Textile Tools at Tiryns

Rahmstorf, Lorenz; Siennicka, Malgorzata; Andersson Strand, Eva Birgitta; Nosch, Marie Louise Bech; Cutler, Joanne

Published in:
Tools, Textiles and Contexts. Investigations of textile production in the Bronze Age Eastern Mediterranean

Publication date:
2015

Document version
Version created as part of publication process; publisher's layout; not normally made publicly available

Citation for published version (APA):
Rahmstorf, L., Siennicka, M., Andersson Strand, E. B., Nosch, M. L. B., & Cutler, J. (2015). Textile Tools at Tiryns. In M-L. Nosch, & E. Andersson Strand (Eds.), *Tools, Textiles and Contexts. Investigations of textile production in the Bronze Age Eastern Mediterranean* Oxbow Books. ANCIENT TEXTILE SERIES

Chapter 6.9

Textile tools from Tiryns

Lorenz Rahmstorf, Małgorzata Siennicka, Eva Andersson Strand, Marie-Louise Nosch and Joanne Cutler

Tiryns is situated on an elongated hillock rising up to 25 m above the Argive plain. Traces of habitation date from the Late Neolithic to the Archaic/Early Classical period (Fig. 6.9.1).

The site is especially well known for its Mycenaean occupation; however, the Early Bronze Age (EBA) and Early Iron Age (EIA) were also important in its history. Tiryns was situated only 300 m from the shoreline during the EBA, while the LBA citadel was separated from the shore by a 1 km wide coastal plain (Zangger 1994, 196). Nevertheless, Tiryns was always orientated towards the sea and hence to contacts, communication and trade. The Mycenaean palatial citadel was divided into the upper citadel (Oberburg), middle citadel (Mittelburg) and lower citadel (Unterburg). In addition, there are also extensive remains of domestic architecture outside the citadel; this area is known as the town/city (Stadt/Unterstadt) of Tiryns. The remains of the citadel date to Late Helladic (LH) IIIA to LH IIIC (*c.* 1425–1075 BC), *i.e.* the Palatial and Postpalatial phases (Rahmstorf 2008, pl. 100–102). There are also important remains dating to the EBA, especially the Early Helladic (EH) II phase (*c.* 2750–2300/2200 BC). Middle Helladic (MH) remains are very scant. The palace on the upper citadel was excavated by H. Schliemann in the late 19th century and succeeding excavations in Tiryns were carried out by German and Greek archaeologists during the early 20th century, the 1920s, the late 1950s and the 1960s (on the history of the excavation see: Rahmstorf 2008, 6–12). Systematic and careful excavations were undertaken between 1976 and 1983 by K. Kilian, mainly in the lower citadel. These excavations brought to light a neatly stratified sequence from LH IIIA2 until LH IIIC Late, so far unique for a Mycenaean centre. The most recent excavations have been carried out by J. Maran since 1997 (Maran 2000; Maran and Papadimitriou 2006; Maran 2008a, 2008b).

Certainly, during EH II Tiryns was one of the most important sites in southern Greece. The unique monumental circular building (*e.g.* Marzollf 2004) on the highest point of the hill, a densely settled lower citadel and a large lower town at its foot, as well as significant classes of artefacts (*i.e.* clay sealings and weights) give the impression of a prosperous town.[1] Unquestionably, Tiryns was also one of the most important centres of the Mycenaean culture during the Palatial period of the 14th and 13th centuries. However, a reconstruction of demographic and social aspects of the people living in the lower

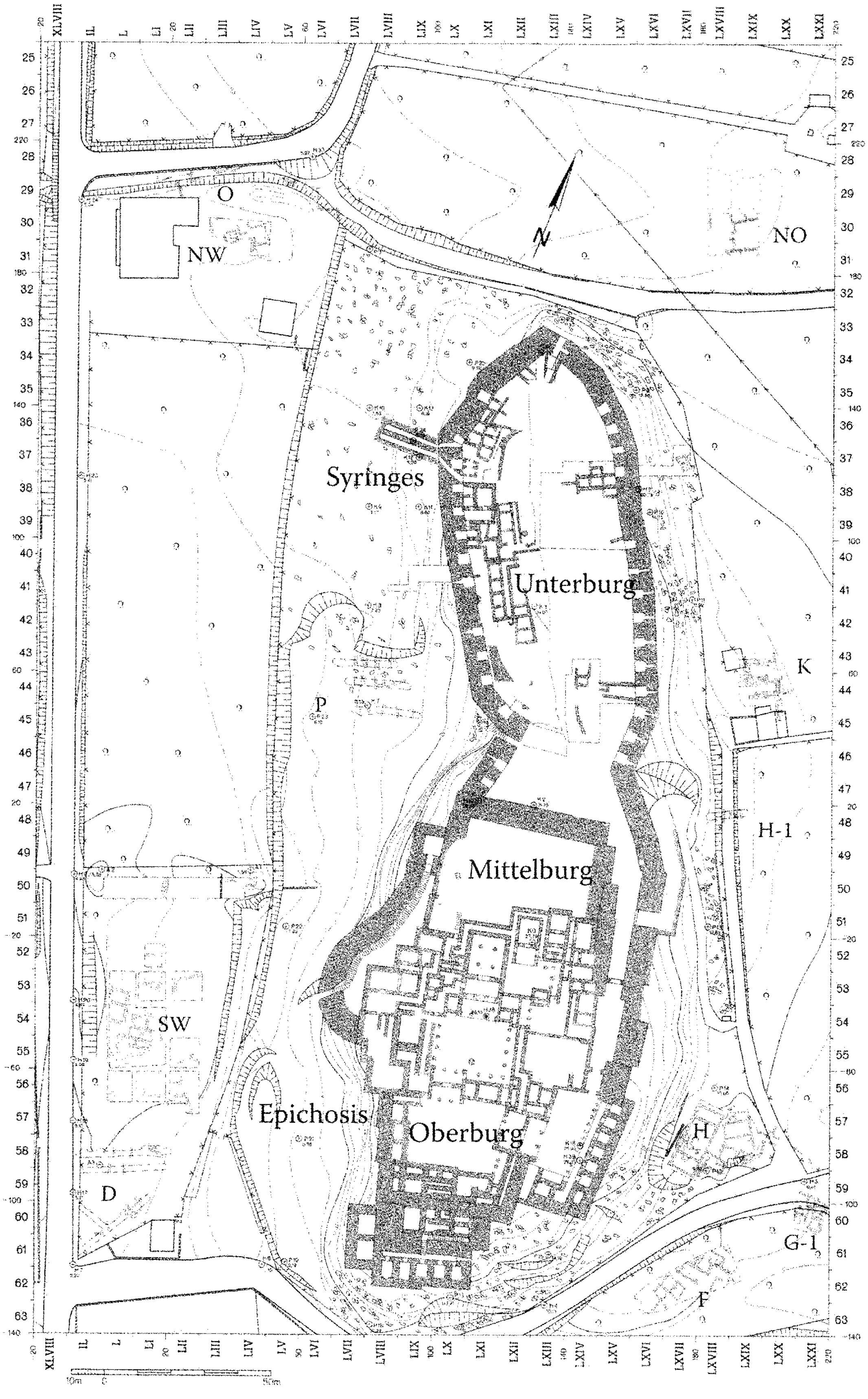

Fig. 6.9.1. Plan of the citadel and of the lower town of Late Bronze Age Tiryns (plan: Rahmstorf 2008, pl. 99).

citadel remains difficult.[2] There is insufficient evidence for storage facilities and workshops (pottery, lapidary, *etc.*) in the LH IIIB lower citadel to indicate the existence of specialised workshops; however, there are indications of metal working.[3] Spindle whorls are more or less evenly distributed over the lower citadel, hinting at spinning as a daily activity.[4] Still, the high quality of the domestic architecture and the luxury items uncovered in the houses suggest that (at least some of) the inhabitants had a higher socio-economic position in the society. During the Postpalatial period, *i.e.* after the collapse of the palace and the palatial culture, the social structure of the people living in the lower citadel was possibly different. A qualitative difference is evident in the amount of labour investment in architecture and objects used during this phase. Luxury objects become very rare, especially during the later LH IIIC. Single household units seem to have worked rather autonomously in this period. With the disappearance of the bureaucratic order every household became responsible for its own needs, including textile production.

The LH small finds from Tiryns, including over 700 (possible) tools for spinning and weaving, have been published (Rahmstorf 2008). Of these, *c.* 660 are from Kilian's excavations in the lower citadel. Of the total number of textile tools, 171 objects are recorded in the TTTC database (Fig. 6.9.2). However, in this chapter, results from Rahmstorf's work (for example Rahmstorf 2008) will be included and discussed together with the results from the TTTC tool analyses.[5] The majority of the tools recorded in the database are dated to LH IIIA-C (147 objects), while 13 spindle whorls and 11 loom weights are dated to EH.[6] The tools recorded in the database are mostly from secure contexts and can be considered as representative for the site/periods.

Spindle whorls, conuli and spinning

Spinning during the Early Helladic period[7]

There are 20 clay spindle whorls from the EH layers and another 16 EH whorls were found in later Mycenaean layers (Rahmstorf 2008, 21, 27–30, 34, 36, figs. 6, 13, pl. 6 (upper part)). The typical EH spindle whorls are convex or slightly stretched hemispherical with rounded transitions to base and top (Fig. 6.9.3).

	Spindle whorls	Conulus	Kylix stem	Loom weight	Total
EH	13			11	**24**
LH IIIA	2	1			**3**
LH IIIB	5	22		3	**30**
LH IIIC	25	20	1	68	**114**
Total	**45**	**43**	**1**	**82**	**171**

Fig. 6.9.2. Textile tools recorded in the TTTC database, by type and date.

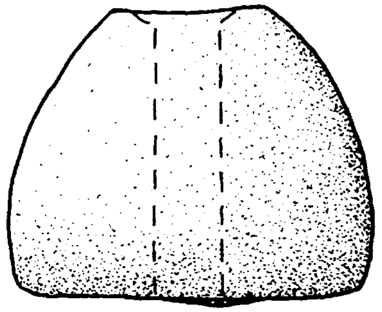

Fig. 6.9.3. Clay spindle whorl, Early Helladic (drawing: Rahmstorf 2008, cat.-no. 2394 (LXI 54/9 2615 I). D: 5.1 cm, H: 4.1 cm, Wt: 116 g).

The uniformity of this type during the EH and especially during EH II in the northeast Peloponnese and central Greece is striking and has been noted previously (Carington Smith 1992, 682). The size of the spindle whorls varies considerably. There are a few large examples (diameter 5–5.4 cm, height 3.6–4.3 cm, weight of completely preserved objects 94–120 g), some are of medium size (diameter 4.1–4.4 cm, height 3.4–3.7 cm, weight of completely or almost completely preserved objects 63–72 g) and there are several smaller spindle whorls (diameter 2.1–3.9 cm, height 1.8–2.9 cm, weight of completely or almost completely preserved objects 9–48 g). The perforations are of average diameter: 0.9 cm in the large examples, 0.7–0.8 cm in the medium, 0.4–0.8 cm in the small whorls. Bone spindle whorls are EH in date[8] and are rather homogenous in size (diameter 4.2–5.3 cm, height 1.7–2.3 cm) due to the bone material used. Their weight varies between 14 and 36 g (Fig. 6.9.4). Their shape is reminiscent of the EH clay spindle whorls. The diameters of the perforations measure 0.4–1.1 cm. The bone spindle whorls were probably made from the heads of the humerus/femur of large ruminants (Bovidae, Cervidae) and/or Equidae. They were nicely shaped, with their curved surfaces usually well polished and the flat bases polished or left unworked and rough.

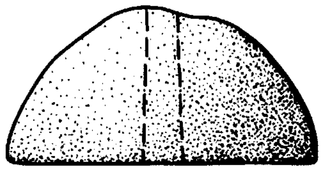

Fig. 6.9.4. Bone spindle whorl, Early Helladic (drawing: Rahmstorf 2008, cat.-no. 1468 (Ti 17228). D: 4.53 cm, H: 2.22 cm, Wt: 25.4 g).

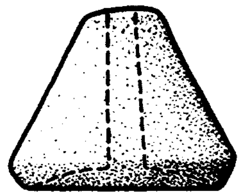

Fig. 6.9.5. Clay spindle whorl, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 790 (LXII 43/42 a1224 XX R215). D: 3.3 cm, H: 2.5 cm, Wt: c. *22 g).*

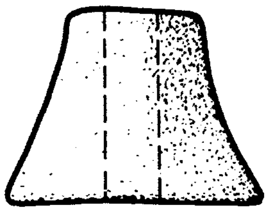

Fig. 6.9.6. Clay spindle whorl, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 816 (LXI 41/97 a1578 Pl. IVa). D: 3 cm, H: 2.7 cm, Wt: 25.4 g).

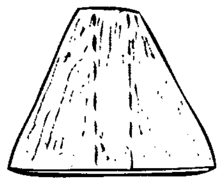

Fig. 6.9.7. Stone spindle whorl, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 177 (LXII 44/6 a1355 XVI). D: 3.12 cm, H: 2.31 cm, Wt: c. *22 g).*

To conclude, the range in the weight and diameter of the spindle whorls suggests a very varied production of different types of spun yarn. If the heaviest whorls were used as spindle whorls this yarn must have been very thick and could only have been used for producing coarse textiles, or for plying.

Spinning during the Late Helladic Period

Clay spindle whorls from LH Tiryns can be assigned either to the Palatial or Postpalatial period. So far 143 spindle whorls are known. A dozen different types can be distinguished according to shape (Rahmstorf 2008, 18–21, fig. 6). In particular, whorls with a straight sharp conical profile and a concave top ("hollow top") seem to be typical for the Palatial period (Fig. 6.9.5). During the Postpalatial period whorls with a conical concave profile were preferred, also with a concave or convex top (Fig. 6.9.6).

In Tiryns all whorls made of stone (steatite or similar stone) are defined as conuli, despite size. They are likely to have had a function ranging between whorl and bead. Two hundred and eighty-seven objects from Tiryns have been published (Rahmstorf 2008, 126–138, pl. 47–51, 91, 9–11). The most common type (Rahmstorf 2008, 128, fig. 34: type 1: *c.* 80%) is conical (Fig. 6.9.7), others have a concave-conical profile (Rahmstorf 2008, 128, fig. 34: type 2: *c.* 10%) or are 'disc-shaped', 'shanked' or 'button-shaped' (Rahmstorf 2008, 128, fig. 34: type 3: *c.* 10%).

The different shapes are evenly distributed through Palatial and Postpalatial levels. No biconical conuli have been found in Tiryns; evidence from other sites suggests that this type may not have been produced anymore after LH IIIA (Rahmstorf 2008, 132–133). The weight of most conuli from Tiryns falls between 4 and 20 g, the minimum is 1.5 g and the maximum 41 g. On average, the conuli are lighter than clay spindle whorls, but if one excludes the 'button-shaped' type (type 3) – which possibly was not used as a spindle whorl – the difference is not so strong anymore (Rahmstorf 2008, 28, fig. 11). In addition, the stone conuli became less common after the Palatial period and were supplemented more and more by clay spindle whorls and possibly to a certain extent by rounded perforated sherds in Postpalatial times (Rahmstorf 2008, 25 fig. 10). This would imply that during the Palatial period a thinner thread on average was produced.

Rounded, perforated sherds have been considered to be spindle whorls, as the weight distribution of these artefacts is very similar to the normal clay spindle whorls (Rahmstorf 2008, 50 with fig. 12, pl. 7–9). In addition, these 67 artefacts are especially typical (80%) for LH IIIC Late when there is a general deterioration in the quality of artefacts. The rounded perforated pot sherds (Fig. 6.9.8) were easy and quick to produce and it is plausible that some of the rounded pot sherds with a (central) perforation made from finer Mycenaean pottery were used as provisional spindle whorls during LH IIIC Late.

Thirty-three of the LH III spindle whorls, of which 12 are pierced sherds, are recorded in the TTTC database, as well as 43 conuli. Sixty-nine of these whorls had a recordable weight and diameter. As can be seen in Figure 6.9.9, they vary in weight from 3 g to 50 g and in diameter from 1.7–6.5 cm.

The groups of spindle whorls and the conuli are more homogeneous in weight, diameter and hole shape than the pierced sherds (compare Rahmstorf 2008, fig. 13 and fig. 19). The weight and the diameter vary within these two groups, but there is a more or less standardised relationship between these two parameters. The yarn spun with the lightest conulus would be much thinner than the yarn spun with the heaviest conulus. The thin type of yarn would demand well prepared raw materials. The fabrics produced with these fine threads would have taken a considerable amount of time to make. If using the same type of prepared raw material, the yarn produced with the heaviest conulus would be thicker and the fabric coarser.

However, there is also a difference between, on the one hand, the spindle whorls and conuli, and on the other, the pierced sherds (Fig. 6.9.9). The pierced sherds generally have a larger diameter than the spindle whorls and conuli. According to the recordings in the database, the pierced sherds from Tiryns are also often irregular in shape and not rounded. Another difference is that the hole shape of the pierced sherds is often hourglass shaped (Fig. 6.9.10). It would be difficult to fix this type of whorl firmly on the spindle, as the spindle would be likely to wobble too much. More tests are therefore needed to see whether these pierced sherds would function well as spindle whorls. During the TTTC spinning tests a slightly irregular spindle whorl was used and both spinners considered that it was not optimal as a spinning tool. The main reason was that the spindle wobbled, and according to their experience, was therefore difficult to spin with and also more time consuming. Another problem was that spinning with this unbalanced spindle gave them pain in their hands and shoulders (chapter 4.1). Nevertheless, other tests (Gibbs 2008) demonstrated that spinning with irregular pierced potsherds with hourglass shaped holes was effective. In the external

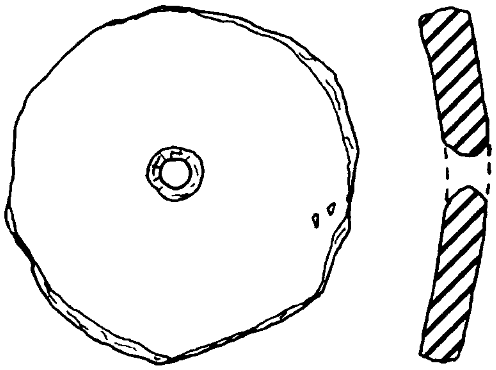

Fig. 6.9.8. Pierced sherd, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 1138 (LXII 36/24 a1382 IIId). D: 4.3–4.6 cm, Wt: 16.7 g).

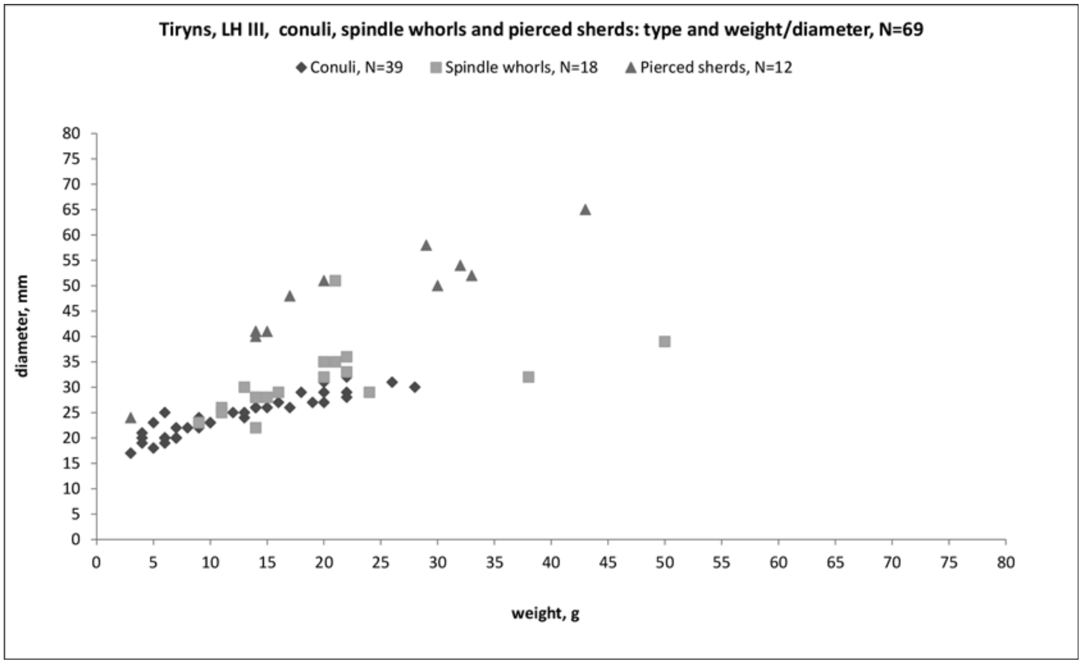

Fig. 6.9.9. LH III spindle whorls recorded in the TTTC database: type and weight/diameter. Please note that some markers represent more than one spindle whorl.

	Plain	Cone	Hourglass	Not available	Total
Spindle whorls	30	4			**34**
Conuli	39	1		3	**43**
Pierced sherds			11	1	**12**
Total	**69**	**5**	**11**	**4**	**89**

Fig. 6.9.10. The relationship between whorl type and hole shape.

analyses of the thread spun with an irregular spindle whorl in the TTTC tests, there were no visual differences from the yarn spun with a functional spindle whorl (chapter 4.2).

To conclude, the range in the spindle whorls' weight and diameter suggests a very varied production of different types of spun yarn and it should be noted that the heavier spindle whorls present in EH contexts are missing during this period.

Loom weights and weaving

Weaving during the Early Helladic

The EH material from Tiryns includes five different types of clay objects, which may be interpreted as loom weights (Siennicka 2012, 68–71, pl. XXV d–h). First, there are the cylindrical objects with two or three perforations and without perforations (Figs. 6.9.11, 6.9.12 and 6.9.13), second, large cones with a horizontal perforation, and crescent objects with perforations at both ends. Cylinders with only one lengthwise perforation have not to date been recovered from Tiryns, but occur sporadically at other EBA or MBA sites, e.g. Eutresis (see Goldman 1931, 193, fig. 266, 3, 6).

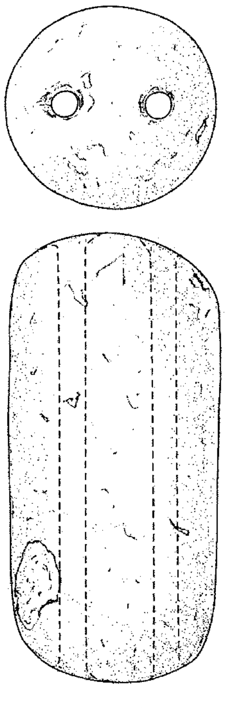

Fig. 6.9.11. Clay cylinder, Early Helladic (drawing: M. Siennicka, unpublished (LXII 39/42 a1472 uNr. 18). D: 5.1 cm, H: 10.7 cm, Wt: c. *335 g).*

Large conical weights or cones are so far known only from Tiryns, where they are only present in EH contexts. Only five fragments have been recovered, all in a bad state of preservation. The cones have straight but uneven (slightly concave or convex) sides and flat oval bases rounded at the edges. Only in one case, where approximately 85% of the object is preserved, is a horizontal perforation placed at *c.* 2/3 of its height visible. Because of similar sizes, diameters, side gradient and material, one can assume that the other fragments belonged to the same conical type with perforation. The best preserved example (Fig. 6.9.14) 10.7 cm in height, but originally it must have been larger (its upper end is not preserved). Its diameter measures *c.* 11 cm and the oval perforation is 1.2–1.3 cm. It has an estimated original weight of *c.* 800 g. The surface was smoothed, but no traces of paint or wash are visible. Even if badly damaged and only preserved as fragments, the cones give an impression of homogeneity regarding their size, form, material and production. Since all the conical weights come from the same area (although from different excavation layers), it cannot be ruled out that they were all used together.

Crescent shaped weights or 'heavy bananas' (nine examples) are usually thicker in the central part and narrower at the ends. The section is more elliptical than oval. The weights have a horizontal perforation at each end, placed symmetrically. Crescent shaped weights are extremely rare in the EBA Aegean and were possibly inspired by EBA Anatolia.[9] Only two examples from Tiryns have been preserved completely or almost completely, while another seven are fragmentary, *i.e.* only half preserved or less than half preserved (see for example, Müller 1938, 64, fig. 50; Weißhaar 1981, 237, fig. 77, 7; 82, 7). The maximum lengths (measured across the two most distant points) are 16 cm and 16.8 cm; maximum diameters are 4.8 cm and 5.8 cm respectively. A few examples are a little thinner, but they do not differ much in size. The perforations measure 0.9 cm in both of the completely preserved objects and are 2.2 cm and 2.9 cm deep. The distance between the holes at each end of these two objects is 13 cm. The complete crescent weighs 592 g (Fig. 6.9.15), while the reconstructed weight of the second smaller one would be *c.* 480 g. Here again the group is very homogenous and all the objects appear to have been manufactured in a similar way. It is notable that the weaving tests have demonstrated that this type of loom weight is very functional, especially when weaving twill (chapter 4.4; Lassen 2013).

Only four examples of perforated spheres, from the lower citadel, were found. Three have a diameter of 9.5–10 cm, the diameter of the fourth is 6.2 cm. They were described as unbaked and crumbling when dried. Unfortunately, they were not illustrated in the publication (see Siedentopf 1971, 82) and have not been loctaed in the excavation depot.. Siedentopf referred to rather similar objects from Eutresis (Goldman 1931, 192, fig. 265). The archaeological context is dated to EH II.

Only 11 of the Early Helladic loom weights are recorded in the TTTC database, only six of which had an original weight that could be estimated. These loom weights therefore cannot be considered as representative. However, the general impression is that the loom weights during this period, due to their size, are most suitable for use in a production of coarser textiles, or at least textiles produced with warp threads needing a lot of tension (chapters 4.1 and 4.5), which supports the interpretation of the spindle whorls dated to the same period.

Weaving during the Late Helladic Period

From the LH period there are three possible classes of clay loom weights: disc (Fig. 6.9.16), spool (Fig. 6.9.17) and torus shaped objects (Fig. 6.9.18). Of these only the disc-shaped weights are definitely loom weights. The majority (68) of the loom weights recorded in the TTTC database are from LH IIIC contexts.

Forty-nine of the loom weights have a recordable weight and thickness (five loom weights and 44 spools); they vary in weight from 15 g to 464 g and in thickness from 1.8 cm to 5.0 cm (Fig. 6.9.19).

Weaving with spools

Spools are the most common type of loom weight recorded in the database, but the weight and the thickness vary within this group (Fig. 6.9.19). Over 200 (fragmentary or complete examples) have been published or mentioned in the literature (Rahmstorf 2008, 59–73, pl. 23–32; Maran 2008a, 78, fig. 71–73). For various reasons it has been argued before by Rahmstorf (Rahmstorf 2003, 2005) that the spools might have functioned as loom weights in a warp-weighted loom. TTTC weaving tests have demonstrated that it is possible to use spools as loom weights, but it is plausible that the smaller spools (weighing below 50 g) would be more suitable for use as weights in tablet weaving or in other band weaving techniques (chapters 2 and 4.1). However, it is of course also possible that extremely thin warp yarn needing less than 5 g tension was used (see also Siennicka and Ulanowska in press).

Loom weights and spools in contexts, an example

In some cases, several spools are found together. For example, 11 spools recorded in the database, made of fired clay, are from the same context (Ti LXII 42/59 IV G9). Eight of these spools weigh between 23–28 g, with a thickness varying from 2.4 cm to 2.8 cm (Fig. 6.9.20). None of these spools would have functioned optimally as weights on a warp-weighted loom. The weight of the other three spools varies from 104 g to

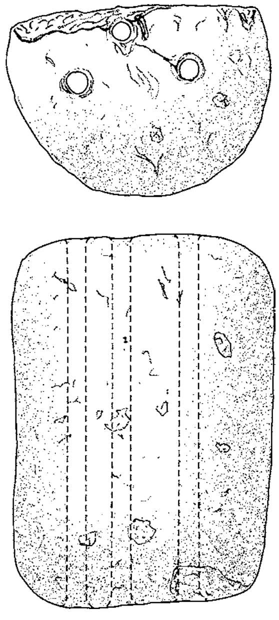

Fig. 6.9.12. (left) Clay cylinder, Early Helladic (drawing: M. Siennicka, unpublished (LXII 39/47 VI a). D: 7.2 cm, H: 10.5 cm, Wt (rec.): c. *607 g).*

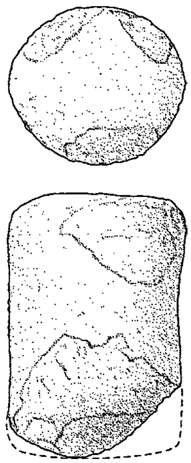

Fig. 6.9.13. (above) Clay cylinder, Early Helladic (drawing: M. Siennicka, unpublished (LXIV 38/67 a1531 XIb). D: 4.8 cm, H: 7.15 cm, Wt (rec.): c. *187 g).*

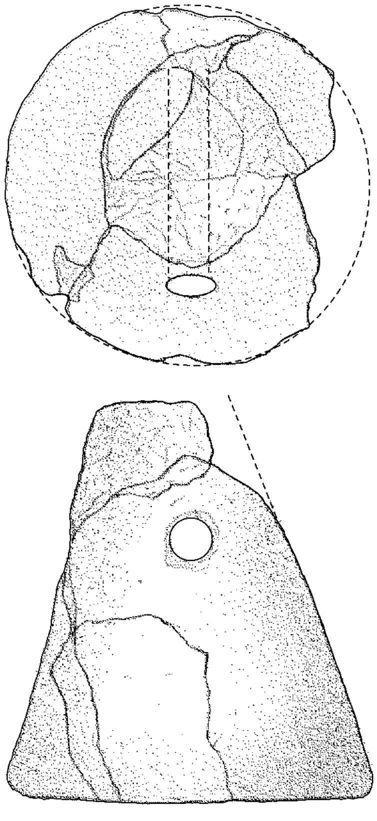

Fig. 6.9.14. Clay cone loom weight, Early Helladic (drawing: M. Siennicka, unpublished (LXIII 39/18 VI). D: c. *11 cm, H: 10.7 cm, Wt (rec):* c. *800 g).*

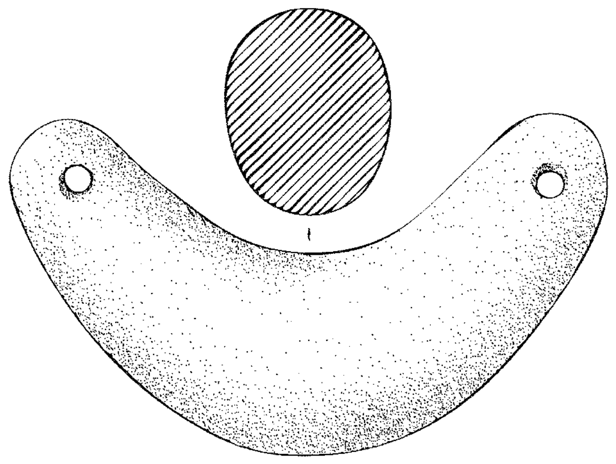

Fig. 6.9.15. (left) Clay crescent loom weight, Early Helladic (drawing: M. Siennicka, unpublished (LXI 38/60 a1461 VI) L: 16.5 cm, D: 5.8 cm, Wt: 592 g).

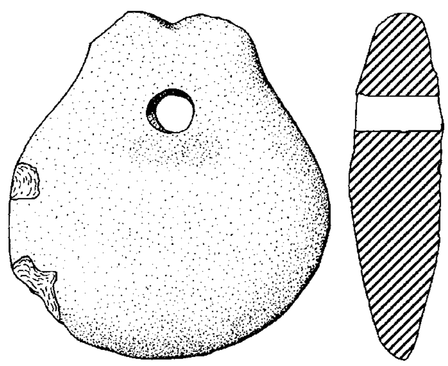

Fig. 6.9.16. (right) Clay disc shaped loom weight, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 1536 (LXI 40/82 XIIIa). L: 16.5 cm, D: 5.8 cm, Wt: 592 g).

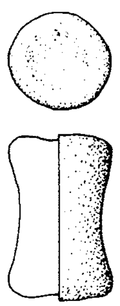

Fig. 6.9.17. Clay spool shaped loom weight, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 1672 (LXII 42/59 IV G9). D: 2.45 cm, H: 3.88 cm, Wt: c. *23 g).*

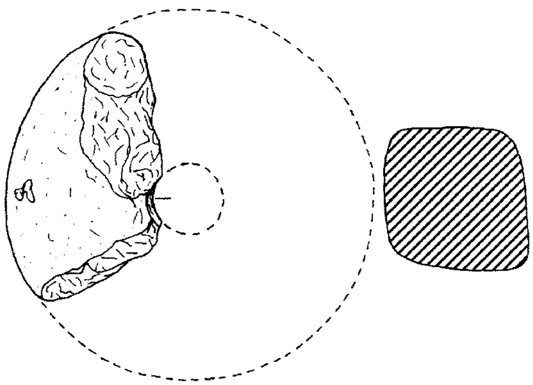

Fig. 6.9.18. Clay torus shaped loom weight, Late Helladic (drawing: Rahmstorf 2008, cat.-no. 2484 (LXI 43/9 XIIIa). D: 10.5 cm, H: 4 cm, Wt (rec.): c. *464 g).*

122 g and the thickness varies from 3.7 cm to 4.2 cm; these spools could have been used as loom weights using warp threads needing *c.* 5–10 g tension. The spools were found together, but according to their weight and thickness they are clearly divided into two groups, demonstrating that they would not optimally be functional together in a regular setup on a warp-weighted loom (Rahmstorf 2008, pl. 141). Another nine spools from the same period were found nearby (Ti LXII 42/70 IV G9). The original weight has been estimated on four of these incomplete spools and varies from 15 g to 33 g. Their thickness varies from 2.0 cm to 2.7 cm. They could therefore have been used with the other eight spools from Ti LXII 42/59 IV G9 (Fig. 6.9.20). However, if these spools were used in a setup it would have been either for a tablet/band weave or in a very special setup on the warp-weighted loom.

Summary

The EH levels from the lower citadel are not published yet[10] and only a few textile tools have some contextual information. Seven fragments of cylinders with three lengthwise perforations were uncovered in Room 143 in the central part of the lower citadel.[11] Room 143, a spacious central chamber, belonged to an only partially excavated large house complex, which Kilian compared to important EH II Late buildings at other sites. Because of the accumulation of the cylinders, Kilian suggested weaving activities in that room (like House B6 and the House of the Tiles at Lerna and the corridor house at Akovitika: Kilian 1981, 189, fig. 45; 1983, 312, fig. 39, a). The relevant layers in Room 143 should rather be dated to the EH II–EH III transitional horizon (for this "Übergangshorrizont" see Maran 1998, 12–13, pl. 80–81). In addition, fragments of four large cones and two fragments of crescent shaped weights were uncovered in adjacent squares to the east, and may be contemporary in date.[12] In general, the architecture and the finds of the EH II and the transition to EH III from the lower citadel give the impression of a vibrant town with combined use of houses for living, working, craft, storage and trading activities.[13] The constant activity in spinning and weaving surely belonged to these daily practices.

The number of tools from EH recorded in the TTTC database is small and no detailed conclusions about EH textile production can be drawn from these items. However, it is interesting to note that the results from the analyses of both the spindle whorls and the loom weights suggest a production of slightly coarser fabrics than during the Late Helladic period.

For the Palatial period it is not possible to identify particular concentrations of textile tools in the lower citadel. Sometimes 2–3 clay spindle whorls or 4–5 conuli were found rather close to each other (Rahmstorf 2008, 23, 130 pl. 111; 117; 138, 2; 139), but otherwise they are ubiquitous finds apparently scattered over the lower citadel. Spinning was probably practised in every household. Since only a few disc shaped loom weights were found in the lower citadel it is hard to tell where, if at all, a warp-weighted loom was originally installed. Two different pairs of disc shaped loom weights might imply two looms at different locations (in a building). Nevertheless, the evidence is very weak and poses the question whether weaving on a warp-weighted loom played any important role during LH IIIB in the lower citadel.

A number of spindle whorls, above all conuli, date to LH IIIB, demonstrating a varied production of different yarns from very fine to thicker spun thread. In this period, however, the few loom weights recovered means that it is almost impossible to suggest which types of fabrics were produced. The analysis of the whorls suggests a varied production of different types of fabrics woven with very thin thread to fabrics woven with thicker thread. To spin and weave with the thinnest threads would have been time consuming and demanded specialist knowledge.

There is a distinct increase in the number of recorded regular spindle whorls dating to LH IIIC and it is interesting to note that these spindle whorls are within the same weight/diameter range as the conuli. On the other hand, if the pierced pot sherds are not included, the analysis of the whorls from LH IIIC does not demonstrate any changes from LH IIIB in the production of different or new types of yarn, despite the typological change in spindle whorls.

In the Postpalatial period there are no more typical loom weights. Clay spools only appeared during LH IIIC Middle and may have taken over the function of loom weights. Concentrations in certain areas in the lower citadel suggest that during the Postpalatial period weaving was practised throughout the

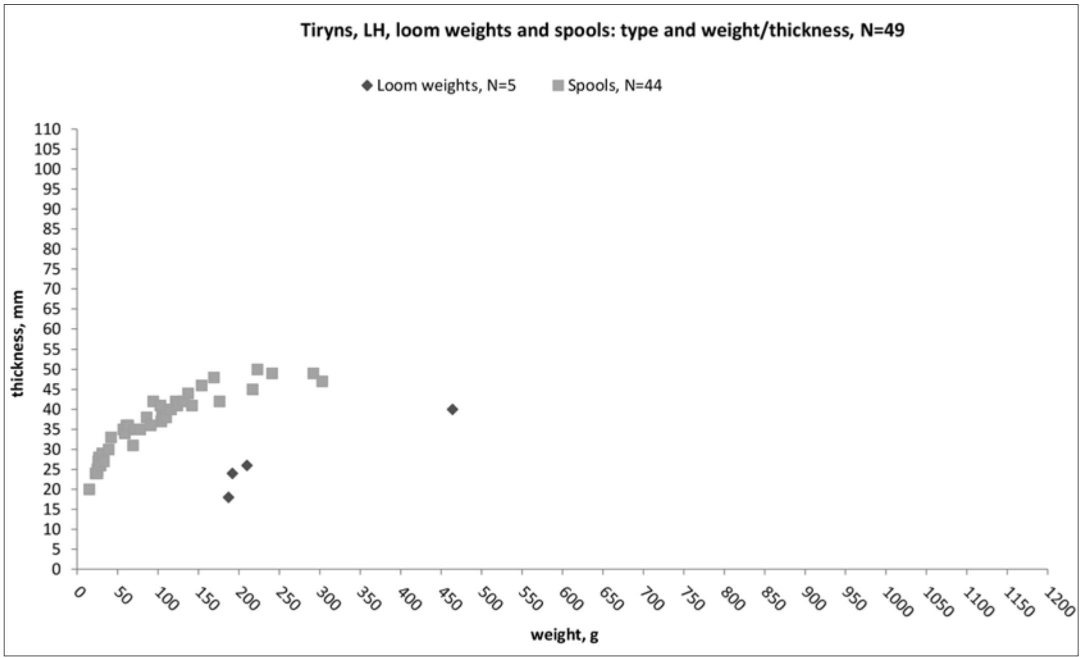

Fig. 6.9.19. LH loom weights and spools: type and weight/thickness. Please note that some markers represent more than one loom weight.

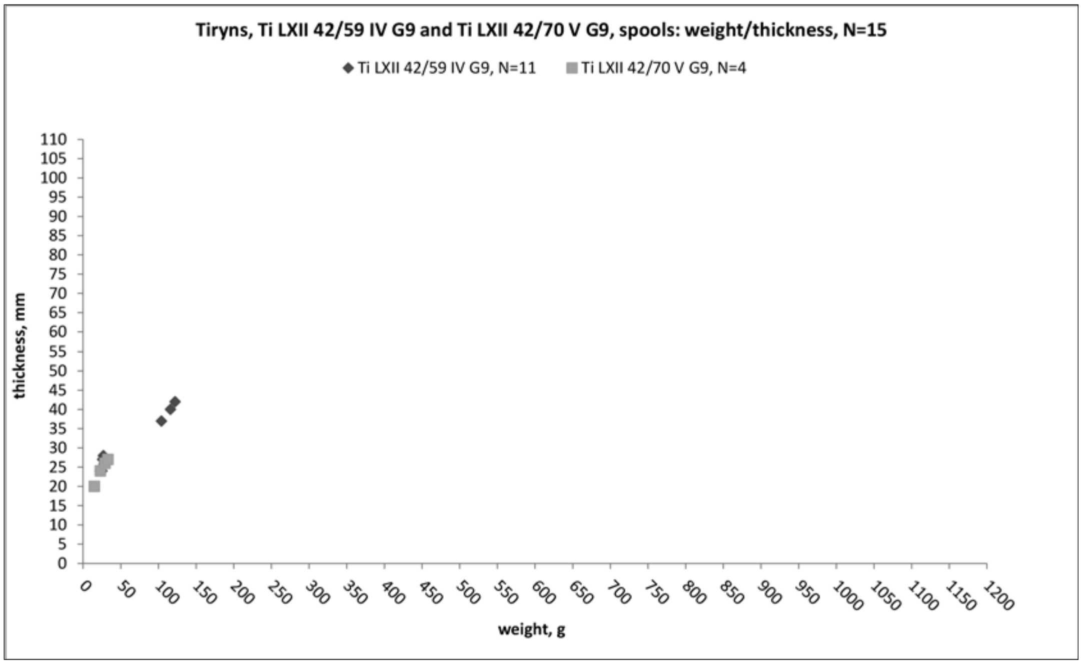

Fig. 6.9.20. Spools from Ti LXII 42/59 IV G9 and Ti LXII 42/70 V G9: weight/thickness. Please note that some markers represent more than one spool.

area of the lower citadel (Rahmstorf 2008, 60, pl. 130; 138, 1; 140; 141; 148, 1). It is possible to interpret the spools as deterioration in textile production during later LH IIIC, as they were produced quickly and easily, similarly to the contemporary rounded pierced sherds. It is uncertain whether the smaller spools (under 100 g) replaced other, heavier loom weights, or were used for other types of weaving (band or tablet weaving). However, the large spools would be suitable for use as loom weights. Therefore, it is probable that a new type of fabric was being produced compared to the textiles woven in earlier phases, *i.e.* a fabric with very thin threads.

In conclusion, the textile tools from LH IIIB and LH IIIC demonstrate a production of 'very fine' and 'fine' fabrics. It is plausible that other coarser textiles were also produced in Tiryns, but this production seems to be invisible and was probably performed with other types of spindles and looms, if not at another location. The visible production, however, demonstrates high quality textiles that would have demanded well prepared raw materials, textiles that were time consuming to produce (compared to coarser types) and demanded skilled craftspeople with the knowledge, time and ability to produce these types of fabrics.

Notes

1 For most recent finds of EH II sealings in the lower town see Maran 2008b, 103, fig. 9. For EH II weights see Rahmstorf 2006, 25–27, fig. 4.

2 It is likely that individuals of higher social status lived within the citadel during the Palatial period but it is difficult to systematically compare their situation with the contemporary domestic quarters outside the citadel due to the lack of adequately published remains of the Palatial period.

3 This is indicated by installations and small finds at three to four different places in the lower citadel during LH IIIB Developed and Late: (Rahmstorf 2008, 240–241, 248–249, 252–253, 274, 287, pls. 104, 111, 114, 135, 150–151). For recent results on new excavations in building XI see Maran 2008a.

4 This, however, was probably not restricted to a certain class of people (*e.g.* servants, slaves, craftspeople), as persons with high status were spinning as well. Compare *Odyssey* 4.130–35 where "a princess is given gold and silver spinning gear as a present by a high-born lady-friend"; Barber (1991, 60–64, fig. 2.24–28) also makes references to spindles and whorls made of gold, silver and ivory from Bronze Age contexts in the Eastern Mediterranean.

5 The majority of the textile tools from Tiryns are published in Rahmstorf 2008. Approximately 60 EH textile tools from pure EH contexts are going to be published separately.

6 In this chapter, results on the EH material from Rahmstorf's and Siennicka's works (Rahmstorf 2008; Siennicka 2012) will be included and discussed together with the results from the TTTC tool analyses. The EH material from Tiryns includes 30 clay spindle whorls, seven bone spindle whorls and 30 loom weights.

7 For a detailed discussion on the Early Helladic textile tools from Tiryns see Siennicka 2012.

8 Only one of the bone spindle whorls was recovered from a pure EH layer, but from the comparative material from other sites it is clear that bone spindle whorls were used only during the EBA or Neolithic in southern Greece (see Rahmstorf 2008, 209).

9 Very few similar objects are known: only from Troia (Schmidt 1902, 296, no. 8240) and Thermi on Lesbos (Lamb 1936, pls. 24, 31, 61) and a recent find from Geraki in Laconia (Crouwel *et al.* 2007, 6–9, fig. 4, pl. II). In Anatolia they appeared much more often at EBA sites (*e.g.* Demircihöyük: Korfmann 1981, 33–34, fig. 45; Aphrodisias: Joukowsky 1986, 516, fig. 369, 4) and continued to be typical loom weights during the second millennium BC.

10 Only short comments in preliminary reports are available at the moment: Kilian 1979, 408–409, fig. 32–33; 1981, 186–192, fig. 44–47; 1982, 420–424, fig. 39–47; 1983, 314–326, fig. 39–56; Siedentopf 1971; Grossmann and Schäfer 1975.

11 K. Kilian mentioned the cylinders, but they have not been illustrated as a separate picture or drawing. One can recognise them, however, on a detailed plan of the complex R 142–144 in Room 143 just north of the entrance in the partition wall between Rooms 143 and 144 (Kilian 1981, 189, fig. 45).

12 Without stratigraphical analysis, it is not yet clear if they are contemporary with Room 114. The large cones were discovered in LXII 39/18, LXII 39/29 layer Va, LXII 39/78 layer Va, LXIII 39/18 layer VI. The crescent objects came to light in LXII 39/18, LXII 39/20 layer VI.

13 For example, the thick destruction deposit in Room 196 yielded a rich array of pottery, pithoi, grinding tools, lead objects, obsidian tools, bone points and balance weights. See Kilian 1982, 420–424, fig. 41–46; Rahmstorf 2006, 25–27, fig. 4.

14 For more on the EH textile tools and production see Siennicka 2012

Bibliography

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

Carington Smith, J. (1992) Spinning and weaving equipment, in Macdonald, W. A. and Wilkie, N. C. (eds), *Excavations at Nichoriain in Southwestern Greece. 2. The Bronze Age Occupation*, 674–711. Minneapolis. University of Minnesota Press.

Crouwel, J., Prent, M. and Shipley, D. G. J. (2007) Geraki. An acropolis site in Lakonia. Preliminary report on the thirteenth season, *Pharos*, 15, 1–16.

Gibbs, K. T. (2008) Pierced clay disks and Late Neolithic textile production, in Córdoba, J. M., Molist, M., Pérez, M. C., Rubio, I., and Martínez, S. (eds), *Proceedings of the 5th International Congress on the Archaeology of the Ancient Near East, Madrid, April 3–8 2006*. Madrid. UAM Ediciones.

Goldman, H. (1931) *Excavations at Eutresis in Boeotia: Conducted by the Fogg Art Museum of Harvard University in Cooperation with the American School of Classical Studies at Athens, Greece*. Cambridge, Massachusetts. Harvard University Press.

Grossmann, P. and Schäfer, J. (1975) Tiryns: Unterburg 1968. Grabungen im Bereich der Bauten 3 und "4", in Müller, K. (ed.), *Tiryns. Forschungen und Berichte VIII*, 55–96. Mainz. Philipp von Zabern.

Joukowsky, M. S. (1986) *Prehistoric Aphrodisias. An Account of the Excavations and Artefact Studies*. Providence. Brown University.

Kilian, K. (1979) Ausgrabungen in Tiryns 1977, *Archäologischer Anzeiger*, 379–411.

Kilian, K. (1981) Ausgrabungen in Tiryns 1978–1979, *Archäologischer Anzeiger*, 149–194.

Kilian, K. (1982) Ausgrabungen in Tiryns 1980, *Archäologischer Anzeiger*, 393–430.

Kilian, K. (1983) Ausgrabungen in Tiryns 1981, *Archäologischer Anzeiger*, 277–328.

Korfmann, M. O. (1981) *Demircihüyük. Die Ergebnisse der Ausgrabungen 1975–1978. 1. Architektur, Stratigraphie und Befunde*. Mainz. Philipp von Zabern.

Lamb, W. (1936) *Excavations at Thermi in Lesbos*. Cambridge. Cambridge University Press.

Lassen, W. A. (2013) Technology and palace economy in Middle Bronze Age Anatolia: the case of the crescent shaped loom weight, in Nosch, M.-L., Koefoed, H. and Andersson Strand, E. (eds), *Textile Production and Consumption in the Ancient Near East. Archaeology, Epigraphy, Iconography*, 78–92. Ancient Textiles Series 12. Oxford. Oxbow Books.

Maran, J. (1998) *Kulturwandel auf dem griechischen Festland und den Kykladen im späten 3. Jahrtausend v.Chr.: Studien zu den kultuellen Verhältnissen in Südosteuropa und dem zentalen sowie östlichen Mittelmeerraum in der späten Kupfer- und frühen Bronzezeit*. Bonn. Rudolf Habelt.

Maran, J. (2000) Das Megaron im Megaron. Zur Datierung und Funktion des Antenbaus im mykenischen Palast von Tiryns, *Archäologischer Anzeiger*, 2000/1, 1–16.

Maran, J. (2008a) Forschungen in der Unterburg von Tiryns 2000–2003, *Archäologischer Anzeiger*, 2008/1, 35–111.

Maran, J. (2008b) Tiryns, Deutsches Archäologisches Institut, Jahresbericht 2007. *Archäologischer Anzeiger*, 2008/1, Beoheft, 103–105.

Maran, J. and Papadimitriou, A. (2006) Forschungen im Stadtgebiet von Tiryns 1999–2002, mit Beiträgen von R. Pasternak, P. Stockhammer, C. Hübner und S. Giese, *Archäologischer Anzeiger*, 2006/1, 97–169.

Marzolff, P. (2004) Das zweifache Rätsel Tiryns, in Schwandner, E.-L. and Rheidt, K. (eds), *Macht der Architektur – Architektur der Macht*, 79–91. Mainz. Philipp von Zabern.

Müller, K. (1938) *Tiryns IV. Die Urfirniskeramik*. München. F. Bruckmann.

Rahmstorf, L. (2003) Clay spools from Tiryns and other contemporary sites. An indication of foreign influence in LH IIIC?, in Kyparissi-Apostolika, N. and Papakonstantinou, M. (eds), *Η περιφέρεια του μυκηναϊκού κόσμου./The Periphery of the Mycenaean World*, 397–415. Athens. Greek Ministry of Culture.

Rahmstorf, L. (2005) Ethnicity and changes in weaving technology in Cyprus and the eastern Mediterranean in the 12th century BC, in Karageorghis, V. (ed.), *Cyprus: Religion and Society: From the Late Bronze Age to the End of the Archaic Period*, 143–169. Möhnesee-Wamel. Bibliopolis.

Rahmstorf, L. (2006) In search of the earliest balance weights, scales and weighing systems from the Eastern Mediterranean, the Near and Middle East, in Alberti, M. E., Ascalone, E. and Peyronel, L. (eds), *Weights in Context. Bronze Age Weighing Systems of Eastern Mediterranean: Chronology, Typology, Material and Archaeological Contexts*, 9–45. Rome. Istituto Italiano di Numismatica.

Rahmstorf, L. (2008) *Kleinfunde aus Tiryns, Terrakotta, Stein, Bein und Glas/Fayence vornehmlich aus der Spätbronzezeit*. Wiesbaden. Reichert Verlag.

Rahmstorf, L. (2011) Handmade pots and crumbling loom weights: 'Barbarian' elements in the Eastern Mediterranean in the last quarter of the 2nd millennium BC, in Kouka O. and Karageorghis V. (eds), *On Cooking Pots, Drinking Cups, Loomweights and Ethnicity in Bronze Age Cyprus and Neighbouring Regions*, 315–330. Nicosia. A. G. Leventis Foundation.

Schmidt, H. (1902) *Heinrich Schliemann's Sammlung trojanischer Altertümer*. Berlin. Georg Reimer.

Siedentopf, H. B. (1971) Frühhelladische Siedlungsschichten auf der Unterburg von Tiryns, in Jantzen, U. (ed.), *Tiryns. Forschungen und Berichte V*, 77–85. Mainz. Philipp von Zabern.

Siennicka, M. (2012) Textile production in Early Helladic Tiryns, in Nosch, M.-L. and Laffineur, R. (eds), *KOSMOS. Jewellery, Adornment and Textiles in the Aegean Bronze Age*, 65–75. Liège. Peeters.

Siennicka, M. and Ulanowska, A. (in press) So simple yet universal. Experimental approach to clay spools from Bronze Age Greece, in Alfaro, C. *et al.* (eds), *Purpureae vestes VI. Textiles and Dyes in the Mediterranean World, Abbey of Montserrat*, 19–23.03.2014.

Weißhaar, J.-H. (1981) Ausgrabungen in Tiryns 1978–1979. Bericht zur frühhelladischen Keramik, *Archäologischer Anzeiger*, 220–256.

Zangger, E. (1994) Landscape changes around Tiryns during the Bronze Age, *American Journal of Archaeology*, 98 (2), 189–212.