From archaeological finds to high quality textile fabrics: new data from *Herakleia*, southern Basilicata, Italy

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ABSTRACT
The research is based on the archaeological textile tools coming from the western quarter of the Castle Hill of Herakleia, systematically catalogued and processed with new experimental archaeology systems which allow us to attest the production of high quality fabrics using discoid circular loom weights. This result seems to confirm what can be traced with the study of literary sources for the whole Ionic Arc and in particular for Taranto, Herakleia's motherland, and its wools.

Keywords: Discoid circular loom weights, thread tension, looms, textile fabrics, household production, textile economy, experimental archaeology.

The following contribution introduces part of the preliminary results of a PhD project (Meo 2013) which has attempted to verify the existence of an interconnected productive wool industry in the 3rd–2nd century BC at *Herakleia* and in general along the whole Ionic arc through the comparison between archaeological data and historical sources (see Map 6), and to establish its mode of operation and economic role (Ghinatti 1975; Morel 1975; 1978; Mele 1997; Giardino 2004, 429–430; Lippolis 2004, 283–285).

To achieve such an end, a substantial part of the project is dedicated to the systematic documentation and study of the archaeological material found in the western district of the Castle Hill of *Herakleia* (Fig. 1) and is concerned with the activities surrounding textile production. The project also attempts to define a possible relationship between Taranto (ancient Taras), a town for which numerous studies deal with wool activity, and *Herakleia* which, it should be noted, was established as its colony in 433 BC.

Turning to *Herakleia*, direct analysis of the archaeological materials and of their distribution within the find contexts greatly clarifies the situation that has emerged to date. The loom weights were discovered during the excavations realised by L. Giardino in the first half of the 1970's in the western district of the Castle Hill of *Herakleia* (Giardino 1998, 173–186; 1999, 310–317; 2004, 412–415. See also Giardino 1996; De Siena and Giardino 2001). In particular, materials coming from blocks I, II, IV and VI are undergoing analysis (Fig. 2), with a series of close examinations on specific closed contexts: the houses inside these blocks. The research project has also examined three sites in the territory, of which two are in the *chora* of Metaponto (Masseria Durante and San Biagio alla Venella) and another in the *chora* of *Herakleia* (Bosco Andriace).

The systematic investigation conducted on the archaeological material of the western district of the Castle Hill of *Herakleia* already allows us to delineate some general characteristics on loom weights. More than 1900 loom weights of various forms and dimensions have been documented to date (Fig. 3).

1. Herakleia
2. Bosco Andriace
3. San Biagio
4. Metaponto
5. Masseria Durante
6. Taranto

Map 6. Placenames mentioned in the article of Meo. Illustration: K. Vajanto.

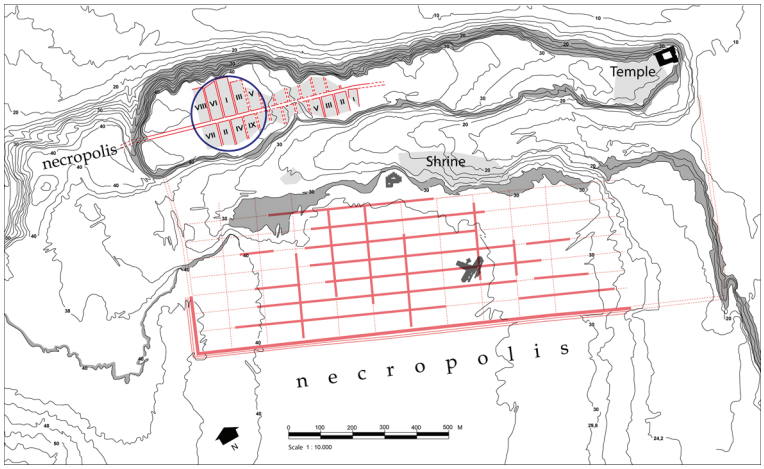

Fig. 1. *Herakleia*: the Castle Hill with the western quarter in evidence in the northern part. (Laboratory of Urbanistica del mondo classico, University of Salento)

Fig. 2. Herakleia, western quarter of the Castle Hill. Plan of the excavated blocks with the typologies of houses. (Laboratory of Urbanistica del mondo classico, University of Salento)

The greatest part of them consists of discoid circular weights with two holes (more than 1600 samples, about 83.7%) (Fig. 4a); more rare is the type varying with convex (17 samples) and hemispherical faces (50 samples). Also other typologies of loom weights are poorly attested: truncated pyramidal (200 samples, about the 10.4%), flat trapezoidal (37 samples), and even more rare are truncated conical weights (2 samples) and the pinched types (7 samples).

Of the discoid circular loom weights analysed to date, about 37% are decorated and less than 4% (58 samples) have one or more inscriptions (Fig. 4b). Decorations belong to the following two typologies: the prevalent one (about 27% of the total number of weights) is constituted by moulded

Fig. 3. *Herakleia*, western quarter of the Castle Hill. Examples of typologies of loom weights. (Photo: F. Meo)

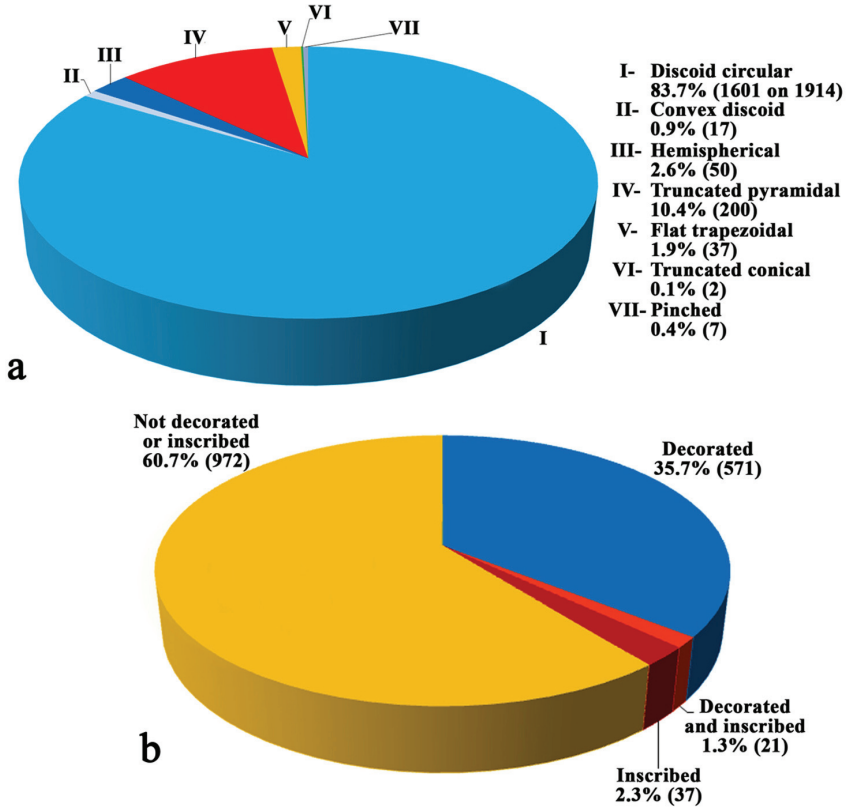

Fig. 4. *Herakleia,* western quarter of the Castle Hill. Typological classification of loom weights and percentage of decorations and inscriptions on until now processed discoid circular weights. (F. Meo)

Fig. 5. Herakleia, western quarter of the Castle Hill, block I, modular complex of 6 'arcaded courtyard' houses; the later 'atrium house' in grey. Distribution of loom weights and other textile implements inside the rooms. (Graphic elaboration: F. Meo)

stamps among which the most common types are the 'wheel with four rays' and various stylised floral motives; the second typology (around 10.5% of the total number of the weights) is instead constituted by embossed elements of which the commonly attested types are Gorgoneion and Aphrodite on a couple of swans. Inscriptions are moulded, inside a stamp, or more frequently the letters are engraved before firing.

Before going into detail about the above-mentioned analysed contexts, it is important to explain the applied method of analysis for each of the individualised sets of loom weights; that is the method elaborated by the Centre for Textile Research of Copenhagen[1] (Mårtensson et al. 2007; Mårtensson et al. 2009; Andersson Strand 2010; 2012); the method attempts to try to match the quality of the fabric produced through analysis of the relationship between weight and thickness of the loom weight: the weight of a loom weight determines how many threads can be attached to it while the thickness is able to establish their number. The combination of these two data gives us the probable quality of the produced fabric[2].

As stated previously, the closed contexts that were analysed belong to the houses of the western district of the Castle Hill of *Herakleia*. Since the excavation in 1973 was executed by *tagli*, horizontal cuts of about ten centimetres which did not necessarily follow the archaeological layers; so the locus lot method, which makes it possible to individualise stratigraphical units, was not used and the only ascertainable information obtainable is a spatial distribution of loom weights room by room.

1 The present research is limited to the use of discoid circular loom weights with one hole.
2 New researches on mineralised textiles from modern Basilicata Region are confirming the reliability of the CTR method.

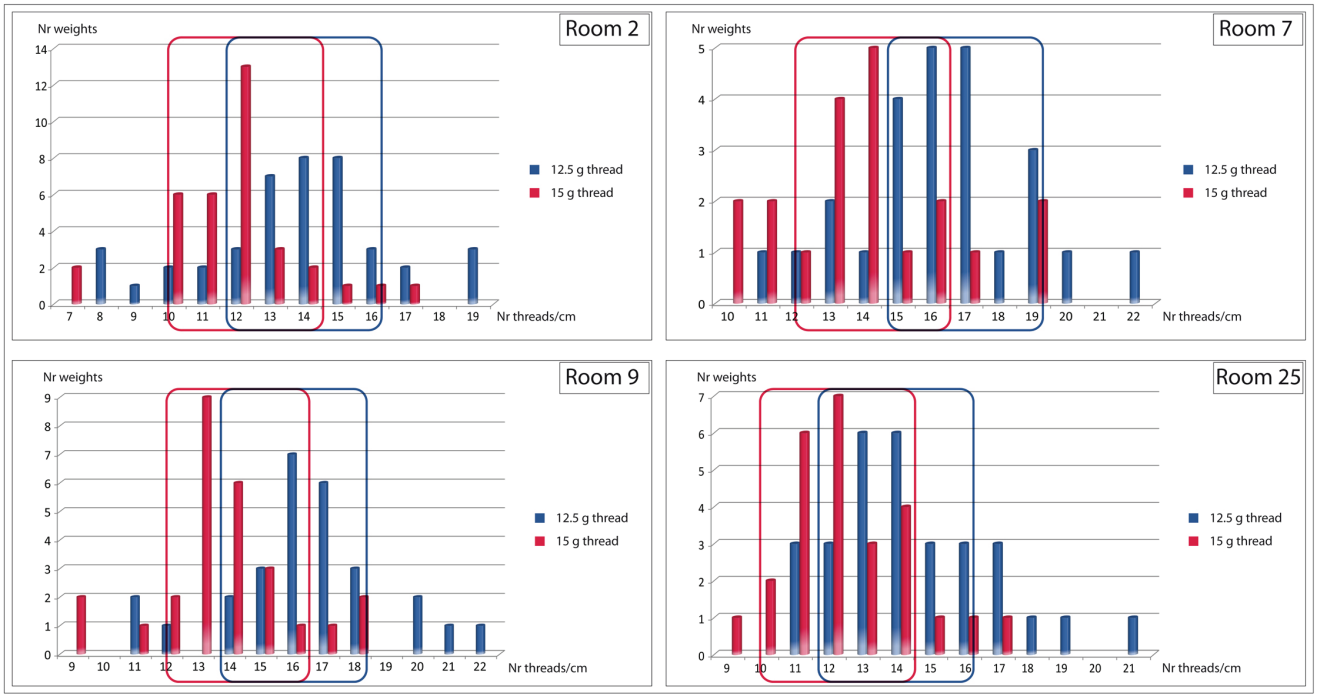

Fig. 6. *Herakleia*, western quarter of the Castle Hill, block I, modular complex. Dimensions of the groups of loom weights found in the houses of the complex and probable fabric realizable with them. (F. Meo)

A particular investigated context is a modular complex (Fig. 5), an atypical example of the housing typology because it would normally have linked both the functions of house and shop; in particular, the first room from the main street would have been a shop while the other rooms with the inner courtyard would have been the real house. The picture that emerges from this context is particularly variegated and problematic, above all because of the restructuring and re-appropriation of the whole complex in the 1st century BC with the construction of one 'atrium house' frequented up to the Augustan age (house I/7; Fig. 2, area with oblique blue lines) on houses I/3–I/5 (Giardino 1976, 549–552, 557; 1996, 150–152, 159; 2004, 413–415, 425; De Siena and Giardino 2001, 159).

The discoid circular weights are always the most attested type: 59 samples are in house I/1, while the varying convex discoid (1 sample), hemispherical (1 sample), truncated pyramidal (1 sample) and flat trapezoidal (2 samples) are very limited. Seventeen samples of discoid circular loom weights are in house I/2. In house I/3 43 samples of discoid circular and six truncated pyramidal weights have been found. Forty-six samples of the discoid circular type, five of the truncated pyramidal one and one pinched weight are in house I/4. Forty-three loom weights are in house I/5 and 24 are in house I/6: all of them are of the discoid circular typology.

Most of the loom weights of house I/1 are in room 2 (Fig. 5); this group consists of 33 discoid circular samples with thickness included between 2 and 2.2 centimetres and weight between 150 and 190 g (Fig. 6). Through the analysis of data, the used thread would have been of 12.5–15 g tension in weight. A clay spheroidal spindle whorl has also been discovered in room 13β of this house; it has a diameter of 3.2 centimetres and a weight of 32 g.

A group of weights has also been individualised in room 7 of house I/3 (Fig. 7): it consists of 21 discoid circular weights which have a thickness of 2.2–2.8 centimetres, but it is not possible to identify a precise range for their weight (Fig. 8). Also in this case, analyzing data with the CTR method, it is possible to hypothesise the presence of one loom for the production of a very thin fabric, with warp threads of 12.5–15 g tension.

Two other consistent groups of discoid circular weights are in room 9 of house I/4 and in room 25 of house I/5 (Fig. 7) and could attest to the presence of as many looms inside the first room of both

houses. However, if we consider the commercial function hypothesised for the first rooms (Giardino 1976, 549–552, 557; 1996, 150–152, 159; 2004, 413–415, 425; De Siena and Giardino 2001, 159; Meo 2013, 93–98), to have a loom in a shop would be unlikely. So, it is likely that they are part of one or two groups and refer to the 1st century BC 'atrium house' or they are part of two looms originally placed in rooms 12 (house I/4) and 23 (house I/5) and scattered during the later re-occupation of the area.

In order to try to verify both hypotheses, the two groups have been individually analysed. The group of house I/4 (rooms 9, 10, 12) consists of 35 samples: 30 discoid circular, four truncated pyramidal and one pinched weights. The discoid circular weights (Fig. 6) have a thickness of between 2 and 2.4 centimetres and a weight ranging from 170 to 225 g; the analysis of the data suggests the used thread to have been of 12.5–20 g tension in weight but warp threads of 20 g tension would produce the most uniform fabric.

The group of weights individualised in house I/5 (rooms 23 and 25) consists of 33 discoid circular weights which have a thickness of 1.9–2.2 centimetres and a weight between 160 and 240 g (Fig. 8). Despite that both ranges of dimensions are wider than those of the previous group, also in this case it is possible to hypothesise the presence of one loom for the production of a very thin fabric, with warp threads needing 15 g tension; the warp would not be homogeneous enough with a lower tension (12.5 g) while the number of loom weights would be too scarce and the warp not dense enough with a higher tension (20 g).

As the two groups are different with regard to thread tension and dimensions (thickness and weight), they are likely to be part of two different sets for as many looms which more probably refer to the first occupation of the area ('arcaded courtyard' houses I/4 and I/5) than to the 'atrium' house I/7. So, four groups of weights, which would attest to the presence of as many looms, have been isolated inside the modular complex.

Especially interesting is the comparison between data from this particular complex and those from the other houses of the western quarter of the Castle Hill of *Herakleia* because the quantifica-

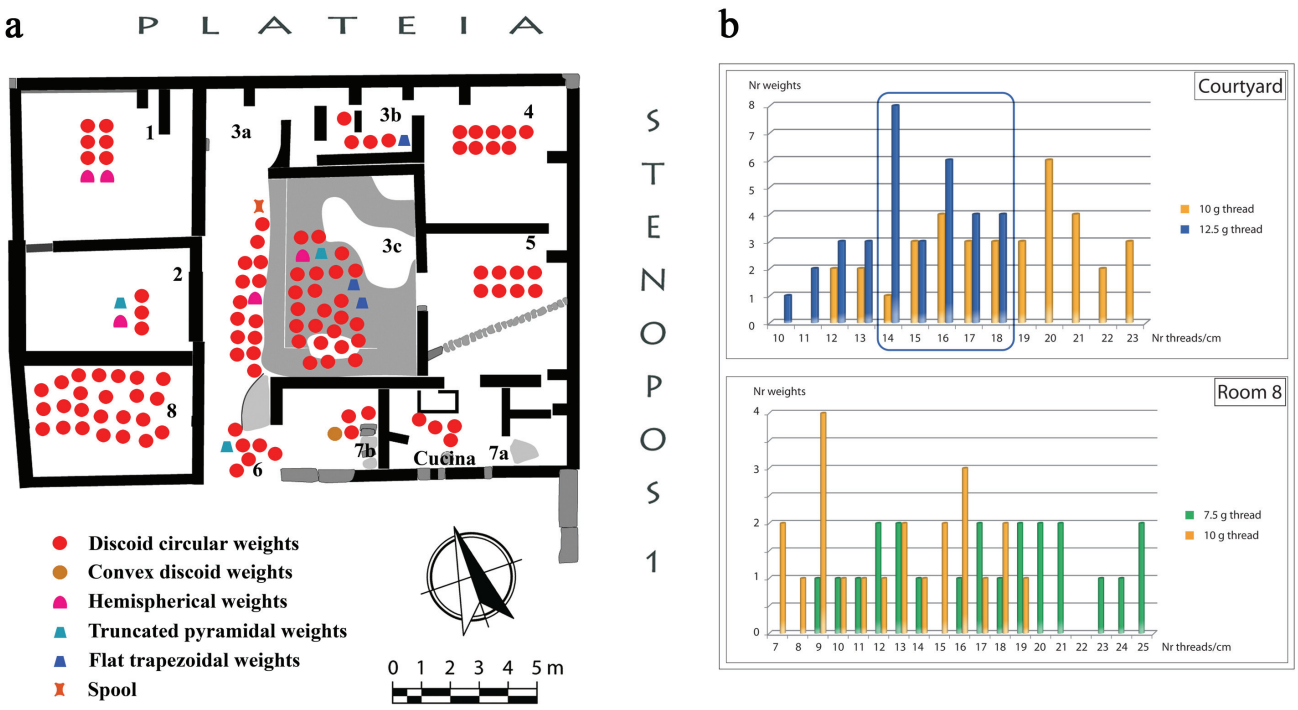

Fig. 7. *Herakleia*, western quarter of the Castle Hill, block II, 'courtyard house'. Distribution of loom weights and other textile implements inside the rooms (a) and probable fabrics from groups of loom weights found in the house (b). (F. Meo)

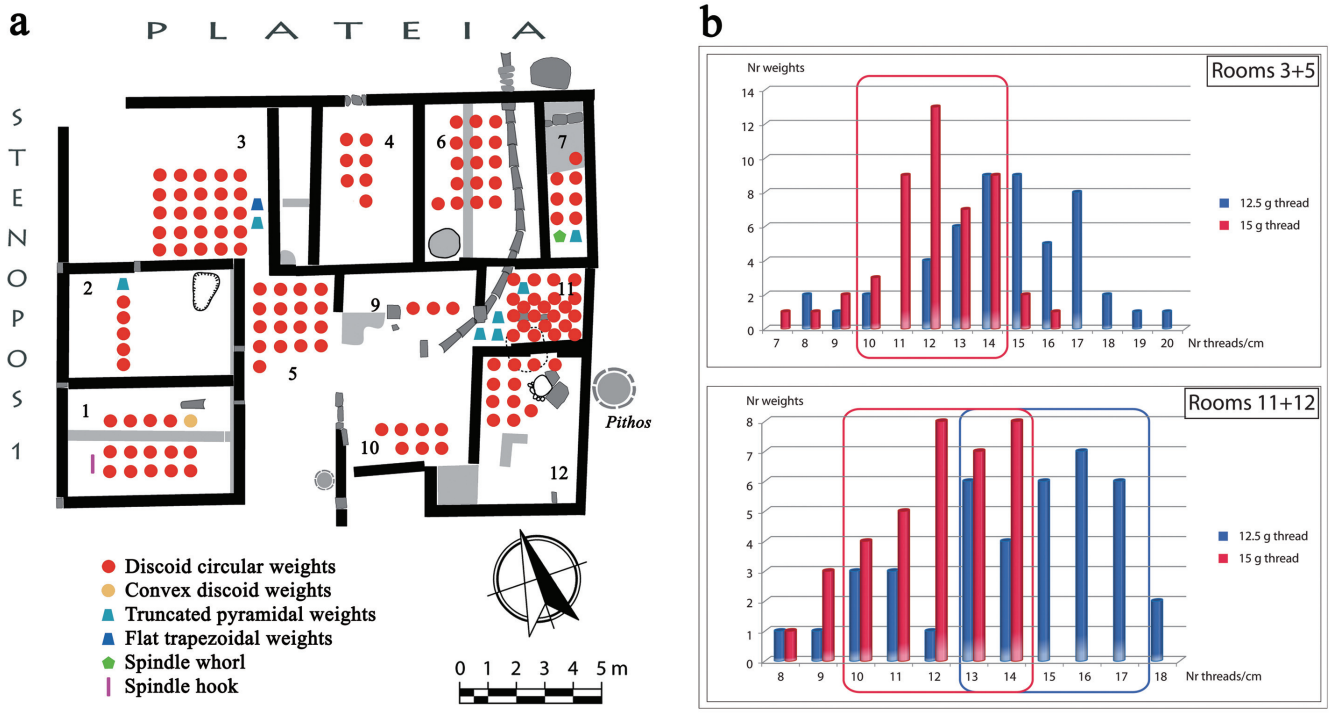

Fig. 8. *Herakleia*, western quarter of the Castle Hill, block IV, 'courtyard house'. Distribution of loom weights and other textile implements inside the rooms (a) and probable fabrics from groups of loom weights found in the house (b). (F. Meo)

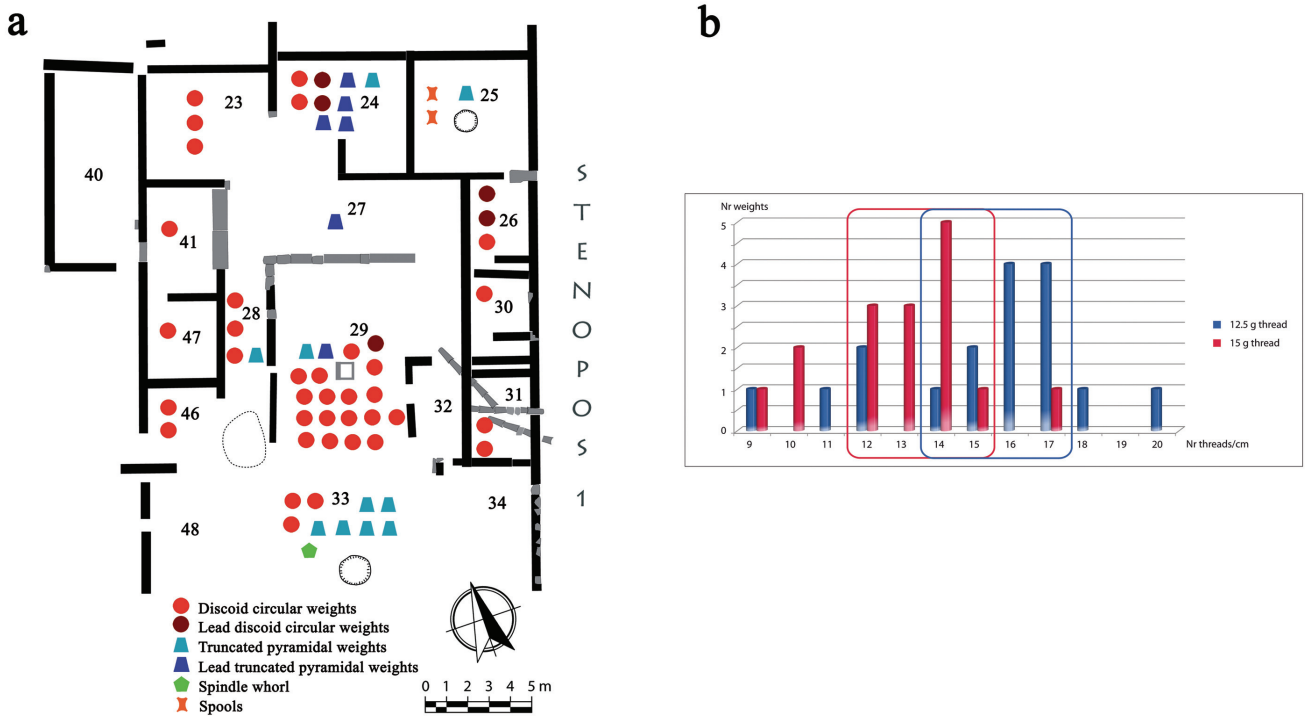

Fig. 9. *Herakleia*, western quarter of the Castle Hill, block II, 'Peristyle house'. Distribution of loom weights and other textile implements inside the rooms (a) and probable fabric from the group of loom weights found in the house (b). (F. Meo)

tion, distribution and contextualization of weights inside houses and, more in detail, rooms make it possible to clarify also the mechanisms surrounding textile workmanship.

House 'A' of Block II is a 'courtyard house' built at the beginning of the 3rd century BC, and continuously occupied throughout the entire 2nd century BC, with traces of occupation in the early Imperial times (De Siena and Giardino 2001, 144–145; Giardino 1996, 142–150, Fig. 7; 1998, 177–183; 2004, 402–403, Fig. 7; Meo 2011, 6–7; 2012, 265–266; 2013, 71–75; 2014, in press). Inside the house, 158 loom weights were discovered and two groups probably pertaining to as many looms have been identified (Fig. 7a). Regarding the loom in room 8, despite percentages of thickness and weight of loom weights being more homogeneous (uniform) than those of the first one, it is not possible to isolate a particular set of production but only possible to hypothesise the production of a fabric of a slightly superior quality, with threads requiring 7.5–10 g tension (Fig. 7b).

The loom of the courtyard would have produced a very thin fabric, as a numerous set of weights for 12.5 g tension threads attest to. A production with threads requiring 10 g tension would have been possible but the non-homogeneity of the fabric, due to the excessive discrepancy between 12 and 23 threads/cm, allows for the exclusion of this possibility.

The other courtyard house isolated in the western district is in the northwestern corner of block IV; this house has been used contemporaneously with the previous one, from the end of the 3rd century BC till the end of the 1st century BC (Siciliano and Stazio 1993; Giardino 1996, 143 Fig. 6, 148; 2004, 402; De Siena and Giardino 2001, 144–145; Meo 2013, 76–80; 2014, in press): 143 loom weights were recovered in the house. From the distribution of the finds inside the rooms it is again possible to single out two groups of weights: the first one in rooms 3 and 5, the second in rooms 11 and 12 (Fig. 8a). Once more we are in the presence of two looms that are more homogenous in comparison with the previous examples and probably refer to two looms meant for the weaving of similar warps, slightly thicker compared to those of the previous house (Fig. 8b). With regard to the loom of rooms 3 and 5, it likely produced a fabric with 15 g tension threads although a thinner fabric with threads requiring 12.5 g tension cannot be excluded. As for the second loom two sets can be singled

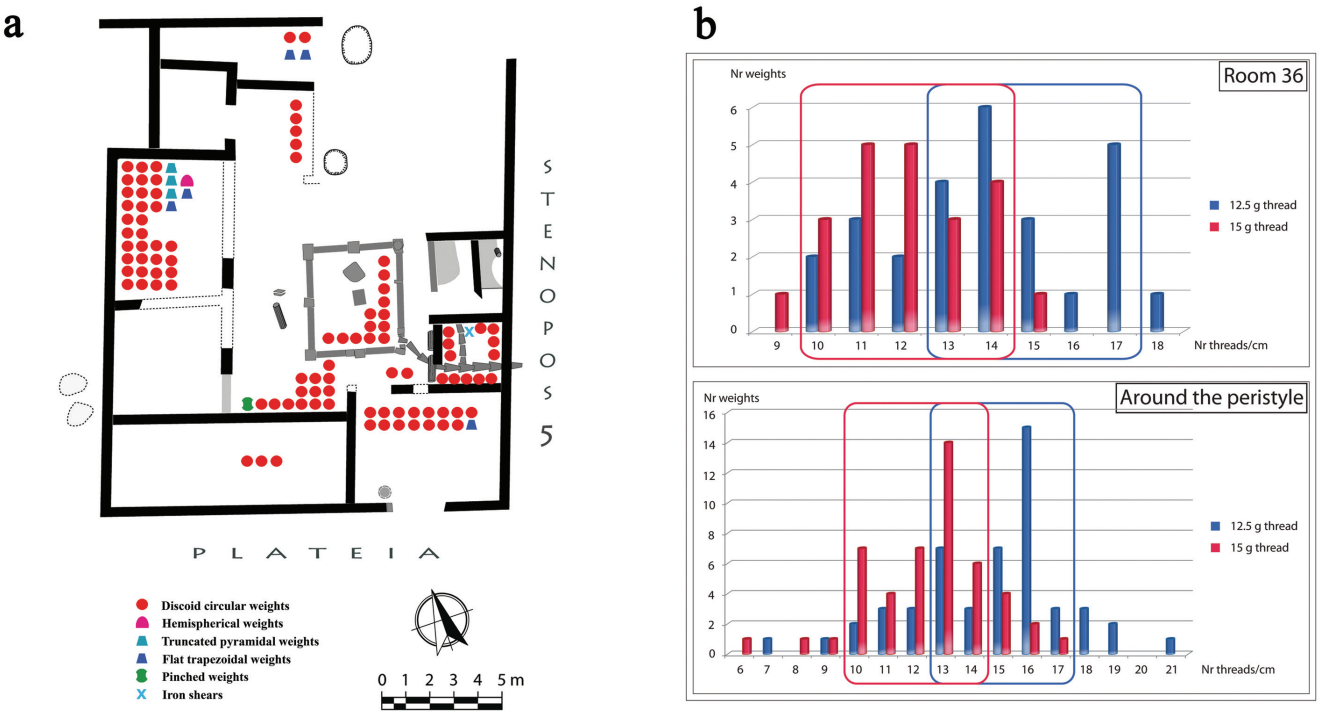

Fig. 10. *Herakleia*, western quarter of the Castle Hill, block VI, 'Peristyle house'. Distribution of loom weights and other textile implements inside the rooms (a) and probable fabric from the group of loom weights found in the house (b). (F. Meo)

out for the production of fabrics both with calculated 12.5 and 15 g tension threads. Nevertheless, weaving using threads requiring 15 g tension is more probable as the resulting fabric would be more uniform.

There are three 'Peristyle houses' two of which, as already noted, are contemporary to the 'courtyard houses' while the third one, in block VI, has a more recent plan. The house at the southeastern extremity of block II is not easy to read as a notable quantity of Archaic material has been found in it; even if the house has not been completely excavated, the identification of a probable set of weights allows for a series of considerations (Fig. 9a). A group of weights (rooms 29 and 33) most likely belonged to a loom used in the production of a fabric with a thread needing 12.5–15 g tension (Fig. 9b) has been nevertheless identified (Meo 2013, 84–86; 2014, in press).

In the peristyle house of block VI, built at the beginning of the 2nd century BC and in use between the 2nd and the 1st century BC, (Fig. 10a) 126 loom weights were recovered (Giardino 1996, 152–156, Fig. 14; 1998, 177–183; Meo 2011, 7–8; 2012, 266; 2013, 86–90; 2014, in press); the spatial distribution of weights inside each single room reveals how, also in this case, these two areas of use emerge: the first one in room 36 and the second one near the peristyle (rooms 1, 2, 3 and 4). It is also possible in this case to hypothesise the presence of two looms; a notable uniformity of the fabric is evident (Fig. 10b), with all the groups that would have allowed for the production of fabrics of very fine/thin quality, with thread tension of 12.5–15 g.

Based on the data presented above, a series of preliminary conclusions can be drawn. In terms of chronology, the examined contexts attest to the presence of discoid circular loom weights in levels dated to the 3rd–2nd centuries BC and the absence of contexts dated to the second half of the 4th century BC in the investigated area. This is in contrast to the generic dating of 4th–3rd century BC given for this type in the archaeological literature because they are in use also during the entire 2nd century BC and probably also in the first decades of the 1st century BC.

The quantification, distribution and contextualization of loom weights inside the houses and, more specifically, inside the rooms allows us to also clarify the organization of textile working: the presence of 10/11 vertical looms with discoid circular weights in the investigated houses to date, seems to show that weaving took place inside the houses and not inside specialised workshops. Moreover, it is possible to hypothesise that textile working was not merely a simple domestic activity but a real economic activity, confirming the testimony of Leonidas of Taranto, in the 3rd century BC (Leonidas, *Anth. Pal.*, 6, 286; 6, 288; 7, 726). In all three epigrams wool production is conducted by women and inside a domestic environment; besides they do not produce for themselves but for someone who will subsequently sell their products. Women did not own the wool but it was allocated to them and they were remunerated for their work. This model of production denies women large profits from such activity (Mele 1997).

Research in experimental archaeology has also given rise to new considerations about the product: the realised fabric was of good quality and the thread tension never exceeded 15 g. The contemporary presence of a notable number of looms for threads of 12.5–15 g can also be interpreted as a probable standardization of the production due to a certain type of request of products for markets.

Finally, the presence of a low percentage of loom weights, however minimal, made from Taranto clay (73 examples on 1914, about the 4%) with some same decorations used on *Herakleia* weights allows us to hypothesise that *Herakleia* and Taranto belong to a unique system of production. It is yet another testimony to the close bond between *Herakleia* and its mother-city, Taranto.

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