibres were found stuck to the neck of an amphora at La Mata, and interpreted as the remains of a cloth used to close the vessel tightly (Tresseras and Matamala 2004, 437).

Regarding animal husbandry, the Middle Guadiana Valley shows strong continuity from the Bronze Age to the Iron Age (Castaños 1998; Hernández 2008). Zooarchaeological analyses carried out at Medellín yielded a percentage of 27,5% for sheep (*Ovis aries*) (Almagro 1977, 473). More detailed – and more recent – are the faunal studies for the sites of Cancho Roano and La Mata (Celestino 2001, 52–53; Castaños 2004). At the former site, sheep made up approximately 40% of the identified fragments, and 28% at the latter site, where the sheep population comprised 33% young (juvenile) individuals, 40% semi-adults and 20% adults. This may likely be associated with a mixed strategy of meat processing (juvenile sheep) and secondary products such as wool and milk (adults and semi-adults).

Textile production and technologies in the middle Guadiana basin

Flax and wool fibres need to be appropriately prepared before they can be spun, and the process is quite different for each fibre (Barber 1991, 11–33; Gleba 2008, 69, 97–98). Farmers have to pull out flax plants by the roots and assemble them into bundles to let them dry. Once the stems are dry, the seed capsules have to be removed by rippling the stems, which are then retted in dew or water in order to allow the pectin to rot away that keeps the fibres together. Retting can take up to 2or 3weeks and requires close supervision to avoid weakening or ruining the fibres. Shepherds do not need as much time and labour to produce a larger volume of wool fibres as flax requires: their primary task is to look after their flock and, when the time comes, to shear their sheep. The resulting wool then requires washing and sorting.

Once the fibres are ready for use, there are different thread-making techniques (Barber 1991, 39–78). One can 'hand spin' by twisting the fibres manually into a thread, without the help of any tool. Draft spinning is a method in which the fibres are twisted by hand with the help of a shaft – spindle – usually made of wood, and a weight, known as spindle whorl. While the former is rarely preserved in the archaeological record, the latter is a common find, as it is mostly made of fired clay, stone, ivory and bone. There exist two variations of this method, namely drop-spinning and supported spinning: in the first technique, the spindle is suspended to rotate freely, while in the second one, the spinner employs a small ceramic bowl to hold the spindle while spinning the fibre. Spindle whorls differ in measurements and shape depending on the time and place of production, as well as their intended use (Barber 1991, 51–68; Gleba 2008, 103–109).

Loom weights are used for weaving on a vertical warp-weighted loom. The function of the loom weights is to pull down the warp (vertical) threads, while the weaver inserts weft (horizontal) yarn, working from the top downwards. This type of loom was typical for the Iron Age in Iberia. In the Middle Guadiana region, and dated to the seventh and fifth centuries BC, there are six sites where spindle whorls and/or loom weights have been found and that inform this research (Table 1).

The spindle whorls recovered from Escuela de Hostelería de Mérida, Cerro Manzanillo, Medellín and El Palomar are handmade from tempered clays, whereas the spindle whorls from La Mata, and particularly the ones found at Cancho Roano, are usually made of a fine, levigated clay paste. In the latter site, archaeologists also recovered a significant number of mould-made spindle whorls

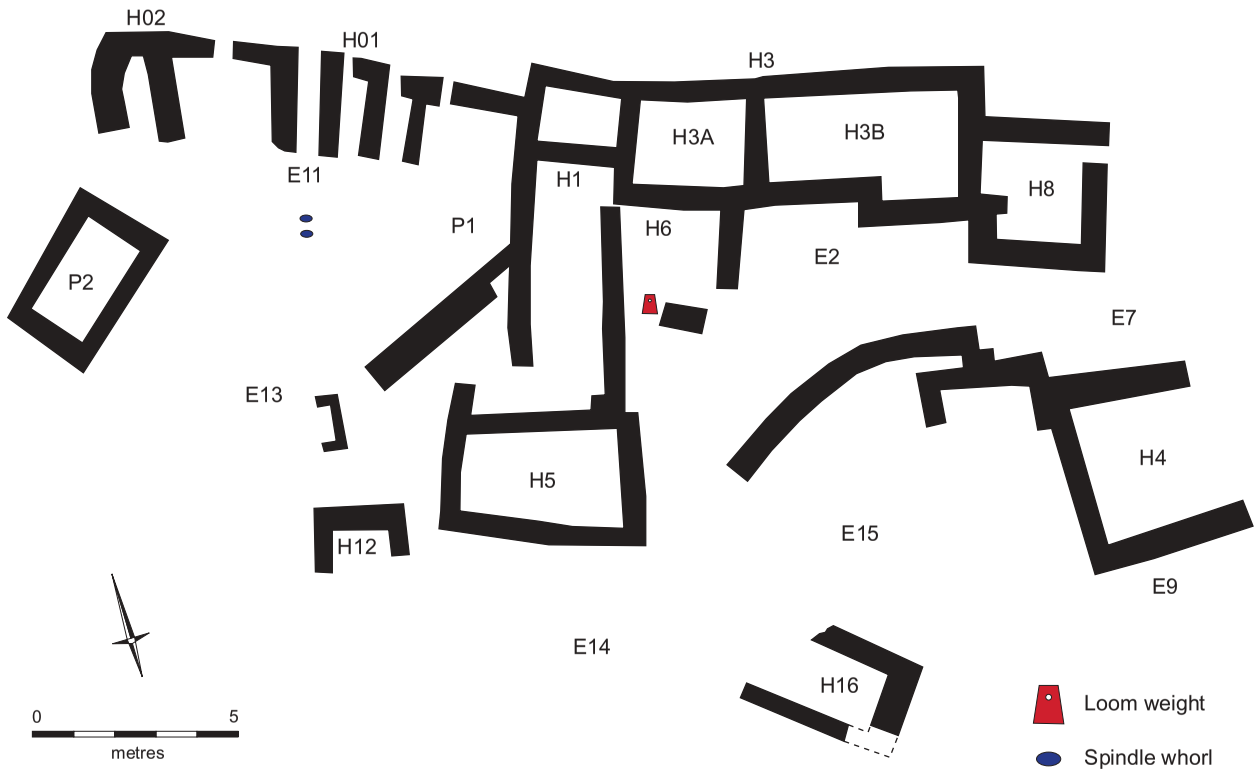

Figure 3a. The farm of Cerro Manzanillo with the location of textile tools (Author: Vicki Herring, after Rodríguez et al. 2009, 116 fig 49).

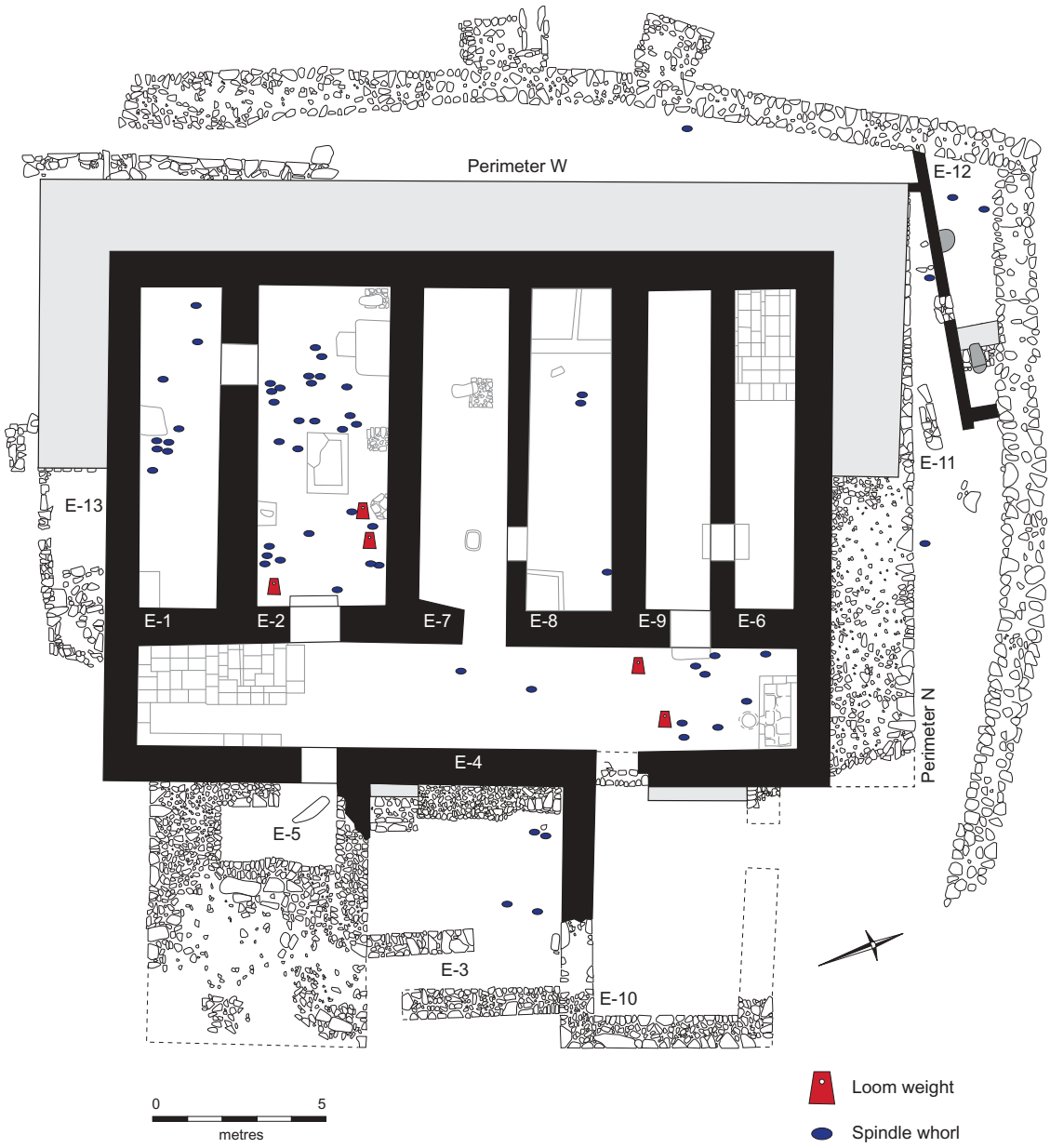

Figure 3b. The site of La Mata (lower floor) with the location of textile tools (Author: Vicki Herring, after Rodríguez & Ortiz 2004: fig. 104).

manufactured from a very fine clay paste (Figure 2(a)). Alongside these mould-made whorls (152 in total), archaeologists discovered 14 decorated spindle whorls with incised lines, dots or chevrons at Cancho Roano (Figure 2(b)). Some of the spindle whorls found in the earlier sites are also decorated, such as one found at the Escuela de Hostelería de Mérida site (Figure 2(c)), but the majority is not.

At Cerro Manzanillo, spindle whorls were found in an open space (E11), whilst loom weights were excavated from room H6 (Figure 3(a)). By contrast, the distributions of spindle whorls and

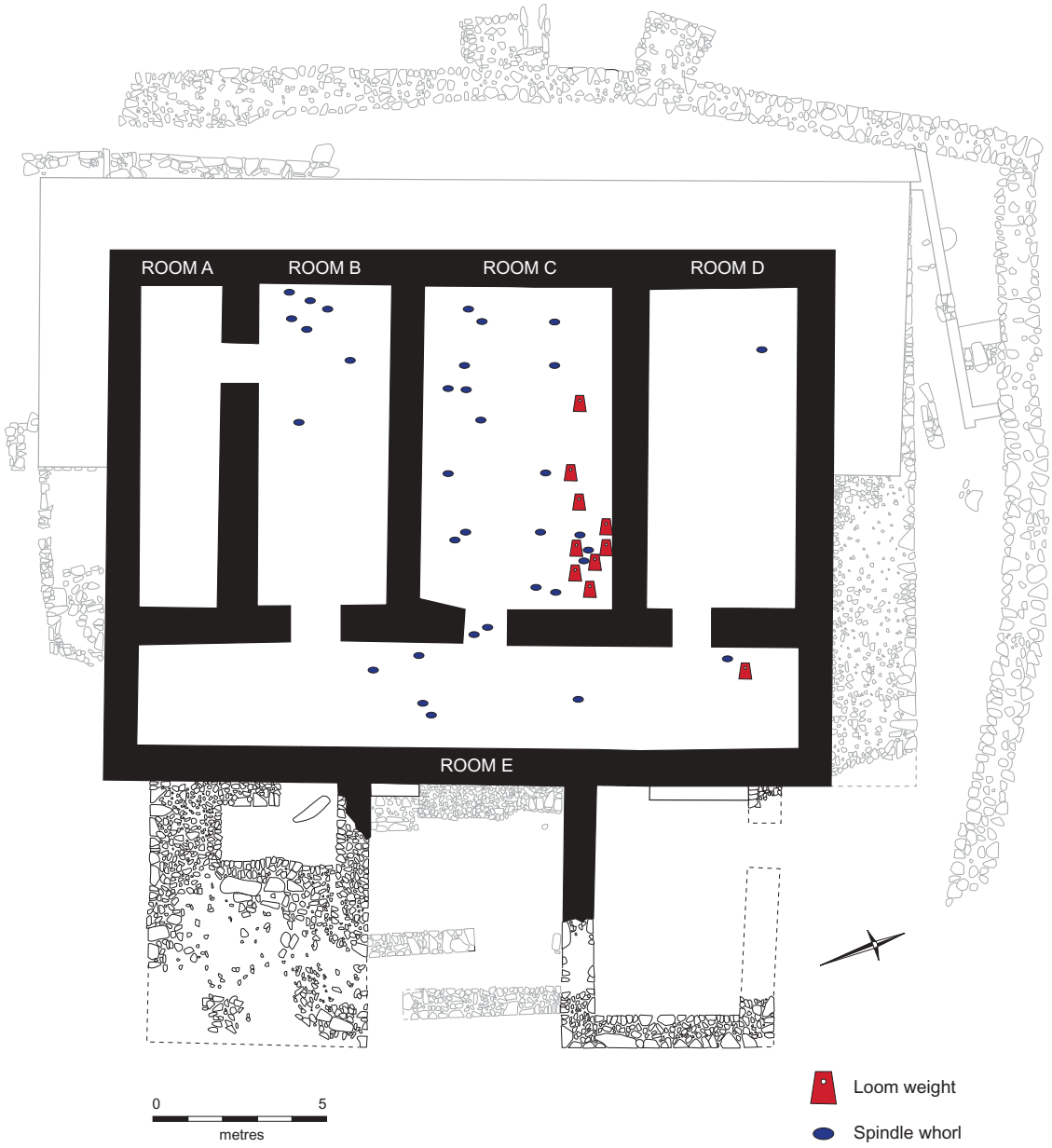

Figure 3c. The site of La Mata (upper floor) with the location of textile tools (Author: Vicki Herring, after Rodríguez & Ortiz 2004: fig. 105).

loom weights in La Mata and Cancho Roano mostly overlap, which means that the two activities were carried out in close association (Figure 3(b–d)). Groups of loom weights have been found *in situ* in E2 and Room C at La Mata, while at Cancho Roano there are particularly numerous assemblages in the courtyard (17 units) and in rooms H2 (35 units), H3 (30 units), O1 (12 units), O3 (32 units) and O5 (40 units) (Berrocal 2003, 266–267). There are over 200 loom weights mentioned in the excavation reports of Cancho Roano (Celestino and Jiménez-Ávila 1996, 109–111; Berrocal

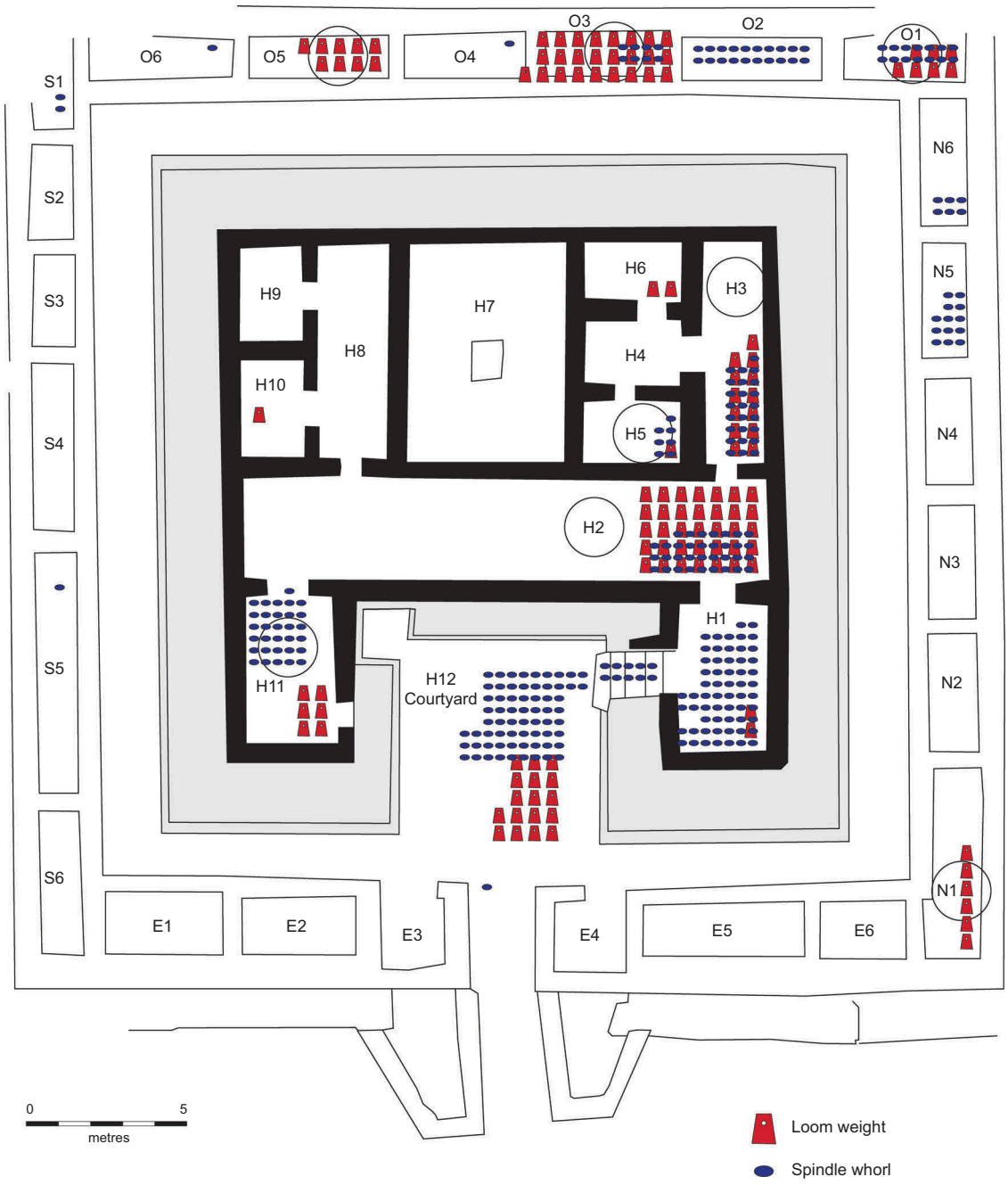

Figure 3d. The site of Cancho Roano with the location of textile tools (in circle the assemblages found in situ) (Author: Vicki Herring, after Berrocal 2003: fig. 1 & 18).

2003). Since they were not fired, they were very poorly preserved and only 145 are preserved in the Museo de Badajoz today.

Table 1. Textile tools found in the sites studied in this paper[a].

SITES	N. LOOM WEIGHTS	N. COMPLETE	N. TOTAL ANALYSED	N. SPINDLE WHORLS	N. COMPLETE	N. ANALYSED	REFERENCES
Medellín	0			4	4	0	Almagro 1977, 422–426, 432–435, 470
El Palomar	0			6	6	0	J. Jiménez-Ávila, personal communication, November 28, 2017
EHM	0			5	5	4	Jiménez-Ávila and Heras 2017
Cerro Manzanillo	1	0	0	5	5	2	Rodríguez et al. 2009, 115–117
La Mata	15	0	0	74	70	70	Rodríguez and Ortiz 2004, 265–267
Cancho Roano	145	70	70	366	341	341	Berrocal 2003

[a] - The spindle whorls from Medellín come from the cemetery and they have not been analysed to date. There are no spindle whorls from the settlement. The spindle whorls from El Palomar have not been published nor studied yet.

Spindle whorls

Spindle whorls are used by archaeologists to determine the thickness of the yarn spun and used. The most important parameters are the weight, diameter, and shape of the whorls. They are used to estimate the tension and diameter of the thread as well as the rotational frequency and duration (Grömer 2005; Martial and Médard 2007; Mårtensson, Nosch, and Andersson Strand 2009, 374).

The great number of spindle whorls at La Mata and particularly at Cancho Roano, especially when compared to the seventh–sixth-century sites, indicates that the scale of yarn production was large, well beyond the requirements of even a large household. The distribution of spindle whorls by weight and diameter in the upper scatter plot shows indeed clear differences between the sites dated to the seventh and sixth centuries BC and the country estates of the sixth and fifth centuries BC (Figure 4(a,b)). The range of spindle whorls at Escuela de Hostelería de Mérida and Cerro Manzanillo is more limited than in the larger complexes, and the same can be said for El Palomar and Medellín. Additionally, spindle whorls at those sites are heavier and present a diameter of no less than 18 mm, and are therefore better suited to spinning a thread of about 0.6 to 1 mm (Mårtensson, Nosch, and Andersson Strand 2009, 378). The spindle whorls found at La Mata provide the broader variation of weights, from 4 to 53 g. The yarn spun at this site ranged thus from ca 0.3 to 1.5–2 mm, based on the Centre for Textile Research experiments (Mårtensson, Nosch, and Andersson Strand 2009, 378; see also Grömer 2016, 86–87).

Truly fascinating is Cancho Roano, where three spindle whorls were as light as 1 g, and six more weigh just 3 g. Most of the whorls recovered from this site weigh less than 15 g and have a maximum diameter of 30 mm, and they are therefore made for spinning a very thin thread. Such spindle whorls are used for spinning cotton in America today (King 2011 with references), but since cotton did not exist in first millennium BC Iberia, they must have been used for working with short-fibre fluffy wool (Barber 1991, 52; Grömer 2016, 86–87).

Several spindle whorls at Cancho Roano, by contrast, weigh around 25–35 g, and they twist faster and are more suitable for spinning flax, the fibres of which are longer and with more overlap (Grömer 2016, 88–89). Most spindle whorls at La Mata range between 15 and 35 g in weight, which means that they were more suitable for spinning flax, thicker wool thread or plying.

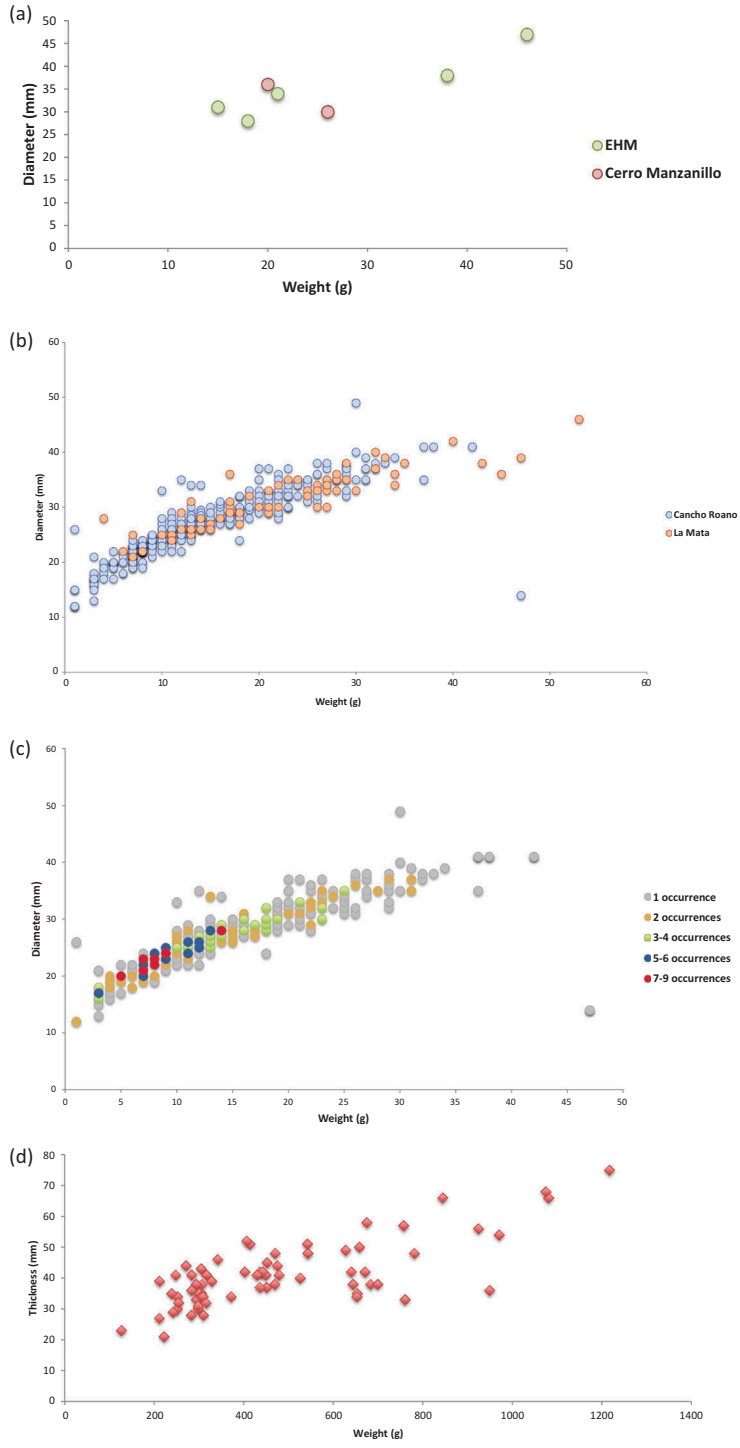

Figure 4. a) Spindle whorls from EHM and Cerro Manzanillo distributed by weight (g) and diameter (mm); b) Spindle whorls from La Mata and Cancho Roano distributed by weight (g) and diameter (mm); c) Spindle whorls recovered from Cancho Roano distributed by the number of weight and diameter occurrences; d) Loom weights from Cancho Roano distributed by weight (g) and thickness (mm)

Particularly telling are a number of spindle whorls with standard shapes and weights that have only been encountered at Cancho Roano, with the exception of just two from La Mata (Figure 4(c)). Manufactured in a mould, the spindle whorls were burnished, which gave them a characteristic metal shine that sets them apart from the rest. They also tend to have the same weight and diameter, and represent a total of 152 spindle whorls out of the 341 found in all at Cancho Roano. Of the two spindle whorls discovered at La Mata, one weighs 7 g and measures 21 mm and exactly matches eight spindle whorls in Cancho Roano; the other one comes in at 4 g and 28 mm diameter, and finds an approximate match at Cancho Roano in one specimen of 20 mm across.

Some of these mould-made spindle whorls have been found inside two pots, with one containing five and the other three spindle whorls. Their weights (9–16 g) and diameters (23–29 mm) coincide with the spindle whorls that are more common at Cancho Roano.

Loom weights

Archaeological experiments have yielded useful information regarding the functional properties of loom weights (Andersson Strand and Nosch 2015). For optimal weaving, between 5 and 50 warp threads should be attached to each loom weight (Mårtensson, Nosch, and Andersson Strand 2009, 392; L. Hammarlund, personal communication, June 11, 2018). The thread diameter strongly affects the required tension in the loom, but the degree of twist and fibre quality are equally important parameters (Andersson Strand 2010, 18; Grömer 2016, 112). Thick and thin threads generally need different tension in the loom, which is attained by using lighter or heavier weights and/or by varying the number of threads per loom weight. If the weaver attaches heavy loom weights to very thin thread, the latter will most likely break.

The shape of the loom weight determines the possibilities of obtaining higher or lower density of warp threads, e.g. discoid and flat rectangular loom weights need less space than spherical ones, and therefore could potentially produce more warp-dense textiles. The loom weights plotted by weight and thickness in Figure 4(d) come from Cancho Roano. There are three main groups of loom weights found in this site, one ranges between 200 and 350 g, a second one varies between 400 and 450 g, and the last one between 600 and 700 g.

The type of weaving technique – whether a tabby, a twill or variants – is likewise a significant factor when estimating the results of the calculations. A tabby or plain weave is a textile in which one warp thread passes over and under a single weft thread forming a simple crisscross pattern. In an even 2/2 twill weave each warp thread passes over two weft threads, then under two, making a diagonal pattern that can be a chevron, a diamond or other type of geometric design. Tabbies are known as early as the Neolithic and have been documented in the early Bronze Age of Iberia (Alfaro 2012, fig. 16.7) and both tabbies and twills have been attested at Casas del Turuñuelo (Marín-Aguilera et al. 2019). The tabbies at the latter site have 16–12 threads/cm, and the 2/2 twill has 12/13 threads/cm. In the calculations carried out for this article, I apply the same thread/cm count to better estimate the yarn and time consumption during textile production at Cancho Roano.

The loom weights found at La Mata were all fragmented, and therefore inconclusive and not included here. The three best-preserved objects (around 50–60% intact) weight over 500 g, whereas the majority of loom weights recovered from Cancho Roano ranged from 200 to 700 g. I have only made the calculations for the complete Cancho Roano loom weights, using one the weight and thickness of one loom weight for each of the three main groups described earlier. The three selected loom weights weigh 212 g, 436 g and 683 g (Table 2).

The first set of loom weights from Cancho Roano (ranging between 200 and 350 g) is most suitable for a very thin to thin thread (0.3–0.4 mm) that mostly requires 5 to 20 g tension in the loom. If the weaver wants to make a tabby or a 2/2 twill (with two rows of loom weights) that has between 14 and 11 threads/cm, then she must attach 28 threads per loom weight of *ca* 212 g each. She would need 52 loom weights and a very fine yarn with a diameter of 0.3 mm, which needs a tension in the loom of 7.5 g. This type of thread can be spun with the lighter spindle whorls, found in abundance at Cancho Roano, weighting 3–6 g. The weaver would need 5,712 m of yarn for 1 × 2 metres of cloth, which will take the spinner around 163 h to spin.

If the weaver decides, however, to use four rows in order to make a different 2/2 twill, she would need to use a slightly thicker thread of 0.4 mm and thus to increase the thread tension in the loom to 15 g in order to maintain the 14 threads/cm count. This means the spinner would use a spindle whorl weighing 7–15 g to spin a slightly thicker thread. A set-up of four rows also increases the number of loom weights to 104 to manufacture this textile. Yet, spinning time decreases because the spinner needs more time to spin with a 4 g spindle whorl than with an 8 g spindle whorl required for the four rows set-up.

The weaver could also obtain a thread count of 14 threads per cm in her cloth by using the second and the third sets of loom weights (436 and 683 g). However, she would need thicker threads and thus a higher tension in the loom for each thread. This type of yarn could be spun by using the spindle whorls weighing between 8 and 25 g as discovered at both La Mata and Cancho Roano.

A garment of 14 threads/cm like the one calculated here would look very different depending on the type of loom set up that the weaver uses. A tabby or a 2/2 twill with a thread diameter of *ca* 1.3–1.5 mm (683 g loom weight, ca 18 g spindle whorl) would be denser than a cloth with a yarn diameter of around 0.3–0.4 mm diameter (212 g loom weight).

Most important for the following discussion is the number of hours needed to spin the thread of the garments calculated here and found at Casas del Turuñuelo. According to the Centre for Textile Research experiments (Andersson Strand and Nosch 2015), and as shown in Table 2, it would take between 106 and 163 h on average to spin all the required yarn and produce these textiles. In the first case, it would take a single spinner a bit more than 11 days working 10 h per day; in the last example a bit less than 16 days. The number of textile tools at Cancho Roano indicates a textile production well beyond the needs of the household, and this required in turn more intensive agricultural production, and therefore more labour. What did it mean for rural communities in the Middle Guadiana region?

The rural economy and household production

From the seventh to the late sixth centuries BC in the middle Guadiana basin, textile production was mostly domestic and oriented towards local consumption. Archaeologists have not recovered any loom weights and they have documented only four or five spindle whorls at each site investigated. It is likely that loom weights have not survived because most were not fired, or at least not very well, as in the case of La Mata, and they have therefore either not been preserved or broken in pieces. Nonetheless, the fact that at El Palomar no more than six spindle whorls have been found, and that fully excavated sites such as Cerro Manzanillo yielded only five spindle whorls is particularly telling.

Limited as it is, the evidence suggests that each farm and household within the villages produced its own clothing, probably from wool or linen, as concluded for the nearby site of Casas del Turuñuelo (Marín-Aguilera et al. 2019). This is not to say that individual households or

Table 2. Loom weight calculations for tabby weave and 2/2 twill, including time and yarn consumption estimation, following the CTR method (Andersson Strand and Nosch 2015) and experimental archaeology carried out by Lena Hammarlund for the PROCON Project.

Weight of spindle whorl	4	4	4	4	8	8	18	18	44	44	44	44	44	44	44	44
Rate of spinning (m of yarn per hour)	35	35	35	35	40	40	50	50	50	50	50	50	50	50	50	50
Warp thread tension (g)	5	7.5	10	12.5	15	20	25	30	35	40	45	50	55	60	65	70
Light loom weight (D1323): 212 g, 3.9 cm																
Tabby & 2/2 Twill: 2 rows of loom weights																
Number of loom weights	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
No. of warp threads for 2 loom weights	84	56	42	34	28	22	16	14	12	10	10	8	8	8	6	6
Warp threads per cm	22	14	11	9	7	6	4	4	3	3	3	2	2	2	2	2
2/2 Twill: 4 rows of loom weights																
Number of loom weights	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104
No. of warp threads for 4 loom weights	168	112	84	68	56	44	32	28	24	20	20	16	16	16	12	12
Warp threads per cm	43	29	22	17	14	11	8	7	6	5	5	4	4	4	3	3
Technical evaluation:	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	unlikely	unlikely	unlikely	unlikely	unlikely
Tabby & 2/2 Twill 2 rows of loom weights:																
Number of warp threads	2200	1400	1100	900	700	600	400	400	300	300	300	200	200	200	200	200
Amount of warp yarn (m)	4400	2800	2200	1800	1400	1200	800	800	600	600	600	400	400	400	400	400
Amount of weft yarn (m)	4400	2800	2200	1800	1400	1200	800	800	600	600	600	400	400	400	400	400
Yarn consumption (m)	8976	5712	4488	3672	2856	2448	1632	1632	1224	1224	1224	816	816	816	816	816
Time consumption for spinning yarn (h)	256	163	128	105	71	61	33	33	24	24	24	16	16	16	16	16
2/2 Twill 4 rows of loom weights:																
Number of warp threads	4300	2900	2200	1700	1400	1100	800	700	600	500	500	400	400	400	300	300
Amount of warp yarn (m)	8600	5800	4400	3400	2800	2200	1600	1400	1200	1000	1000	800	800	800	600	600
Amount of weft yarn (m)	8600	5800	4400	3400	2800	2200	1600	1400	1200	1000	1000	800	800	800	600	600
Yarn consumption (m)	17544	11832	8976	6936	5712	4488	3264	2856	2448	2040	2040	1632	1632	1632	1224	1224
Time consumption for spinning yarn (h)	501	338	256	198	143	112	65	57	49	41	41	33	33	33	24	24
Medium loom weight (9447): 436 g, 4.2 cm																
Tabby & 2/2 Twill: 2 rows of loom weights																
Number of loom weights	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
No. of warp threads for 2 loom weights	174	116	88	70	58	44	34	30	24	22	20	18	16	14	14	12
Warp threads per cm	41	28	21	17	14	10	8	7	6	5	5	4	4	3	3	3
2/2 Twill: 4 rows of loom weights																
Number of loom weights	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96

(*Continued*)

Table 2. (Continued).

Weight of spindle whorl	4	4	4	4	8	8	18	18	44	44	44	44	44	44	44	44
No. of warp threads for 4 loom weights	348	232	176	140	116	88	68	60	48	44	40	36	32	28	28	24
Warp threads per cm	83	55	42	33	28	21	16	14	11	10	10	9	8	7	7	6
Technical evaluation:	unlikely	unlikely	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible
Tabby & 2/2 Twill 2 rows of loom weights:																
Number of warp threads	4100	2800	2100	1700	1400	1000	800	700	600	500	500	400	400	300	300	300
Amount of warp yarn (m)	8200	5600	4200	3400	2800	2000	1600	1400	1200	1000	1000	800	800	600	600	600
Amount of weft yarn (m)	8200	5600	4200	3400	2800	2000	1600	1400	1200	1000	1000	800	800	600	600	600
Yarn consumption (m)	16728	11424	8568	6936	5712	4080	3264	2856	2448	2040	2040	1632	1632	1224	1224	1224
Time consumption for spinning yarn (h)	478	326	245	198	143	102	65	57	49	41	41	33	33	24	24	24
2/2 Twill 4 rows of loom weights:																
Number of warp threads	8300	5500	4200	3300	2800	2100	1600	1400	1100	1000	1000	900	800	700	700	600
Amount of warp yarn (m)	16600	11000	8400	6600	5600	4200	3200	2800	2200	2000	2000	1800	1600	1400	1400	1200
Amount of weft yarn (m)	16600	11000	8400	6600	5600	4200	3200	2800	2200	2000	2000	1800	1600	1400	1400	1200
Yarn consumption (m)	33864	22440	17136	13464	11424	8568	6528	5712	4488	4080	4080	3672	3264	2856	2856	2448
Time consumption for spinning yarn (h)	968	641	490	385	286	214	131	114	90	82	82	73	65	57	57	49
Large loom weight (CR87 13498/6): 683 g, 3.8 cm																
Tabby & 2/2 Twill: 2 rows of loom weights																
Number of loom weights	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
No. of warp threads for 2 loom weights	274	182	136	110	92	68	54	46	40	34	30	28	24	22	22	20
Warp threads per cm	72	48	36	29	24	18	14	12	11	9	8	7	6	6	6	5
2/2 Twill: 4 rows of loom weights																
Number of loom weights	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104
No. of warp threads for 4 loom weights	548	364	272	220	184	136	108	92	80	68	60	56	48	44	44	40
Warp threads per cm	144	96	72	58	48	36	28	24	21	18	16	15	13	12	12	11
Technical evaluation:	unlikely	unlikely	unlikely	unlikely	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible	possible
Tabby & 2/2 Twill 2 rows of loom weights:																
Number of warp threads	7200	4800	3600	2900	2400	1800	1400	1200	1100	900	800	700	600	600	600	500
Amount of warp yarn (m)	14400	9600	7200	5800	4800	3600	2800	2400	2200	1800	1600	1400	1200	1200	1200	1000
Amount of weft yarn (m)	14400	9600	7200	5800	4800	3600	2800	2400	2200	1800	1600	1400	1200	1200	1200	1000
Yarn consumption (m)	29376	19584	14688	11832	9792	7344	5712	4896	4488	3672	3264	2856	2448	2448	2448	2040

(*Continued*)

Table 2. (Continued).

Weight of spindle whorl	4	4	4	4	8	8	18	18	44	44	44	44	44	44	44	44
Time consumption for spinning yarn (h)	839	560	420	338	245	184	114	98	90	73	65	57	49	49	49	41
2/2 Twill 4 rows of loom weights:																
Number of warp threads	14400	9600	7200	5800	4800	3600	2800	2400	2100	1800	1600	1500	1300	1200	1200	1100
Amount of warp yarn (m)	28800	19200	14400	11600	9600	7200	5600	4800	4200	3600	3200	3000	2600	2400	2400	2200
Amount of weft yarn (m)	28800	19200	14400	11600	9600	7200	5600	4800	4200	3600	3200	3000	2600	2400	2400	2200
Yarn consumption (m)	58752	39168	29376	23664	19584	14688	11424	9792	8568	7344	6528	6120	5304	4896	4896	4488
Time consumption for spinning yarn (h)	1679	1119	839	676	490	367	228	196	171	147	131	122	106	98	98	90

the villages and farms were entirely self-sufficient and that their members did not engage in part-time craft production. But it does mean that between the seventh and late sixth century BC these communities did not depend on (many) imports of food or other products, and therefore there was no need to spin yarn or to make textiles in order to diversify the economy.

This observation is corroborated by other economic activities documented at Cerro Manzanillo, such as agricultural production and surplus, which are estimated to have been sufficient for subsistence and for surviving a year of drought or otherwise reduced crop yields, as well as for exchange, paying tributes, or religious offerings (Rodríguez et al. 2009, 132–133). The small villages of El Palomar and Escuela de Hostelería de Mérida were probably similarly self-supporting.

It is likely that the agricultural surplus produced by these communities was paid as tribute to the elite residing in Medellín, who had control over the land (Rodríguez, Pavón, and Duque 2009, 208; Jiménez-Ávila 2017). Grain storage and processing exceed household capacity in both Cerro Manzanillo and El Palomar, but this was probably not the case for textiles, given the lack of loom weights and the low number of spindle whorls found in the villages and farms of the seventh and sixth centuries BC. Textile production remained a local and mostly inward oriented activity among the rural communities surrounding Medellín, and cloth was most likely not part of tribute payments.

The allure of textiles and craft specialisation

By the end of the sixth century BC, many villages and farms such as El Palomar and Cerro Manzanillo disappeared (Rodríguez, Pavón, and Duque 2009, 214), and major country estates were built in the area, such as Cancho Roano, La Mata, and Casas del Turuñuelo (Rodríguez-González and Celestino 2017). Medellín continued to exist, albeit somewhat less powerful (Rodríguez, Pavón, and Duque 2009, 207–218).

In contrast to the preceding period, the number of textile tools is significantly higher, with 76 spindle whorls and 15 loom weights at La Mata, and 366 spindle whorls and 145 loom weights preserved at Cancho Roano. Textile production appears to have become a significant economic activity for these sites. If we bear in mind that La Mata, Casas del Turuñuelo, and Cancho Roano were not cities or central places like Medellín but *only* country estates, the importance of textile production becomes even more remarkable in these three sites.

Several surveys in the surrounding territory of both La Mata and Cancho Roano have yielded many small, farm-like sites with no evidence of textile tools (Rodríguez, Pavón, and Duque 2004a; Mayoral, Celestino, and Walid Sbeinati 2011). This suggests that in the late sixth century and fifth centuries BC the aristocratic families who inhabited the country estates of La Mata and Cancho Roano were likely controlling textile production in the surrounding districts.

The excavators of La Mata have estimated that an extended family of 15–20 members may have lived at the site (Rodríguez and Ortiz 2004), and similar numbers could be proposed for Casas del Turuñuelo and Cancho Roano. The number of spindle whorls at La Mata and Cancho Roano and the numbers of loom weights found at the latter site thus clearly exceed the needs of the people residing in each of the two buildings. It is difficult to calculate the number of spinners who worked simultaneously at Cancho Roano and La Mata. Yet, even a conservative ratio of four spindle whorls for each spinner would amount to 90 spinners at Cancho Roano and 18 at La Mata, even if they were not necessarily working contemporaneously; the two pots with five and three spindle whorls each may in fact be indicative of the number of these tools per artisan. Additionally, there were at least four looms simultaneously active in Cancho Roano by the time it was abandoned (rooms H2, H3, O3 and O5); and other ones had probably been set up in the courtyard (H12) and in H11, N1

and O1 where loom weights were found in situ. The extremely bad preservation of the remains in the latter rooms does not allow us to assume the presence of three more looms.

The exponential increase in spindle whorls and loom weights in comparison to the previous period points to specialisation of craft production. Textile manufacture, and spinning in particular, is tremendously time-consuming, as discussed above, and this means that the country estates, Cancho Roano in particular, needed the workforce of many spinners and a smaller number of weavers.

The standardization of the spindle whorls themselves supports this point even more. Over a third of the spindle-whorls found at Cancho Roano have the same size and weight, and were mould-made. This means that textile production was important enough by this time for the tools to be produced by specialised potters, which in turn introduces further complexity into the textile production chain. The specialised production of spindle whorls no longer allowed spindle whorls to be personalized with decorations, as they were all identically manufactured and burnished.

The standardized spindle whorls moreover suggest that just one or few types of thread were needed and spun regularly, and that these were subsequently used for weaving in the same building or for paying tributes or offerings, as already mentioned. This implies that textiles became more desired and were consumed in greater numbers than previously, and that this development led to increased textile production in the sixth and fifth centuries BC.

The standardization of textile tools and craft specialisation at Cancho Roano clearly points to a textile workshop in the complex. The fact that it is only at Cancho Roano that sheep bones dominate the faunal assemblage, also corroborates the existence of such a workshop. Whether the production was associated with rituals performed at the site (Celestino and Jiménez-Ávila 1996, 111; Celestino 2001, 49), or with the surplus production controlled by the aristocratic family residing at the site (Almagro et al. 2011; Rodríguez, Pavón, and Duque 2018), is hard to say, but also less relevant for the organization and level of textile production.

The specialisation in textile crafts between the sixth and fifth centuries BC correlates very well with the increase of agricultural production and surplus at both La Mata and Cancho Roano (Hernández 2008, 142–143; Pérez 2004; Tresseras and Matamala 2004). In order to boost the production of textiles, it was necessary to intensify cultivation and to increase flock size. The aristocratic families residing on these country estates pushed up the productivity of their lands and people, controlled and likely distributed both agricultural surplus and textile production. Yet, who were the specialised artisans behind the production of such fine threads and textiles?

Textile labour and artisans' mobility

Spinning and weaving activities have long been associated with women in Iberian and Celtiberian societies (Almagro et al. 2011, 170, 174; Vílchez 2015; Gomes 2017; for a critique, Rafel 2007), in ancient Greece (Bundrick 2008), as well as in other Mediterranean contexts such as Etruria and Lazio in Italy during the Early Iron Age (Bietti Sestieri 2008; Gleba 2007, 71–74). For Classical Antiquity, all documentary evidence indeed points to the predominance of women as textile labourers (Harlow, Michel, and Nosch 2014). Women were economic agents valued for their skills, especially concerning textile production, and for those specialised skills they were exchanged and even captured to produce textiles for others (Gleba 2014, 94–95).

Spinners and weavers at Cancho Roano were very skilful and specialised artisans. Working with less than 10 g whorls entails a higher skill level than spinning with a 20–40 g spindle whorl (Baitzel and Goldstein 2018), and it also requires a different technique. The heavier spindle whorls (over 20

g) are suitable for the drop-spinning technique, whereas with the lighter ones spinning is possible using the supported technique that allows a greater control over the quality of the thread (Grömer 2005; Ibarra, López, and Santacruz 2018; L. Hammarlund, personal communication, June 11, 2018).

Most notably, and contrary to the conventional idea of women manufacturing textiles in the intimacy of their homes (Budin 2013, 8–11; Burke 2016), spinning and weaving at Cancho Roano always took place in rooms that functioned as passage ways to other rooms in the building or the courtyard.

From the late sixth century and at least until the end of the fifth century BC, textiles were highly valued among the aristocratic families of the middle Guadiana basin. Fabrics produced at La Mata, Cancho Roano and El Turuñuelo (see Marín-Aguilera et al. 2019) were finer than previously, which means that their material properties made them more appealing and desirable. Their value was also associated with the place of their production – the country estates and Cancho Roano in particular –, and it is precisely the connection with those places that made textiles more exclusive and socially valuable (Harris 2018).

The increasing prominence of quality fabrics among the Middle Guadiana elite contributed to the mobility of specialised textile artisans, particularly spinners. Thread production takes up more than half of the total time of cloth production (Bird 1979, 3), which places a high demand on spinners' time and skills.

Spinning is a motor skill that is learned by imitating the teacher's body and hand movements, and not by looking at the final product (Minar 2001, 388). This means that in order to learn how to spin with very light spindle whorls, i.e. using the supported technique, an apprentice of this method would have to be in constant contact with her teacher for a successful learning process. The two very light mould-made spindle whorls made at Cancho Roano but found at La Mata are significant in this respect, as they suggest that either spinners from La Mata learned the supported technique at Cancho Roano and brought not only new skills but also some of the tools back with them to La Mata; or it could be that spinners from Cancho Roano moved to La Mata to teach apprentices there. Either way, these two spindle whorls demonstrate that artefacts, craftspeople and knowledge circulated widely among rural society in the Middle Guadiana region. The mobility of female spinners and weavers is moreover well documented in other regions and chronologies (Haynes 1999; Foxhall 2011; Cutler 2012).

Weaving rural economies

The evidence discussed in this paper shows that textile production was an important economic activity and thus at the very heart of broader questions of rural societies in the Iron Age middle Guadiana basin. Above all, the study of textile tools from this region shows that rural economies were far more complex and dynamic than has been commonly assumed.

Textile manufacture was one of the driving forces of economic production that shaped broader social realities in the middle Guadiana area. Widely studied for its country estates of the late sixth and fifth centuries BC, the region received hardly any scholarly attention for the period between the seventh and late sixth centuries BC precisely because of the lack of monumentality.

Rural society in the middle Guadiana Valley went through important transformations in the sixth century BC, when a new political organization emerged. This political change was not only manifest in control over land, including animal husbandry and fibre production, and surplus.

Above all, it also involved access to, control over, and the distribution of resources for manufacturing textiles, which became specialised and standardzsed.

If cloth was predominantly produced within the household for self-consumption between the seventh and sixth centuries BC, by the end of the sixth century the country estates of Cancho Roano, La Mata, and El Turuñuelo had gained control over textile manufacture. Cancho Roano in particular, with the establishment of a textile workshop, controlled the production and distribution of textiles that became increasingly valued, consumed and probably exchanged. In these processes of economic, societal and political transformations of Iron Age rural society, spinners and weavers were crucial protagonists for their skills and knowledge that defined the quality of the textiles produced in the Middle Guadiana region.

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No potential conflict of interest was reported by the author.

Notes on contributor

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References

Alfaro, C. 1984. *Tejido y Cestería en la Península Ibérica*. Madrid: Consejo Superior de Investigaciones Científicas.

Alfaro, C. 2012. "Spain." In *Textiles and Textile Production in Europe from Prehistory to AD 400*, edited by M. Gleba and U. Mannering, 334–348. Oxford: Oxbow.

Allison, P. M. 1999. *The Archaeology of Household Activities*. London: Routledge.

Almagro, M. 1977. *El Bronce Final y el Período Orientalizante en Extremadura*. Madrid: Consejo Superior de Investigaciones Científicas.

Almagro, M., A. J. Lorrio, A. Mederos, and M. Torres. 2008. *La Necrópolis de Medellín III. Estudios Analíticos IV. Interpretación de La Necrópolis V. El Marco Histórico de Medellín-Conisturgis*. Madrid: Real Academia de la Historia.

Almagro, M., M. Torres, A. Gómez, and H. Sofía. 2011. "El personal del palacio tartésico de Cancho Roano (Badajoz, España)." *Zephyrus* 68: 163–190.

Andersson Strand, E. 2010. "The Basics of Textile Tools and Textile Technology: From Fibre to Fabric." In *Textile Terminologies in the Ancient near East and Mediterranean from the Third to the First Millennia BC*, edited by C. Michel and M.-L. Nosch, 10–22. Oxford: Oxbow.

Andersson Strand, E., and M.-L. Nosch, eds. 2015. *Tools, Textiles, and Contexts: Investigating Textile Production in the Aegean and Eastern Mediterranean Bronze Age*. Oxford: Oxbow Books.

Arnold, D. 1985. *Ceramic Theory and Cultural Process*. Cambridge: Cambridge University Press.

Baitzel, S. I., and P. S. Goldstein. 2018. "From Whorl to Cloth: An Analysis of Textile Production in the Tiwanaku Provinces." *Journal of Anthropological Archaeology* 49: 173–183. doi:10.1016/j.jaa.2017.12.006.

Barber, E. J. W. 1991. *Prehistoric Textiles: The Development of Cloth in the Neolithic and Bronze Age with Special Reference to the Aegean*. Princeton: Princeton University Press.

Berrocal-Rangel, L. 2003. "El Instrumental Textil en Cancho Roano: Consideraciones Sobre sus Fusayolas, Pesas y Telares." In *Cancho Roano IX. Los Materiales Arqueológicos II*, edited by S. Celestino, 211–298. Mérida: Junta de Extremadura.

Bietti Sestieri, A. M. 2008. "Domi Mansit, Lanam Fecit: Was that All? Women's Social Status and Roles in the Early Latial Communities." *Journal of Mediterranean Archaeology* 21: 133–159.

Bird, J. B. 1979. "Fibers and Spinning Procedures in the Andean Area." In *The Junius B. Bird Pre-Columbian Textile Conference*, edited by A. P. Rowe, E. P. Benson, and A.-L. Schaffer, 13–18. Washington: Textile Museum and Dumbarton Oaks.

Brumfiel, E. M., and T. Earle. 1987. "Specialization, Exchange, and Complex Societies: An Introduction." In *Specialization, Exchange, and Complex Societies*, edited by E. M. Brumfiel and T. Earle, 1–9. Cambridge: Cambridge University Press.

Budin, S. L. 2013. *Intimate Lives of the Ancient Greeks*. Santa Barbara, CA: Praeger.

Bundrick, S. 2008. "The Fabric of the City: Imaging Textile Production in Classical Athens." *Hesperia* 77: 283–334. doi:10.2972/hesp.77.2.283.

Burke, B. 2005. "Textile Production at Gordion and the Phrygian Economy." In *The Archaeology of Midas and the Phrygians. Recent Work at Gordion*, edited by L. Kealhofer, 69–81. Philadelphia: University of Pennsylvania Press.

Burke, B. 2016. "Beyond Penelope: Women and the Role of Textiles in the Bronze Age Aegean." In *Women in Antiquity: Real Women across the Ancient World*, edited by J. M. Turfa and S. L. Budin, 635–646. New York: Routledge.

Castaños, P.-M. 1998. "Evolución de las faunas prehistóricas en Extremadura." In *Extremadura protohistórica: paleoambiente, economía y poblamiento*, edited by A. R. Díaz, 63–72. Cáceres: Universidad de Extremadura.

Castaños, P.-M. 2004. "Fauna y prácticas ganaderas." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. R. Díaz, 453–467. Cáceres: Universidad de Extremadura.

Celestino, S., and J. Jiménez-Ávila. 1996. "El palacio santuario de Cancho Roano V - El Sector Oeste." In *El palacio santuario de Cancho Roano V-VI-VII. Los sectores oeste, sur y este*, edited by S. C. Pérez, 13–224. Madrid: Junta de Extremadura.

Celestino, S. 2001. "Los Santuarios de Cancho Roano. Del Indigenismo al Orientalismo Arquitectónico." In *Arquitectura oriental y orientalizante en la Península Ibérica*, edited by S. C. Pérez, 17–56. Madrid: Consejo Superior de Investigaciones Científicas.

Celestino, S., and C. López-Ruiz. 2016. *Tartessos and the Phoenicians in Iberia*. Oxford: Oxford University Press.

Childe, V. G. 1950. "The Urban Revolution." *Town Planning Review* 21: 3–17. doi:10.3828/tpr.21.1.k853061t614q42qh.

Costin, C. L. 1991. "Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production." *Archaeological Method and Theory* 3: 1–56.

Costin, C. L. 2015. "Craft Specialization." In *The International Encyclopedia of Human Sexuality*, edited by P. Whelehan and A. Bolin, 1–5. Electronic document, http://onlinelibrary.wiley.com/doi/10.1002/9781118896877.wbiehs106/abstract accessed February 22, 2018.

Cutler, J. 2012. "Ariadne's Thread: The Adoption of Cretan Weaving Technology in the Wider Southern Aegean in the Mid-Second Millennium BC." In *KOSMOS: Jewellery, Adornment and Textiles in the Aegean Bronze Age*, edited by M.-L. Nosch and R. Laffineur, 145–154. Liège: Peeters.

Cutler, J., M.-L. Nosch, and E. Andersson Strand. 2013. "Textile Production in Quartier Mu." In *Fouilles exécutées à Malia. Le Quartier Mu V. Vie quotidienne et techniques au Minoen Moyen II*, edited by J.-C. Poursat, 95–118. Athènes: École Française d'Athènes.

Douglass, J. G. 2002. *Hinterland Households: Rural Agrarian Household Diversity in Northwest Honduras*. Boulder: University Press of Colorado.

Douglass, J. G., and N. Gonlin. 2012. "The Household as Analytical Unit. Case Studies from the Americas." In *Ancient Households of the Americas: Conceptualizing What Households Do*, edited by J. G. Douglass and N. Gonlin, 1–44. Boulder: University Press of Colorado.

Duque, D., and G. Pérez. 2009. "Restos antracológicos y carpológicos." In *El caserío de Cerro Manzanillo (Villar de Rena, Badajoz) y la colonización agraria orientalizante en el Guadiana Medio*, edited by A. Rodríguez, D. Duque, and I. Pavón, 159–170. Mérida: Junta de Extremadura.

Foxhall, L. 2011. "Loom Weights." In *The Chora of Metaponto 3: The Survey I: Bradano to Basento*, edited by C. Carter and A. Pietro, 539–554. Austin: Texas University Press.

García, D., S. Ramos, and V. Francisco-María. 2009. "Estudio Palinológico." In *El caserío de Cerro Manzanillo (Villar de Rena, Badajoz) y la colonización agraria orientalizante en el Guadiana Medio*, edited by A. Rodríguez, D. Duque, and I. Pavón, 149–158. Mérida: Junta de Extremadura.

Gleba, M. 2007. "Textile Production in Proto-Historic Italy: From Specialists to Workshops." In *Ancient Textiles. Production, Crafts, and Society*, edited by C. Gillis and M. L. Nosch, 71–76. Ancient Textiles Series 1. Oxford: Oxbow Books.

Gleba, M. 2008. *Textile Production in Pre-Roman Italy*. Oxford: Oxbow Books.

Gleba, M. 2014. "Cloth Worth a King's Ransom: Textile Circulation and Transmission of Textile Craft in the Ancient Mediterranean." In *Knowledge Networks and Craft Traditions in the Ancient World: Material Crossovers*, edited by K. Rebay-Salisbury, A. Brysbaert, and L. Foxhall, 83–103. New York: Routledge.

Gomes, F. B. 2017. "Fusayolas de la necrópolis de Olival do Senhor dos Mártires (Alcácer Do Sal, Portugal): tipología, función y simbolismo." *Saguntum* 49: 43–59.

González, P., C. Masvidal, S. Montón, and M. Picazo, eds. 2007. *Interpreting Household Practices: Reflections on the Social and Cultural Roles of Maintenance Activities*. Bellaterra: Universitat Autònoma de Barcelona.

Grömer, K. 2005. "Efficiency and Technique - Experiments with Original Spindle Whorls." In *Hallstatt Textiles. Technical Analysis Investigation and Experiment on Iron Age Textiles*, edited by P. Bichler, K. Grömer, R. Hoffmann-De Keijzer, A. Kern, and H. Reschreiter, 81–90. BAR International Series 1351. Oxford: Archaeopress.

Grömer, K. 2016. *The Art of Prehistoric Textile Making*. Vienna: Natural History Museum Vienna.

Hafter, D. M., ed. 1995. *European Women and Preindustrial Craft*. Bloomington: Indiana University Press.

Harlow, M., C. Michel, and M.-L. Nosch, eds. 2014. *Prehistoric, Ancient near Eastern & Aegean Textiles and Dress*. Oxford: Oxbow Books.

Harris, S. 2018. "From Value to Desirability: The Allure of Worldly Things." *World Archaeology* 49 (5): 681–699. doi:10.1080/00438243.2017.1413416.

Haynes, D. E. 1999. "Conceiving Mobility: Weavers' Migrations in Pre-Colonial and Colonial India." *The Indian Economic and Social History Review* 36 (1): 35–67. doi:10.1177/001946469903600102.

Hendon, J. A. 1996. "Archaeological Approaches to the Organization of Domestic Labor: Household Practice and Domestic Relations." *Annual Review of Anthropology* 25: 45–61. doi:10.1146/annurev.anthro.25.1.45.

Hernández, A. M. 2008. "Paleoambiente y paleoeconomía en la cuenca del Guadiana durante el Hierro I." In *SIDEREUM ANA I. El río Guadiana en época post-orientalizante*, edited by J. Jiménez-Ávila, 135–148. Mérida: CSIC.

Hirth, K. G. 2009. "Housework and Domestic Craft Production: An Introduction." In *Housework: Craft Production and Domestic Economy in Ancient Mesoamerica*, edited by K. G. Hirth, 1–12. Hoboken: Wiley.

Hruby, Z. X., and R. K. Flad, eds. 2007. *Rethinking Craft Specialization in Complex Societies: Archaeological Analyses of the Social Meaning of Production*. Arlington: American Anthropological Association.

Ibarra, T. E., A. López, and R. Santacruz. 2018. "The Artisan and the Tool: A Technological-Functional Analysis of Tlaxcallan Spindle Whorls." *Archaeometry* 60: 1221–1236. doi:10.1111/arcm.12385.

Jiménez-Ávila, J. 1997. "Cancho Roano y los complejos monumentales post-orientalizantes del Guadiana." *Complutum* 8: 141–159.

Jiménez-Ávila, J., and J. Ortega. 2001. "El poblado orientalizante de El Palomar (Mérida, Badajoz)." In *Arquitectura oriental y orientalizante en la Península Ibérica*, edited by D. Ruiz and S. Celestino, 227–248. Madrid: Consejo Superior de Investigaciones Científicas.

Jiménez-Ávila, J. 2017. "Ancha es Tartessos. El Período Orientalizante (siglos VIII–VI a.C.) en el tramo extremeño del Guadiana." In *SIDEREUM ANA III: El Río Guadiana y Tartessos*, edited by J. Jiménez-Ávila, 69–106. Mérida: Consorcio de la Ciudad Monumental, Histórico-Artística y Arqueológica.

Jiménez-Ávila, J., and J. Heras. 2017. "La ocupación orientalizante de la Escuela de Hostelería de Mérida." In *SIDEREUM ANA III: El río Guadiana y Tartessos*, edited by J. Jiménez-Ávila, 107–130. Mérida: Consorcio de la Ciudad Monumental, Histórico-Artística y Arqueológica.

Jones, A. R., and P. Stallybrass. 2000. *Renaissance Clothing and the Materials of Memory*. Cambridge: Cambridge University Press.

Jover, F. J., and J. A. López. 2013. "La producción textil durante la Edad del Bronce en el cuadrante suroriental de la Península Ibérica: materias primas, productos, instrumentos y procesos de trabajo." *Zephyrus* 71: 149–171.

King, S. M. 2011. "Thread Production in Early Postclassic Coastal Oaxaca, Mexico: Technology, Intensity, and Gender." *Ancient Mesoamerica* 22 (2): 323–343. doi:10.1017/S0956536111000253.

Lampe, J. R., and M. R. Jackson. 1982. *Balkan Economic History, 1550–1950. From Imperial Borderlands to Developing Nations*. Bloomington: Indiana University Press.

Li, B. 2009. "Involution and Chinese Cotton Textile Production: Songjiang in the Late Eighteenth and Early Nineteenth Centuries." In *The Spinning World: A Global History of Cotton Textiles, 1200–1850*, edited by G. Riello and P. Parthasarathi, 387–396. Oxford: Oxford University Press.

Marín-Aguilera, B., E. Rodríguez-González, S. Celestino, and M. Gleba. 2019. "Dressing the sacrifice: textiles and rituality at the palace-sanctuary of Casas del Turuñuelo, Spain". *Antiquity* 93 (370). 933-953 doi: 10.15184/aqy.2019.42.

Mårtensson, L., M.-L. Nosch, and E. Andersson Strand. 2009. "Shape of Things: Understanding a Loom Weight." *Oxford Journal of Archaeology* 28 (4): 373–398. doi:10.1111/j.1468-0092.2009.00334.x.

Martial, E., and F. Médard. 2007. "Acquisition et traitement des matières textiles d'origine végétale en Préhistoire: l'exemple du lin." In *Plant Processing from a Prehistoric and Ethnographic Perspective*, edited by V. Beugnier and P. Crombé, 67–82. Oxford: Archaeopress.

Mayoral, V., S. Celestino, and S. Walid Sbeinati. 2011. "Intensive Survey and Protohistoric Settlement in the Middle Guadiana Basin." In *Hidden Landscapes of Mediterranean Europe: Cultural and Methodological Biases in Pre- and Protohistoric Landscape Studies*, edited by M. van Leusen, G. Pizziolo, and L. Sarti, 27–34. Oxford: Archaeopress.

Minar, J. 2001. "Motor Skills and the Learning Process: The Conservation of Cordage Final Twist Direction in Communities of Practice." *Journal of Anthropological Research* 57 (4): 381–405. doi:10.1086/jar.57.4.3631352.

Mohanty, G. F. 2006. *Labor and Laborers of the Loom: Mechanization and Handloom Weavers, 1780–1840*. New York: Routledge.

Netting, R. M., R. R. Wilk, and E. J. Arnould. 1984. "Introduction." In *Households: Comparative and Historical Studies of the Domestic Group*, edited by R. M. Netting, R. R. Wilk, and E. J. Arnould, xiii–xxxviii. Berkeley: University of California Press.

Nevell, M. 2008. "The Archaeology of Industrialisation and the Textile Industry: The Example of Manchester and the South-Western Pennine Uplands during the 18th Century (Part 1)." *Industrial Archaeology Review* 30 (1): 33–48. doi:10.1179/174581908X285110.

Pavón, I., and A. Rodríguez. 2007. "Campo y ciudad en la protohistoria extremeña: conceptos y criterios investigadores." In *Arqueología de la tierra. Paisajes rurales de la protohistoria peninsular*, edited by A. Rodríguez and I. Pavón, 11–44. Cáceres: Universidad de Extremadura.

Pérez, G. 2004. "Cultivos y Prácticas Agrarias." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, 385–422. Cáceres: Universidad de Extremadura.

Rafel, N. 2007. "El Textil Como Indicador de Género En El Registro Funerario Ibérico." *Treballs d'Arqueologia* 13: 115–146.

Rodríguez, A., I. Pavón, and D. Duque. 2004a. "'La Mata' y su Territorio." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, 497–571. Cáceres: Universidad de Extremadura.

Rodríguez, A., I. Pavón, and D. Duque. 2004b. "La Mata: Macroespacio y Contexto Histórico." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, 573–619. Cáceres: Universidad de Extremadura.

Rodríguez, A., I. Pavón, and D. Duque. 2009. "Contexto Territorial e Histórico." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, D. Duque, and I. Pavón, 183–218. Mérida: Junta de Extremadura.

Rodríguez, A., I. Pavón, D. Duque, A. Domínguez, M. Girón, and A. Criado. 2009. "El Asentamiento." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, D. Duque, and I. Pavón, 31–138. Mérida: Junta de Extremadura.

Rodríguez, A., I. Pavón, and D. Duque. 2018. "Familias, linajes y 'grandes casas' en la 'Extremadura tartésica'." In *Más allá de las casas. Familias, linajes y comunidades en la protohistoria peninsular*, edited by A. Rodríguez, I. Pavón, and D. Duque, 209–264. Cáceres: Universidad de Extremadura.

Rodríguez, A., D. Duque, and I. Pavón. 2009. *El caserío de Cerro Manzanillo (Villar de Rena, Badajoz) y la colonización agraria orientalizante en el Guadiana Medio*. Cáceres: Universidad de Extremadura.

Rodríguez, A., and I. Pavón, eds. 2007. *Arqueología de la tierra. Paisajes rurales de la protohistoria peninsular*. Cáceres: Universidad de Extremadura.

Rodríguez, A., and P. Ortiz. 2004. "'La Mata', Un Edificio Organizado." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, 75–314. Cáceres: Universidad de Extremadura.

Rodríguez-González, E., and S. Celestino. 2017. "Las estancias de los dioses: la habitación 100 del yacimiento de Casas del Turuñuelo (Guareña, Badajoz)." *Cuadernos de Prehistoria y Arqueología de la Universidad Autónoma de Madrid* 43: 179–194.

Ross, J. C., and S. R. Steadman. 2017. *Ancient Complex Societies*. New York: Routledge.

Sevillano, L. A., V. Mayoral, E. Salas, R. Liceras, and F.-J. Heras. 2013. "Detectando prácticas agrarias antiguas en el territorio sur de Medellín. La expresión material de las actividades agrícolas protohistóricas del Suroeste Peninsular." In *VI Encuentro de Arqueología del Suroeste Peninsular*, edited by J. Jiménez-Ávila, M. Bustamante, and M. García, 1031–1064. Villafranca de los Barros: Ayuntamiento de Villafranca de los Barros.

Tresseras, J., and J.-C. Matamala. 2004. "Estudio Arqueobotánico (Fitolitos, Almidones y Fibras) y Compuestos Orgánicos." In *El edificio protohistórico de "La Mata" (Campanario, Badajoz) y su estudio territorial*, edited by A. Rodríguez, 433–452. Cáceres: Universidad de Extremadura.

Tsurumi, E. P. 1990. *Factory Girls: Women in the Thread Mills of Meiji Japan*. Princeton: Princeton University Press.

van der Leeuw, S. 1977. "Towards a Study of the Economics of Pottery Making." In *Ex Horreo*, edited by B. L. van Beek, R. W. Brandt, and W. Groenman-van Waateringe, 68–76. Amsterdam: University of Amsterdam.

van Voss, L. H., E. Hiemstra-Kuperus, and E. van Nederveen Meerkerk, eds. 2010. *The Ashgate Companion to the History of Textile Workers, 1650–2000*. Farnham: Ashgate.

Vílchez, M. 2015. "Tejido y Rito En Espacios de Culto Íberos: Las Fusayolas Como Objeto de Estudio." *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social* 17: 281–288. doi:10.25267/Rev_atl-mediterr_prehist_arqueol_soc.2015.v17.25.

Wilk, R., and W. Ashmore. 1988. *Household and Community in the Mesoamerican Past*. Albuquerque: University of New Mexi.

Wilk, R., and W. Rathje. 1982. "Household Archaeology." *American Behavioral Scientist* 25 (6): 617–639. doi:10.1177/000276482025006003.