

## THE MINOAN TEXTILE INDUSTRY AND THE TERRITORY FROM NEOPALATIAL TO MYCENAEAN TIMES: SOME FIRST THOUGHTS

The textile industry of Bronze Age Crete is well documented for the Mycenaean period by numerous series of Linear B tablets from Knossos. At the moment, however, the historical development of the industry during the Bronze Age, with its associated productive organisation and administrative mechanisms, has not yet been reconstructed. Such an enterprise would require extensive research into relevant archaeological contexts from the Early Minoan to Subminoan periods, and has to be conducted gradually, investigating each period on its own and then comparing it with the image formed for other periods. The focus of the present work is the Neopalatial archaeological evidence, which is particularly well-documented and offers many opportunities to address productive and organisational questions such as the relationship between industry and territory, the scale of production and the administrative structure.

The question of the historical genesis of the Mycenaean textile industry has been taken up periodically by Linear B and textile specialists both in conjunction with each other and separately. Whether some of the productive characteristics of the industry could have developed from similar features of a Neopalatial industry is an issue that has been raised many times and deserves re-examination. The aim of the present work, therefore, is to try to answer this question, illustrating as much as possible the continuities and discontinuities between the Neopalatial and Mycenaean textile evidence<sup>1</sup>.

Two classes of documentation will be analysed: the evidence from the Knossos Linear B tablets concerning the Mycenaean textile industry and the archaeological evidence of textile processing from the Neopalatial period. As far as the Linear B texts are concerned, a brief outline of the reconstructed productive structure will be provided and some specific points and questions related to textile industry will be discussed. Regarding the Neopalatial period, comprehensive bodies of relevant archaeological evidence have been examined. Only a summary of the analysis of these will be illustrated along with a preliminary division based on functional specialisation and scale of production<sup>2</sup>. The emerg-

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<sup>1</sup>In this paper I present some of the results and insights of the research undertaken in working toward the completion of my PhD thesis on textile fibre processing in Bronze Age Crete. I wish to thank, first of all, Prof. Elisabetta Borgna and prof. Paola Cassola Guida of the University of Udine, prof. Emanuele Greco of the Scuola Archeologica Italiana di Atene and Metaxia Tsiropoulou of the ΚΑ' Εφορεία Π.Κ.Α of Αγίος Νικόλαος for their help during this period. My warmest thanks

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<sup>2</sup>A more detailed overview and analysis of the archaeological documentation of the Neopalatial textile industry, especially concerning fibre processing, is in preparation by the author for subsequent publication.

ing characteristics of the two classes of evidence will then be compared in order to both verify the presence of elements of continuity and to underline differences. A review of the archaeological evidence for textile activities from Mycenaean Crete (LMII-III B) is necessary to complete this research project as outlined above. Such work has just now started and, it is hoped, will improve the picture in the future. With this research and the analysis of the Neopalatial evidence both continuously progressing, the results of this present study will necessarily be preliminary in many cases. Only the most prominent patterns/trends and features can be identified at the moment.

### 1. *The Mycenaean textile industry from the Knossos texts*

It will be useful to begin with a brief outline of the organisation of the textile production as illustrated by the surviving administrative documents from Mycenaean Knossos (conventionally dated to LM IIIA2 early, but more likely later, within the LM III B period)<sup>3</sup>. As is well-known, the wool textile industry, from the rearing of sheep to textile finishing, is one of the major concerns of Mycenaean palaces, along with extensive (large scale) agriculture, metals processing and production and perfumed oils production. In these domains, the palace is directly involved, controlling and recording the main steps of the production processes, in order to provide resources and finished items for distributing rations and accumulating prestige objects and trading goods. For other economic, non-staple, sectors, products are acquired indirectly through «taxation»<sup>4</sup>.

At Knossos, sheep rearing takes place on a large scale (80,000 - 100,000 animals have been counted)<sup>5</sup>. Flocks are assigned to shepherds and «collectors» connected to various

<sup>3</sup>The chronology of the last important destruction phase of the Knossos palace and of the various groups of tablets is a question of much scholarly debate. It is not possible to list all the relevant bibliography here. In a recent study, R.J. FIRTH (A Review of the Find-places of the Linear B Tablets from the Palace of Knossos, in *Minos* 35-36, 2000-2001, pp. 63-290), after reviewing all the available documentation, summarises the important points of the question and proposes, for the bulk of the archive, a date after LM IIIA2 early, possibly within LM III B. The tablets dealing with textile matters belong to this part of the archive.

<sup>4</sup>Much research on the subject has been conducted and presented by Paul Halstead. See recently HALSTEAD 2001 with references. The interconnections between the «palace» and «non-palace» economic sectors, with many insights into local rural communities, have been discussed variously in *Economy and Politics* (see especially DE FIDIO 2001; HALSTEAD 2001; DRIESSEN 2001). Some kinds of textiles are also collected by the administration through taxation (KILLEN 1984).

<sup>5</sup>Fundamental contributions have been furnished by John Bennet, Yves Duhoux, Paul Halstead, John

Killen, José Melena, Marie-Louise Nosch, Jean-Pierre Olivier and Françoise Rougemont. See especially (with references): BENNET 1985 and 1990; HALSTEAD 2001; KILLEN 1984; J.T. KILLEN, The Wool Industry of Crete in the Late Bronze Age, in *BSA* 59, 1964, pp. 1-15; ID., Epigraphy and Interpretation in Knossos WOMAN and CLOTH Records, in *Texts, Tablets and Scribes*, pp. 167-183; J.L. MELENA, *Studies on Some Mycenaean Inscriptions from Knossos Dealing with Textiles* (*Minos* Suppl. 5), Salamanca 1975; ID., On the Linear B Ideogrammatic Syllabogram ZE, in J.T. KILLEN, J.L. MELENA, J.-P. OLIVIER eds., *Studies in Mycenaean and Classical Greek Presented to John Chadwick* (*Minos* 20-22), Salamanca 1987, pp. 389-457; NOSCH 1998, 1997-2000, 2000 and 2001; J.-P. OLIVIER, «KN: Da-Dg», in *Texts, Tablets and Scribes*, pp. 219-267; F. ROUGEMONT, Some Thoughts on the Identification of the 'Collectors' in the Linear B Tablets, in *Economy and Politics*, pp. 129-138; EAD., Flax and Linen Textiles in the Mycenaean Palatial Economy, in *Ancient Textiles* (forthcoming). A synthetic view is now available in I. ΤΖΑΧΙΑΗ, Υφαντική και υφάντρες στο Προϊστορικό Αιγαίο 2000/1000 π.Χ., Ηράκλειο 1997, esp. pp. 46-77,

localities in the territory and are periodically inventoried (KN series Da-Dg)<sup>6</sup>. Plucking/shearing probably takes place in the countryside or in these same minor localities: the wool from diverse centres is recorded along with the relative deficit (KN series Dk, Dl and Do), and then presumably brought to the palace to be redistributed (additional comments concerning this will be made below). The wool is distributed to many work-groups spread over the whole of south-central Crete. These groups are charged with the actual making of the textiles and are composed of women and children of both sexes who are identified by their ethnic (on the basis of their villages' names) or by their specialisation: i.e. *pa-i-ti-ja*, women from *pa-i-to* (Phaestos); or *te-pe-ja*, producers of *te-pa* (series KN Ak, Ap, Lc). Each group consists of 20-30 women, for a total of approximately 1000 people. The wool is assigned according to the production target, depending on the quality and quantity of the textiles needed (series KN Lc).

Generally speaking, local characteristics seem to play a role in the administrative targets put in place by the palace, and, as far as the textile sector is concerned, western Crete seems to have specialised in the production of *pa-we-a*<sup>7</sup>. In this overall picture of Knossian textile production, we also see that there is a special sector formed by the groups, places and textiles involved in the «*ta-ra-si-ja*» system: very interestingly, only certain types of textiles (*te-pa*, *pe-ko-to te-pa*, *tu-na-no* and *pa-we-a*) are produced according to this obligatory productive system and only in a few particular localities<sup>8</sup>. It is worth noting that while among the attested work denominations those deriving from a certain type of textiles are abundant (*ko-u-re-ja*, *te-pe-ja*, *pe-ki-ti-ra*<sub>2</sub>), other professional terms, like spinners (*a-ra-ka-te-ja*) and weavers (*i-te-u*), are quite rare. Once the textiles are made, they are gathered and brought to the palace from the various work-groups by «intermediaries» (series KN Le) and again distributed to other workshops to undergo finishing (series KN Ld, Ln and Od). Apparently, these workshops are located at the centre as they are not connected to any

129-133, 193-195, 262-263. On sheep-rearing see the last works by Alessandro Greco (e.g. A. GRECO, *I pastori di Cnosso*, Ph.D. Dissertation, University of Florence 2001-02; ID., Omologazione, integrazione, sostituzione: le procedure di aggiornamento dei documenti inerenti alle greggi del palazzo di Cnosso, in *Creta Antica* 3, 2002, pp. 217-246).

<sup>6</sup>The recorded localities/toponyms probably indicate second-order administrative centres or shearing places (BENNET 1985, p. 235).

<sup>7</sup>Mostly in connection to «collectors» (NOSCH 2000, p. 46).

<sup>8</sup>This term (= \**talansia*/τάλασσία in the 1<sup>st</sup> millennium B.C.E.) in historical Greek indicates exclusively an amount of spun wool or of spinning work (see *pen-sum* in Latin). In Linear B texts, however, it is also related to other cycles of production (metalworking, chariots, perhaps weapons, furniture, leather goods) and probably indicates the allotment of measured quantities of raw material to workshops or work-groups to produce an exact quantity of specific goods. Allotments and finished items are strictly recorded by

the administration. The *ta-ra-si-ja* system has been recently studied by Marie-Louise Nosch (see n. 3). The localities connected in the texts with the textiles *ta-ra-si-ja* are: Amnisos, *da-\*22-to*, *da-wo*, *do-ti-ja*, *e-ko-so*, *e-ra*, *\*i-ja-pu*, Knossos, Phaestos, *qa-mo*, *ri-jo-no*, *se-to-i-ja*, *tu-ni-ja*, *tu-ri-so*, *\*56-ko-we*. In particular, at Knossos, *ko-u-re-ja* and *te-pe-ja* are attested, at Amnisos *ko-u-re-ja*. The texts concerning the *ta-ra-si-ja* were found in the West Storerooms of the palace (especially in F10 and F14), while the other texts were found in F3 and in the North sector: given the difference of scribal hand, it is possible to imagine that there were two separate *bureaux* (NOSCH 1997-2000, pp. 31-44). Female work-groups are apparently far more frequent in the *ta-ra-si-ja* texts than in the others, where male names recur instead («collectors», «responsibles»), so «... on est amené à se demander si la responsabilité collective féminine, identifiée par des ethniques, n'est pas surtout un des signes caractéristiques de la production appelée *ta-ra-si-ja*» (NOSCH 1998, p. 406).

toponyms. Finishing operations are completed by male specialists (*ka-na-pe-u*, fuller) as well as some female workers (*a-ze-ti-ri-ja/a-ke-ti-ra<sub>2</sub>*, *o-nu-ke-ja*, finishers).

The pattern is quite clear: the palace attempts to collect as many finished products as possible, discharging in large part the costs and organisation problems onto the individual village communities. Sheep rearing and textile production are therefore attached to local centres (ranging from small settlements to large sites such as Phaestos/*pa-i-to*), while finishing operations converge on the palace where the products are gathered and then used according to palace needs<sup>9</sup>. This pattern is quite widespread in the ancient world, especially in temple- or palace-centred administrations, starting with the evidence of the Uruk IV texts onwards (ca 3100 BCE)<sup>10</sup>. The complexity of the interrelations between centre and countryside are increased by the intrinsic technical characteristics of the textile industry on that large of a scale, imposing different solutions, places, relationships and organisation for each productive step<sup>11</sup>.

## 2. The Mycenaean textile industry at Knossos: some insights on decentralisation and complexity

The general picture of the Knossian textile industry is thus quite clear; nonetheless, there remain several aspects that deserve further discussion. First of all, with respect to the location of the work-groups in the territory, we should emphasise that they are connected

<sup>9</sup> Finishing workshops or work-forces are generally recorded (KN Ld, Ln) without a place-name, thus probably being located at or near the centre (KILLEN, *Epigraphy and Interpretation*... cit. in note 5, p. 177).

<sup>10</sup> For a recent review of the question, see M. LIVERANI, *Uruk la prima città*, Roma-Bari 1998, pp. 52-58. See also H. WAETZOLDT, *Untersuchungen zur neusumerischen Textilindustrie (Centro per le antichità e la storia dell'arte del Vicino Oriente, Studi economici e tecnologici 1)*, Roma 1972 (Neo-Sumerian period) and M. VAN DE MIEROOP, *Sheep and Goat Herding according to the Old Babylonian Texts from Ur*, in J.N. POSTGATE, M.A. POWELL eds., *Domestic Animals of Mesopotamia I (Bulletin on Sumerian Agriculture 7)*, 1993, pp. 161-182 (Old Babylonian texts). The archives in question are, in various periods, from Uruk, Ur, Larsa and Lagash. In Early and Middle Bronze Age Mesopotamia, spinning and weaving operations are concentrated in the administrative centres, in large segregated workshops with hundreds of workers (women and children). In Late Bronze Age Syria, at Ugarit (XIV-XIII B.C.E.), both sheep rearing and textile production are decentralised among palatial rural estates, thus matching the almost contemporary Knossian evidence: spinners, weavers and fullers are attested in the *gt*, agricultural estates or farms, shearers in the *bt*, pastoral estates. See M. LIVERANI, *Economia delle fattorie palatine ugaritiche*,

in *DdA 2*, n.s., 1979, pp. 57-72, esp. pp. 68-69; HELTZER 1982, pp. 49-79; S. RIBICHINI, P. XELLA, *La terminologia dei tessili nei testi di Ugarit (Collezione di studi fenici 20)*, Roma 1985, pp. 18-22. For a recent comparison of the Mesopotamian and Mycenaean textile industries, see also EVELY 1993-2000, pp. 562-5. On the usual concentration of final processing at the administrative centre, see VIDALE 1992, pp. 66-68.

<sup>11</sup> «Il ciclo della lana [infatti,] dà luogo ad una complessità che può dirsi 'di sequenza', nel senso che le varie fasi [...] comportano differenti rapporti di gestione» (LIVERANI, *Uruk*...cit. in note 10, p. 52). «Questo tipo di complessità è probabilmente nuovo rispetto alle unità domestiche, nelle quali l'intero processo – dalla pecora al vestito – poteva essere eseguito direttamente dalla stessa unità produttiva. [...] il trasferimento di questo ciclo nelle agenzie centrali comportò l'emergere di una gamma di rapporti completamente diversi tra loro, ma di volta in volta particolarmente adatti alla soluzione dei vari problemi tecnici e amministrativi» (*ibidem*, pp. 57-58). «La complessità intrinseca delle industrie tessili, e la capacità dei tessuti finiti di muoversi, come valore d'uso e di scambio, all'interno di ampi segmenti del corpo sociale, spiegano il ruolo pionieristico di queste industrie nei primi processi di centralizzazione economica e politica» (VIDALE 1992, p. 62).

to minor centres or villages. This is an important element of decentralisation. Many studies have tried to reconstruct a possible geography of Crete from administrative texts; an analysis of these seems to indicate that Knossos controlled mainly the central part of the island with some interests in western Crete and the Lassithi area in the east<sup>12</sup>. Combining epigraphical and archaeological data, it is possible to reconstruct a probable settlement hierarchy in LMIII Crete with Knossos at the apex and numerous secondary centres acting as the focus of each region (western Crete, Amari valley, Messara, Lassithi). Actual relationships between localities, however, are still elusive<sup>13</sup>. In this sense, local communities could have been quite dynamic, developing agricultural products, craftworks and other economic resources and moving them from the countryside and villages to the secondary centres and then to the palace. Textile work-groups are widespread throughout the area under Knossian control, with special emphasis in central and western Crete where *ta-ra-si-ja* production was particularly developed<sup>14</sup>.

As far as local communities are concerned, it is probable that they play a complex role in the textile industry – from plucking/shearing to textile production. What exactly happened to the wool after shearing? Despite the general assumption that the entire harvest was diverted to the palace, the texts do not clearly illustrate the process. It is far from clear whether all the plucked/sheared wool, that is to say ca 30-50 tons, was actually brought from the periphery to the centre. Since the work-groups responsible for producing textiles were, for the most part, spread throughout the territory, it would not have been economical to move the same wool back and forth through half of the island. It might, however, have been more convenient to gather only the information about plucking/shearing results at the centre, leaving most of the wool in the village communities ready to be used by local work-groups according to the palace production targets. Some wool would probably have been transferred from one place to another under central supervision in order to fulfil local needs and production targets. Nevertheless, a portion of the wool was indeed brought to the palace and then redistributed to palatial workshops for textile production (at Knossos *ko-u-re-ja* and *te-pe-ja* are attested) and for the finishing of the cloth, or used for some other need, as attested by the series KN Od (although the quantities are, in general, small).

The hypothesis that a mixed (centralised and decentralised) system of wool management existed can be successfully demonstrated with the Linear B evidence, keeping in mind that caution is essential when working with an incomplete archive. As has already been pointed out, and which can easily be confirmed by the tablets, is that a recurring group of place-names, presumably located in central Crete and occurring in the sheep records (KN Da-Dv) as well, is also connected to the textile series (KN Ap, L, Lc, Ld, Od). In these centres, at least a portion of the local wool could have been worked locally<sup>15</sup>. It is also possible to individuate probable pasture and plucking/shearing areas in those

<sup>12</sup>Various attempts to reconstruct the geography of Knossos texts in BENNET 1985 and 1990; J. McARTHUR, *Place-names in the Knossos Tablets. Identification and Location* (Minos Suppl. 9), Salamanca 1993; NOSCH 1997-2000; DRIESSEN 2001.

<sup>13</sup>BENNET 1990, p. 208, fig. 5 (hypothetic LMIII settlement hierarchy); DRIESSEN 2001, p. 111 («islands

of influence»).

<sup>14</sup>NOSCH 1997-2000.

<sup>15</sup>*Da*-\*22-*to*, *da-wo*, *e-ko-so*, *e-ra*, *pa-i-to* (Phaestos), *qa-mo*, *ri-jo-no*, *se-to-i-ja*, *tu-ni-ja*, *tu-ri-so* (Tylissos), \*56-*ko-we*, *do-ti-ja*. For this discussion, see: NOSCH 1997-2000, pp. 33-35, tab. 2; DRIESSEN 2001, tab. 5, p. 110, where KN As is also considered.

place-names appearing only in the sheep records: in such cases, a more complex and centralised organisation would have been needed, with the wool being collected and re-directed to work centres<sup>16</sup>. Apparently, some place-names are attested only in the shearing records (KN Dk, Dl), thus further complicating the picture<sup>17</sup>. On the other hand, very few place-names are related only to textile orders or work-groups: they would eventually represent centres of textile production, exploiting an external supply of wool<sup>18</sup>. The case of Knossos (*ko-no-so*) and Amnisos (*a-mi-ni-so*) is different since the two sites are mostly attested in the textile series but occur at least once in the sheep records (Dv, Dn). It is probable that the two were essentially production centres where the wool was collected but were also responsible for some aspects of the sheep-rearing<sup>19</sup>. Obviously the picture outlined above is tentative, our full comprehension being limited by the incomplete and fragmentary status of the available documentation.

Another question which is still – and will remain – open is the status of the female work-groups. Since they receive rations, they have often been considered «... menial dependents, virtually if not legally slaves»<sup>20</sup>. The same inference can be construed from the evidence from Pylos where such groups seem to be composed of prisoners or foreign women – some from the major centres of the Near East. According to the Knossos tablets, however, these groups are widespread in the territory and are named using local ethnic designations. It is also quite difficult to assess the actual caloric content of the dispensed rations<sup>21</sup>. Thus, it is possible to suggest a more fluid situation in which the women from minor centres who work for the palace eventually (but not necessarily) gather together in a single work-place, perhaps as a form of *corvée*, and receive integrative rations while con-

<sup>16</sup> *Da*-\*83-*ja*, *da-ra-ko*, *di-ro*, *ku-ta-to*, *ma-sa*, *pu-na-so*, *pu-so*, *qa-na-no-to*, *qa-sa-ro-we*, *ra-ja*, *ra-to*, *ru-ki-to*, *su-ki-ri-ta*, *u-ta-no*. Not all of these appear in the shearing records (KN Dk, Dl). See NOSCH 1997-2000, p. 35. On the topography of the sheep-rearing, see GRECO, *I pastori*...cit. in note 5.

<sup>17</sup> *Da-ta-re-mo*, *ka-ru-no*, *ma-ri*, *qa-mwa-so* *si-ja-du-we* (if my reading is correct).

<sup>18</sup> \**I-ja-pu*<sub>2</sub>, *si-ra-so*, *wi-na-to*, *si-ra-ro* and *ku-do-ni-ja* (Chania).

<sup>19</sup> The question of wool management has not often been raised, and it is assumed generally that the palace was collecting all the wool issued from plucking/shearing. It has been noted, however, that the total amount of wool recorded in the KN Dk series would have been enough to satisfy the production target recorded in the KN Lc series (NOSCH 2000, figs. I and II, pp. 48-49). Here I attempt a preliminary proposal, but more cross-comparisons between different series are needed. I wish to give warm thanks to Maurizio Del Frio and Santo Privitera for discussing my doubts on the mechanisms of wool collecting: my suggestions owe very much to their contributions. Another question is whether the wool was recorded

before or after a first cleaning/sorting or washing. This is quite important for quantification and metrological calculations. See the discussion in P. DE FIDIO, *On the Routes of the Aegean Bronze Age Wool and Weights*, in J. BENNET -J. DRIESSEN eds., *A-na-qa-ta. Studies Presented to J.T. Killen (Minos 33-34)*, 1998-99, pp. 39-63 (with references); see also ANDERSSON-NOSCH 2003. A review of the TH Of wool series, dealing with this and other questions, is forthcoming from Maurizio Del Frio and Françoise Rougemont (M. DEL FRIO, F. ROUGEMONT, *Observations sur la série Of de Thèbes*, in *5<sup>th</sup> International Congress of Boeotian Studies*, Thebes 16-19 September 2005, forthcoming). In their work (see especially the «Schéma du circuit de la production textile palatiale»), they underline that the «wool storerooms» (where the wool was perhaps sorted, washed and combed) were probably decentralised. I thank Maurizio Del Frio for this information.

<sup>20</sup> J. CHADWICK, *The Women of Pylos*, in *Texts, Tablets and Scribes*, p. 92.

<sup>21</sup> See: R. PALMER, *Subsistence Rations at Pylos and Knossos*, in *Minos* 24, 1989, pp. 89-124; EAD., *Wine in the Mycenaean Place Economy (Aegaeum 10)*, Liège 1994, pp. 130-132.

tinuing to lead their own lives in their own villages<sup>22</sup>. This alternative can not be ruled out and fits very well with the *ta-ra-si-ja* system. It can even be suggested that shepherds (men) and textile workers (women), recorded separately by the palace administration, were actually an organic part of the same village communities<sup>23</sup>. More probably for textile workers, we should envisage many situations and levels of social status, with various degrees of dependence from the palace and work specialisation according to the historical background and local characteristics of each local centre<sup>24</sup>. A suggestion can be drawn from contemporary rural farms in Ugarit, where workers of different status were operating - both fixed dependents of the structure and personnel employed on a *corvée* basis<sup>25</sup>. This flexible solution would have met the variations of the production needs and conditions.

<sup>22</sup>For the probable correspondence of the *ta-ra-si-ja* with systems of *corvée* see Y. DUHOUX, *Aspects du vocabulaire économique mycénien (cadastré-artisanat-fiscalité)*, Amsterdam 1976, pp. 112-115, and I. TZACHILI, Counting and Recording Textiles in the Mycenaean Archives of Knossos, in A. MICHAÏLIDOU ed., *Manufacture and Measurement. Counting, Measuring and Recording in Early Aegean Societies (MELETHMATA 33)*, Athens 2001, p. 189. Some forms of cottage work can not be excluded. The idea of a household located production is taking more and more weight among specialists. It has been noted that, «Thus, to be able to make one *te-pa* a year for the Mycenaean palace, one must assume that the whole household was mobilized, children as well, and that this *corvée* demanded a considerable amount of time.» (ANDERSSON-NOSCH 2003, p. 201). On the role played by intermediate workshops/storerooms in wool management, see DEL FREQ, ROUGEMONT, *Observations...* cit. in note 19.

<sup>23</sup>L. NIXON, Women, Children and Weaving, in PH.P. BETANCOURT, V. KARAGEORGHIS, R. LAFFINEUR, W.D. NIEMEIER eds., *MELETHMATA. Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters His 65<sup>th</sup> Year (Aegaeum 20)*, Liège 1999, II, p. 566: «Could some workgroups have consisted of a specific number of female textile producers working together officially as the local, palace-regulated team, living with individual shepherds, and arranging their schedules and childcare to suit themselves as well as the palace targets? The *ta-ra-si-ja* system is just what we might expect of an integrated shepherd-weaver system, with the raw materials and finished products carefully measured at every stage, so that shepherds and weavers could not engage in household 'embezzlement' of wool or cloth for non-palatial purposes. [...] Similarly, could the issuing rations reflect the distorting influence of the palaces on textile produc-

tion? That is, did the palaces' demand for textiles require both adult female cloth-workers and their daughters to neglect their normal and necessary subsistence work...?» On the probable involvement of children in the textile industry, see M.L. NOSCH, *Kinderarbeit in der mykenisch Palastzeit*, in F. BLAKOLMER, H.D. SZAMETHY eds., *Akten des 8. Österreichischen Archäologentages am Institut für klassische Archäologie der Universität Wien* (vom 23. bis 25. April 1999), Wien 2001, pp. 37-43.

<sup>24</sup>A difference between a household production of *te-pa* and a more specialised production of *pa-we-a* has been recently suggested (ANDERSSON-NOSCH 2003, p. 202). On the basis of the KN Lc(1) targets, it is possible to suggest that types of textile production are related to types of workers, and that there is probably a relation between the number of women and the number of pieces of cloth to produce (M.L. NOSCH, Two observations on the Knossos Lc(1) targets, in T.G. PALAIMA, C. SHELMEKDINE eds., *11<sup>th</sup> International Mycenaological Colloquium* in Austin, Texas, 8-12 May 2000, *Hesperia Supplement*, in press). I warmly thank Marie-Louise Nosch for giving me a copy of this work, where a great deal of attention is paid to village workers. We should look «... at the palace and the village communities as two fundamental poles of the Mycenaean political and economic world. To view them, that is to say, in terms of an intense and dynamic relationship, and not as static opposites, as a reality in transition in which the palace acted as a stimulus and a force accelerating the processes of transformation and the creation of hierarchies that had been taking place already for some time within the local communities.» (DE FIDIO 2001, p. 23).

<sup>25</sup>Rural farms (*gt*) and pastoral estates (*bt*) are widespread in the territory of the kingdom of Ugarit and are often connected to villages (HELTZER 1982, pp. 52-53). Most of the workforce is composed of

Some other considerations regarding the work organisation and specialisation can be suggested by the scarce attestations of job designations such as combers, spinners and weavers, compared to the recurrence of simple ethnics or of terms such as *te-pe-ja* and *ko-u-re-ja* derived from the type of the produced textiles. Activities such as combing, spinning and weaving were only exceptionally carried out by dedicated specialists; in most cases, they were probably carried out by the same workers responsible for making particular types of textiles (e.g. *te-pa*)<sup>26</sup>. Were the *te-pe-ja*, the *pe-ki-ti-ra*<sub>2</sub>, the *ko-u-re-ja* and the others combing, spinning and weaving the wool to make their own *te-pa*, *pe-ko-to te-pa*, *pa-we-a ko-u-ra*? It seems probable. If this is the case, the work organisation in these local groups would have been quite traditional, according to domestic habits, with a single worker (potentially) actuating the whole production process from the fibre to the cloth. Such a picture would fit very well with the decentralisation of the industry and with a range in the status of the workforce, the palace acting essentially to coordinate local workforces and experiences in order to subordinate their work to the general plan of production and to absorb and accumulate the finished products<sup>27</sup>.

Time does not allow us to enumerate the many other specific characteristics of the Knossos administration that illustrate the complexity of the structure. In the general organisation, and especially in the textile industry, many inner polarities and articulations act at the same time: «palace» sector *vs* «non-palace» sector, «collectors» *vs* «non-collectors», «*ta-ra-si-ja*» *vs* «non-*ta-ra-si-ja*», «centre»/ «intermediaries»/ «local communities». Such a complexity, especially in comparison with the more centralised and tightly organised textile industry deducible from the Pylos archive, is probably an historical product, related to the socio-historical transformations and stratifications that occurred in Crete between the Neopalatial and Mycenaean periods. It is worth noting that the toponyms related to the *ta-ra-si-ja* system appear already in the earlier group of Linear B texts from Knossos, those from the *Room of the Chariot Tablets* and the *Room of the Column Bases* (LMIII A1), thus probably reflecting a long-lasting institution<sup>28</sup>. Indeed, many scholars have pointed out the pos-

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royal dependants (*bu<sup>y</sup> mlk*), but some groups or single workers are temporarily employed on *ilku* (*corvée*) basis, e.g. the shearers (LIVERANI, *Economia...* cit. in note 10, p. 69; HELTZER 1982, pp. 49-79). Moreover, «...it is also possible that spinning was done as an *ilku*-service by the villagers of the kingdom.» (HELTZER 1982, pp. 95-96).

<sup>26</sup>The problem is discussed in ANDERSSON-NOSCH 2003, p. 200, where a bias in the administrative records is suggested. On the other hand, on the basis of the KN Lc(1) targets, it is possible to suppose that the groups of workers could be assigned to various tasks in the textile industry (NOSCH, *Two observations...* cit. in note 24).

<sup>27</sup>To some extent, the palace textile industry can be seen as a stimulating and draining structure superimposed on local production realities. See also DRIESSEN 2001, p. 112: «I do not think that the Knossos tablets allow us to conclude that the Knossos kingdom ever attempted to become a real territorial and

bureaucratic state. The subsistence economy remained in the hands of local producers, but the Knossian élite directed a massive shift to sheep herding after the LMIB destructions because it was easier to control. Sheep herding and textile production were the main issues and the goals of economic exploitation for which military force may have been used randomly. We are further and further away than ever from the tight centralised bureaucratic control that is evidenced at Pylos.»

<sup>28</sup>NOSCH 1997-2000, p. 44. The *ta-ra-si-ja* could have been «...an earlier and decentralized system which was later incorporated into the centralized palace system.» (NOSCH 2000, p. 54). However, some caution is needed since the *ta-ra-si-ja* is used for other productive sectors and attested in mainland archives. The most famous example is the *ta-ra-si-ja* management of (decentralised) metalwork production at Pylos. I thank Maurizio Del Freo for the observation. The two groups of tablets from the *Room of the*

sibility of viewing the particular decentralised structure of Knossos textile production as the adaptation of a pre-existing Neopalatial industry by Mycenaean administrative forms. As John Killen suggested in 1984, «One possibility is ... that the greater decentralization at Knossos reflects the fact that the incoming mainland Greeks found centrally-controlled textile industries already established at a number of the Minoan centres, and decided to keep these in being, merely subordinating them to overall central direction. [...] Given the presence of written records at several of the Minoan centres, it would come as no surprise to discover that these centres did organise textile production on the same general lines as the palace at Knossos in later times. While, however, we do have references to cloth on the Linear A records from one Minoan site (Haghia Triada), we have no evidence as to how this was produced, and therefore no evidence which would help us confirm this suggestion»<sup>29</sup>.

### 3. Neopalatial textile industry: preliminary assessment

Fortunately, in the years following Killen's work of 1984 many studies brought new light to the subject, and it is now possible to try to answer the question posed by him. The works of Jill Carington Smith, Elizabeth Barber, Iris Tzachili, Brendan Burke, Doniert Evely and Pietro Militello<sup>30</sup>, illustrate many aspects of Minoan textile production on the basis of the archaeological evidence. What is still lacking, however, is a global picture of the production units, their typology and their geographical distribution. Since the textile industry of Crete is only poorly documented in Linear A texts<sup>31</sup>, the effort has to be made on almost exclusively archaeological ground. The aim of the present work is to present some insights on the question, starting from a re-examination of the evidence for textile production areas in Neopalatial Crete. As stated above, only an outline and the main results of the analysis are presented here<sup>32</sup>.

Identifying textile work areas is not very easy, and many studies have been undertaken on this subject without finding a simple answer<sup>33</sup>. Generally speaking, while the exist-

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*Chariot Tablets* and the *Room of the Column Bases* are contemporary and dated to LMIIIA1 according to FIRTH, A review... cit. in note 3, tab. III.9, pp. 268-269. According to a previous work of Jan Driessen, the two groups are dated respectively to LMII-III A1 and LMIIIA1 (J. DRIESSEN, *The Room of the Chariot Tablets at Knossos*, *Minos* Suppl. 13, 2000).

<sup>29</sup>KILLEN 1984, pp. 60-61. This would be «...a possible explanation of the growth of the system by incorporating pre-existing organizational units.» (BENNET 1985, p. 249; see also BENNET 1990, p. 209). On the Minoan textile industry see BURKE 1997 and P. MILITELLO, *Textile Industry and the Minoan Palaces*, in *Ancient Textiles*, forthcoming.

<sup>30</sup>J. CARINGTON SMITH, *Spinning, Weaving, and Textile Manufacture in Prehistoric Greece* (Ph.D. Thesis, University of Tasmania, Hobart), pp. 59-69; E.J.W. BARBER, *Prehistoric Textiles. The Development of Cloth in the Neolithic and Bronze Ages with Special Reference to the*

*Aegean*, Princeton, New Jersey 1991, pp. 239-245; TZACHILIAH, *Υφοντιάζη*... cit. in note 5, *passim*; BURKE 1997; EVELY 1993-2000, pp. 494-496; MILITELLO, *Textile*... cit. in note 29.

<sup>31</sup>The evidence is limited to some tablets from Haghia Triada and Akrotiri. See BURKE 1997, pp. 419-420; SCHOEP 2002, pp. 120-122, 131-133, 190-191; HALLAGER 2002 (Haghia Triada); C. BOULOTIS, Les nouveaux documents en linéaire A d'Akrotiri (Théra): remarques préliminaires, in *BCH* 122, 1998, pp. 407-411; A. MICHALIDOU, Indications of Literacy in Bronze Age Thera, in *Minos* 35-36, 2000-2001, pp. 7-30 (Akrotiri).

<sup>32</sup>See n. 2.

<sup>33</sup>See especially D. EVELY, Minoan Craftsmen: Problems of Recognition and Definition, in *Problems*, pp. 397-416; I. TOURNAVITOU, Towards an Identification of a Workshop Space, *ibidem*, pp. 447-468; K. ΚΟΡΑΚΑ, L. ΠΛΑΤΟΝ, Ληνοί Μινωτικοί. Installations minoennes de traitement des produits liquides, in *BCH* 117, 1993,

ing architecture provides no good or unequivocal criteria for recognizing a working area, the presence of many other elements can be considered to be a more reliable indicators: built-in facilities, raw materials, tools, debris, scraps, incomplete products, and finished products (if not in a store or hoard). The tool kit ought to include any associated pottery, especially coarse-ware (cooking pots, basins, storage jars, pithoi). But «...none of the individual categories of objects will, of themselves, act as an infallible indicator. Combination improves the chances, but even this may leave one well short of appreciating what exactly happened where»<sup>34</sup>.

Having presented the subject elsewhere<sup>35</sup>, I will here only briefly outline the various indicators for textile production and fibre processing, which should be used to form an interpretative grid. Activities such as washing, dyeing and fulling are included in the textile operations to be considered, along with the more obvious spinning and weaving.

First of all, for each context, the presence of the following indicators of functional specialisation has to be verified<sup>36</sup>:

- 1) dye-stuffs
- 2) mordants or other chemical substances
- 3) «serial» installations for liquid processing (rows of vats)
- 4) other specific installations for liquid processing (slab and drain, stone-built vat and drain)
- 5) domestic equipment for large-scale liquid processing (vat-and-jar system)
- 6) domestic equipment for medium- and small-scale liquid processing (vats, basins, drains, paved or plastered areas)
- 7) details of the basins: real vats with bottom spout, spouted basins, simple basins, stone basins (*gournes*)
- 8) typical domestic assemblage: cooking and storage vessels, stone tools, hearths, etc.
- 9) proper textile tools (spindles, spinning bowls, spindle-whorls, warp-stands, loom-weights, «spools» and needles)
- 10) other equipment.

We should also verify some quantitative parameters, such as:

- a) the complexity and surface area of the buildings under consideration
- b) the number of the productive areas

pp. 35-101; EVELY 1993-2000. For textile workshops see BARBER, *Prehistoric...* cit. in note 30, pp. 239-240 and M. MONAGHAN, Dyeing Establishments in Classical and Hellenistic Greece, in D. CARDON, M. FEUGÈRE eds., *Archéologie des textiles des origines au V<sup>e</sup> siècle (Actes du colloque de Lattes, octobre 1999)* (*Monographies instrumentum* 14), Montagnac 2000, pp. 167-172. For my recent research on the subject, see *infra*, note 35.

<sup>34</sup> EVELY 1993-2000, pp. 550-551.

<sup>35</sup> M.E. ALBERTI, Washing and Dyeing Installations of the Ancient Mediterranean: towards a Definition from Roman Times back to Minoan Crete, in *Ancient Textiles*, forthcoming; EAD., Washing and Liquid Processing in Minoan Households: Facilities, Tools and Some Reflections on the Scale of Production, in

K. GLOWACKI, N. VOGELKOFF-BROGAN eds., *STEGA. The Archaeology of Houses and Households in ancient Crete from the Neolithic Period through the Roman Era (Proceedings of the International Colloquium held in Ierapetra, 26-28 May 2005)*, forthcoming; EAD., Textile Industry Indicators in Minoan Work Areas: Problems of Typology and Interpretation, in C. ALFARO GINER ed., *II International Symposium on Textiles and Dyes in the Ancient Mediterranean World* (24-26 November 2005, Athens), forthcoming. See also n. 2.

<sup>36</sup> «...uno strumento specializzato è uno strumento prodotto e utilizzato con un'unica funzione tecnologica...» (VIDALE 1992, p. 30); «Specialization [should be considered] a continuum of technological practice and economic intensification.» (P.M. DAY, D.E. WILSON, E. KIRIATZI, Reassessing Specialization

- c) the amount of the specific or large-scale equipment specialised for liquid processing
- d) the amount of the domestic small- or medium-scale equipment for liquid processing
- e) the number of the textile tools.

I tried to apply this interpretative grid to the Neopalatial evidence, looking for textile production areas. At the present, the Neopalatial Minoan sites I have examined are: Kastelli Chania, House I (LMI); Archanes-Phourni Building 4 (LMIA); Vathypetro (LMIB); Malia, Maison Zβ and Maison Zγ (MMIII-LMI); Mochlos «Artisans' Quarter» and Chalinomouri (LMIB); Gournia «palace» (LMI); Petras House II (LMIB); Palaikastro Building 6 EN87 (MMIIIB-LMIA); Kato Zakros town and palace (MMIII-LMIB); Epano Zakros (LMIA-B); Tourtoulī-Prophitis Ilias (LMIA); Haghia Triada, Complesso della Mazza di Breccia (LMIB); Phaestos, Chalara LMIB House and Kommos, various houses of the town (MMIB-LMIIIA2/B).

Some other contexts were only partially considered – mainly for their concentration of loom-weights – regardless of their chronology: Knossos Palace, Loom-weights Basement (MMII); Malia, Quartier Mu (MMII); Haghia Triada, «Villa Reale» (LMI) and Casa delle Sfere Fittili (LMI, probably forming a unique complex with the Casa del Lebete); Knossos, houses on the Acropolis (LMIA) and from the Stratigraphical Museum Excavations (LMIB); Pseira, Building BS/BV (LMIB); Palaikastro, Block E (LMI-II); Karphi (LMIIC late). Many others sites will probably be included as the research progresses<sup>37</sup>.

According to various combinations of indicators, the sites can be separated into six different groups (I-VI) (see *Table 1*).

Before discussing these six groups in greater detail, however, we should mention and bear in mind that most of the interesting contexts are multi-purpose work areas, dedicated to a variety of domestic activities and/or the processing of food-stuffs. A large part of the archaeological assemblage is, consequently, multi-purpose, potentially useful in many productive cycles: querns, pounder-grinders, mortars, pestles, cooking pots and simple basins, not to mention installations such as work-benches or paved floors. There are, in addition, more specialised pieces of equipment, items like spindle-whorls and loom-weights for textile production, or shallow, spouted press-beds for olive pressing. The coexistence of indicators of various activities in the same area occurs on a regular basis, thus suggesting a genuine mixed-usage of spaces in antiquity<sup>38</sup>. In this context, the documented textile activities are only one of the productive processes carried out in the work areas under examination.

in Prepalatial Cretan Ceramic Production, in *Techne*, p. 275).

<sup>37</sup>I include here only some of the published vat-and-jar systems: Archanes-Phourni, Building 4; Choiromandres; Kato Zakros, House A and House E (Hogarth's excavations), House A, House B, House Δ and House Z (Platon's excavations); Palaikastro, EN.87, B.37 and perhaps N.14; Tourtoulī-Prophitis Ilias, E sector and Vathypetro, Room 40. For a more complete list, see ΚΟΡΑΚΑ- ΠΛΑΤΟΝ, *Ληνοί Μινωικοί...* cit. in note 33; PALMER, *Wine...* cit. in note 21, pp. 18-19.

<sup>38</sup>In most ancient and traditional communities the

use of space is not markedly specialised, and many rooms are actually multi-purpose. For Minoan Crete, see MC ENROE 1982, p. 7: «Since various industrial activities were undoubtedly conducted in many rooms, the designation is largely arbitrary. Neither this room nor any other should be understood as having a single function.»; see also P. MILITELLO, *Organizzazione dello spazio e vita quotidiana nelle case TMI di Haghia Triada*, in *Πεπραγμένα Η' Διεθνούς Κρητολογικού Συνεδρίου* (Ηράκλειο, 9/14 Σεπτεμβρίου 1996), A2, Ηράκλειο 2000, p. 314. Out of palatial or elite buildings, the division between work-

Indicators		Groups of sites					
		I	II	III	IV	V	VI
1	Dyeing	*					
2	Washing, mordents		*				
3	«Serial» installations			*			
4	Particular installations		*		*	*	
5	Large-scale liquid processing equipment	*	*	*	*	*	
6	Medium- and small-scale liquid processing equipment	*	*	*	**	*	
7	Number basing/ <i>gournes</i>	various (1-10)	various (1-10)	various (1-10)	3+	<3	
8	Domestic tools	**	**	*	**	*	*
9	Textile tools	**	**	*	**	*	*
10	Other	*	*	**	*	*	*
11	Surface (m <sup>2</sup> )	various	<200	300+	200-400	100-300	<200

TAB. 1 – GROUPS OF NEOPALATIAL SITES WITH CONTEXTS AND ARCHAEOLOGICAL INDICATORS.

To return to the six groups plotted in *Table 1*, they can be outlined as follows:

Group I – The first group consists of Building 4 from Archanes Phourni and Building A and Building B of the «Artisans' Quarter» at Mochlos<sup>39</sup>. These contexts exhibit traces of colouring substances and contain equipment for large- and medium-scale liquid processing, often in large numbers, and an abundance of domestic and textile tools. The number of loom-weights suggests the use of at least two looms at the same time. Generally, the buildings are quite large, often more than 200 m<sup>2</sup>. The combination of dye-stuffs, liquid processing facilities and textile tools points to dyeing and weaving activities, though not exclusively. Mochlos Building B stands out for the number of basins, *gournes* and domestic and productive equipment found within.

Group II – In the second group are included those sites with traces of chemical detergents or probable residues of wool washing (animal fat). However, none of these sites belong to the Neopalatial phase and therefore will not be discussed here<sup>40</sup>.

Group III – In the third group are included work areas with unusual installations consisting of a row of shallow vats, either plastered or of stone. These are related to outlet systems but otherwise bear no trace of dye-stuffs or other substances. Hogarth's House J from Kato Zakros (MMIII-LMI), southern annexes XVII – XX of the W wing of the Kato Zakros

ing and living spaces is not always clear: see J.S. SOLES, *Mochlos I A. Period III. Neopalatial Settlement on the Coast: The Artisan's Quarter and the Farmhouse at Chalinomouri. The Sites (Prehistory Monographs 7)*, Philadelphia 2003, p. 92, about Mochlos Building A and Building B. Moreover, «...one cannot exclude a double or multiple function for any room with an hearth. Some industry or craft on a small scale can also be practised in a kitchen, and frequently is»: H. GEORGIU, *Minoan Coarse Ware and Minoan Technology*, in O. KRZYSZKOWSKA, L. NIXON eds., *Minoan Society (Proceedings of the Cambridge Colloquium 1981)*, Bristol 1983, p. 80.

<sup>39</sup>The same characteristics are shared in other chronological phases by rooms 72-4 and 81 of Myrtos Phournou Koriphi (EMII) and the Unexplored Mansion at Knossos (LMII).

<sup>40</sup>In Group II are included Myrtos Phournou Koriphi (rooms 8-10 and 16-17, with probable *creta fullonica*; rooms 58-60 with traces of animal fat in a basin) and the House of the Snake Tube from Kommos (two phases, LMII and LMIII, with phosphates near a slab and drain device). In none of these cases can the identification of the substances be related indisputably to textile fibre processing.

palace (LMIB), and the Vat Room of the Central Palace Sanctuary at Knossos (LMI) all belong to this group. Lacking such contextual data, the ultimate function of these installations is far from certain, but they probably have an industrial purpose<sup>41</sup>. It can be suggested that such shallow vats were meant to hold jars or amphorae containing liquids, such as wine or oil, or even dye-baths or detergent solutions.

Group IV – A large number of sites and contexts fall into the fourth group. These all contain some a specific installation, namely a slab with drain, and/or large- and medium-scale equipment for liquid processing (especially a vat-and-jar system) and many textile tools (loom-weights for two looms). Generally, at least three basins, vats or *gournes* are attested in each context. There are no traces of dye-stuffs nor other chemical substances. The sites and contexts of Group IV are mainly large urban houses or important «villas», with a surface area of between 200 m<sup>2</sup> and 400 m<sup>2</sup>, and must have been intended as large multi-purpose productive units, dedicated, among other activities, to the processing of textile fibres and textile production. In the Vathypetro and Epano Zakros «villas» (both dated to LMIB), the vat-and-jar system has been strengthened and connected to outlet facilities<sup>42</sup>. At Kommos, the Oblique House (LMIB - LMIIIA2) and the House with the Snake Tube (LMI-II and LMIIIA2-B) both have a similar liquid-processing device consisting of a stone slab connected to an outlet drain<sup>43</sup>. Petras House II (LMIB) contains a very large number of basins and *gournes*, but more precise data are, for the time being, provisional. The other sites which have been included as of the present day are: House Beta (LMIA) and House Epsilon from Kato Zakros (LMIB) and the «villa» at Tourtoulis Prophitis Ilias (LMIA), but more sites will probably be added as research and excavations progress<sup>44</sup>.

Group V – In the fifth group have been included those sites with less specialised but abundant equipment for processing liquid and textile fibres. No dye-stuffs, detergents, or «serial» or particular installations are attested; basins or *gournes* are few, generally less than three, and the number of loom-weights would not serve more than one loom. In general, these are typical domestic contexts, representing the basic production unit (οἶκος; household). Surface areas range from 100 m<sup>2</sup> to 200 m<sup>2</sup>. Textile activities, among many others,

<sup>41</sup>N. PLATON, *Zakros, the Discovery of a Lost Palace of Ancient Crete*, New York 1971, p. 103; L. PLATON, *Ateliers palatiaux minoens: une nouvelle image*, in *BCH* 117, 1993, p. 117. «Whilst thus unconvinced, the author cannot offer any alternative explanation – unless the unit is some sort of a public toilet and washing facility?» (EVELY 1993-2000, p. 496). As far as the Knossos Vat Room is concerned, «...since only the base of a pithos was found in one of the vats, while ten pithoi were found in the adjacent EPC (presumably all contemporary), it is possible that the vats were not used as bases for pithoi but for something else. This could be craft activity, such as cloth dyeing, wine or oil pressing, or processing oils, perhaps perfumed oils. The intense burning, in both the vats and the cist, might have been caused by burning oils.»: M. PANAGIOTAKI, *The Central Palace Sanctuary at Knossos*, BSA Suppl.

31, London 1999, pp. 230-231, n. 211 and 213).

<sup>42</sup>See ALBERTI, *Washing and Liquid processing...* cit. in note 35.

<sup>43</sup>Same facility in House Δ, in a later period (LMII-III A1). See also House ? in Kato Zakros (LMIIIA2-B).

<sup>44</sup>Most of them belong to type 1 and especially type 2 in the classification proposed in Mc ENROE 1982. In Group IV are included: the Vathypetro «villa» (LMIB); the LMIB House at Chalara-Phaestos; the Oblique House (LMIB-III A2) and House X (LMII-III A1) at Kommos; many houses in Kato Zakros (MMIII-LMI); the Epano Zakros «villa» (LMIA-B); House II at Petras (LMIB) and the Tourtoulis-Prophitis Ilias «villa» (LMIA). House I from Kastelli Chanià (LMI) and some of the houses from Haghia Triada (LMI) could probably be added to Group IV as well.

were probably carried out on a medium- or small-scale at these sites. Many medium- and small-sized urban houses at Malia, Haghia Triada, Palaikastro and Kato Zakros belong to this group, along with some farmsteads, such as Chalinomouri at Mochlos (LMIB), and isolated groups of building, such as the *phourio* of Choiromandres (LMI), but the list can doubtless be enlarged with emerging data from ongoing research.

Group VI – Most strictly domestic contexts have been included in the sixth group. These lack liquid-processing equipment entirely, but do have/contain textile tools and indicators of some other productive activities on a small-scale. They are quite common in the archaeological record.

A separate case must be made of certain other contexts where large/significant concentrations of loom-weights are documented but where other indicators of textile processing seem to be lacking. Despite the regular occurrence of loom-weights in Minoan sites, such large concentrations are not typical, appearing in only a small number of cases from MM to LMIIIB: more than four hundred loom-weights come from the Loom-Weight Basement of the Knossos Palace (MMIIB); more than eighty (perhaps amounting to nearly one hundred) from the «Villa Reale» at Haghia Triada (LMI); fifty-two from the Knossos Acropolis houses (Room 1 and neighbouring areas, LMIA); seventy-nine from the North House of the Stratigraphical Museum Excavations at Knossos (LMIB); forty-nine from Building B of the «Artisans' Quarter» at Mochlos (LMIB); forty-six from Building 4 at Archanes Phourni (LMI); forty-two from House I at Kastelli Chania (LMI); thirty-nine from Building BS/BV at Pseira (LMIB); «dozens» from Vathypetro (LMIB); more than seventy from Block E at Palaikastro (E 36-43, LMI-II) and more than one hundred from the Knossos Unexplored Mansion (LMII)<sup>45</sup>. In excavation reports, the exact number is in most cases lacking, and it is simply said that «many» loom-weights were found. It is also important to point out that the great majority of these concentrations are composed of spherical loom-weights. It is not very easy to interpret such evidence; in most cases, since the reports are preliminary or contain few details, it is not possible to establish whether traces of other textile processing operations can be attested. Based on the present evidence, it seems that most of these sites were simply involved in weaving activities, working fibres that were treated and spun elsewhere, thus pointing to some form of specialisation and large-scale organisation of production.

#### 4. Neopalatial textile industry and the territory: issues of decentralisation

As far as textile activities are concerned, the more interesting groups are I, II, IV and V. In these contexts, fibre-processing and textile production were carried out on a large- or medium-scale amidst other domestic or food production activities. This is not yet a definitive picture since many others sites still need to be analysed; nonetheless, it is clear that the present evidence covers a large part of the island, being widely distributed over the territory, from western to eastern Crete and through the central part of the island, from north

<sup>45</sup> See MILITELLO, *Organizzazione...* cit. in note 38. It is commonly considered that each loom employs ca 40 loom-weights. In Block E at Palaikastro, two large

hoards were found, one of spherical weights, the other of cubic weights (LMI-II).

to south. It is also clear that the sites/contexts have a wide range of typologies: houses in palatial centres (Knossos, Kato Zakros, Malia and Petras), in towns (Chania, Palaikastro, Kommos, Haghia Triada) or in large settlements (Mochlos); «villas» (Vathypetro, Epáno Zakros, Tourtoulí); isolated stations (Choiromandres); isolated farmsteads (Chalinomouri) and even a necropolis (Archanes Phourni).

This plurality of attestations fits very well with the socio-economic developments of the LMI period (especially LMIB), when apparently general productive and storing reorganisations take place on a local basis, involving changes in function and improvement of pre-existing buildings, the addition of new facilities to previous productive complexes or the creation of new structures<sup>46</sup>. The settlement pattern in the territory is quite complex, with the expansion of outlying settlements and «villas» in each regional area<sup>47</sup>. All these phenomena, at least from an economic point of view, seem «...to suggest a move to decentralisation away from the Palaces with a centralisation within secondary settlements,» if it is not a «...fragmentation with local elite taking the initiative»<sup>48</sup>.

The multiplication and increase of production units in LMIB result in the creation of large complexes that are apparently involved in many productive cycles at a time on a very large, almost industrial, scale. The Vathypetro «villa» (Group IV), with a vat-and-jar system close to a carefully realised outlet device, a large number of loom-weights, various hearths, drains, querns and mortars spread throughout the building, as well as another vat-and-jar system in the external court, is one of the best cases<sup>49</sup>.

<sup>46</sup>General picture in *Troubled Island*, pp. 50-54.

<sup>47</sup>The Neopalatial settlement pattern(s) has been widely studied. Although the actual political links and economic dynamics are still unclear and disputed, in each regional area various centres of different importance and complexity can be individuated: a palatial centre, many towns (some with a «central» building), various settlements of different sizes (from villages to hamlets, some grouped around a «villa»), farmsteads and specialised sites (ward-posts, harbours, sanctuaries). See J. CHERRY, The Emergence of State in the Prehistoric Aegean, in *PCPS* 210, n.s. 30, 1984, pp. 18-48; BENNET 1990; SCHOEP 1995 and 1996; M. TSIPOPOULOU, A. PAPAPOSTOPOULOU, 'Villas' and Villages in the Hinterland of Petras, Siteia, in R. HÄGG ed., *The Function of the 'Minoan Villa'* (*Proceedings of the Eighth International Symposium at the Swedish Institute at Athens*, 6-8 June 1992) (*SkrAth* 4°, 46), Stockholm 1997, pp. 203-214; *Troubled Island*; K. BRANIGAN, Aspects of Minoan Urbanism, in *Urbanism*, pp. 38-50; J. DRIESSEN, History and Hierarchy. Preliminary Observations on the Settlement Pattern in Minoan Crete, *ibidem*, pp. 51-71 («divergent trajectories and regional dynamics»); T. WHITELAW, From Sites to Communities: Defining the Human Dimensions of Minoan Urbanism, *ibidem*, pp. 15-37; P. WARREN, Political Structure in Neopalatial Crete, in *Monuments of Minos*, pp. 201-205 (with a very articulated pic-

ture); ID., Terra cognita? The Territory and Boundaries of the Early Neopalatial Knossian State, in G. CADOGAN, E. HATZAKI, A. VASILAKIS eds., *Knossos: Palace, City, State (Proceedings of the Conference in Herakleion organised by the British School at Athens and the 23<sup>rd</sup> Ephoreia of Prehistoric and Classical Antiquities of Herakleion, in November 2000, for the Centenary of Sir Arthur Evans's Excavations at Knossos)* (*BSA Studies* 12), Nottingham 2004, pp. 159-168.

<sup>48</sup>*Troubled Island*, p. 54. More cautious is SCHOEP 1999, p. 221. For factional competition in Neopalatial Crete and the implication for productive activities, see Y. HAMILAKIS, Wine, Oil and the Dialectics of Power in Bronze Age Crete: a Review of the Evidence, in *OJA* 15/1, 1996, pp. 1-32; ID., Too Many Chiefs? Factional Competition in Neopalatial Crete, in *Monuments of Minos*, pp. 179-199 (especially p. 195); SCHOEP 1996, p. 83; SCHOEP 2002, pp. 182-183. *Contra*: WARREN, Terra cognita?... cit. in note 47.

<sup>49</sup>In LMIB, «Depending on the scale and intensity of production, several types of artisanal production may be distinguished ranging from the simple household to large-scale, almost factory production [...] The Knossos Linear B tablets reflect the activities of such factories especially with regards to textile and chariot production. [...] Textile production may represent another area in which the step was being taken towards larger scale production: although still mainly domestic

The socioeconomic implications of the phenomenon are important, but, as far as the textile industry is concerned, we should emphasise that notwithstanding the production increase, single-purpose installations for textile production are apparently unattested. At the moment, the identification of areas for centre-organised, collective and aggregated work is lacking. The aforementioned Neopalatial contexts that can perhaps be considered specialised in textile production, with major concentrations of loom-weights, are few, without sure traces of other textile activities, and with a number of loom-weights hardly sufficient for two looms. Quite interestingly, the loom-weights are more numerous and more suitable for a real large-scale production in contexts of Protopalatial (Loom-weights Basement of the Knossos Palace) or Postpalatial period (Knossos Unexplored Mansion), perhaps suggesting a different production strategy. The only promising Neopalatial context is the «Villa Reale» at Haghia Triada, where different conspicuous clusters of loom-weights have been found along with administrative documents dealing with wool and textiles. The «Villa» could have been the centre of the local textile industry, dealing with the rough material produced in the area and producing directly, at least, for its own needs<sup>50</sup>.

This is, however, the sole exception, and the general Neopalatial picture is quite decentralised, the largest work units being located in contexts of Group IV type, in multi-functional structures, with no more than two looms working at a time. Therefore, it seems that textile production, even if on a larger scale, remained attached to the traditional package of activities of domestic origin, such as grain processing or wine making, as part of a whole. In this context, lacking archaeological evidence of functional specialisation or division, textile work organisation in LMIB establishments would have been quite traditional, following domestic habits and based probably on small groups of people with each single worker (potentially) actuating the whole production process<sup>51</sup>. The status of the workers is unknown, but it would be fair to imagine a range of different conditions according to variations in locations and organisational levels. We should probably even conjecture the coexistence, within the same workplace, of fully dependent and *corvée* employees. The involvement of some cottage workers in the hinterland cannot be excluded.

In any case, such a decentralised productive structure seems to match quite well the widespread distribution and typological differentiation of Linear A administrative docu-

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activity, as far as we can tell, some settlements, such as Vathypetro, have yielded such a large number of loom-weights that one could envisage a production of a larger scale than the normal domestic production. At a site such as Vathypetro, the combination of wine-making, textile and pottery production may indicate a greater effort towards economic independence than had been the case in LMIA.» (*Troubled Island*, p. 51).

<sup>50</sup>See n. 31 and 45. One of the most famous texts is tablet HT 24, which records some quantities of wool and which was probably related to a group of sealed nodules found in the room nearby. The tablet was found between corridor 9 and room 26 of the «Villa», the nodules between the same corridor and room 27. The total amount of wool recorded is four and a half talents, i.e. ca 135 kg (HALLAGER 2002). The exact number of loom-weights from the structure is

unknown, but should be enough for three looms. On the findspots of the Haghia Triada tablets, see P. MILITELLO, *A Notebook by Halbherr and the findspots of the Ayia Triada tablets*, in *Creta Antica* 3, 2002, pp. 111-120. The textile evidence from Haghia Triada and Phaestos has been recently reviewed by Pietro Militello (P. MILITELLO, *Attività tessile a Festòs ed Haghia Triada dal Neolitico al Bronzo tardo*, in *Πεπραγμένα Θ' Διεθνούς Κρητολογικού Συνεδρίου* (Ελούντα, 1-6 Οκτωβρίου 2001), A3, *Ηράκλειο* 2006, pp. 173-187).

<sup>51</sup>Judging from the Vathypetro and Epano Zakros evidence, it seems that the major effort towards collective or «team» work was made for wine-making. On the variation of working equipment according to production increase, see ALBERTI, *Washing and Liquid Processing... and EAD., Textile Industry... cit. in note 35.*

ments. In the Neopalatial period, «...an increasing administrative complexity [...] is evidenced by the proliferation of Linear A at several levels...»<sup>52</sup>, both in palatial and non-palatial centres. Hypothetically, decentralised administrations could have existed at Kato Zakros, Knossos and Haghia Triada, while forms of «private» administration could have been present at Chania, Gournia and Palaikastro<sup>53</sup>.

In conclusion, the Neopalatial textile industry – coherently with a general strong territorial articulation of the economy – was strictly linked to local communities and local productive units (and probably also to local traditions and initiatives as well), with towns and villages playing a major role in it<sup>54</sup>. Each unit could have been, depending on historical developments and overall economic organisation, the fulcrum of local production and ultimately an intermediary between the local and a superior administrative level. Such a structure is highly flexible and can withstand various transformations, even in a more centralistic sense.

## 5. Conclusions

It thus appears that we have assembled several pieces of evidence and methods of viewing with which we can attempt to see through the Mycenaean Knossian textile industry all the way back to the Neopalatial period, and in so doing, we can perhaps approach some problems connected to the historical genesis of the Mycenaean textile industry. The general picture provided by the Linear B texts reflects a part of a more complex reality that is obviously the final result of a complex historical process. Although this process is (and probably will continue to be) lost to us in its entirety, we can nonetheless detect some elements of continuity and discontinuity with particular moments of the Minoan past, thus perhaps illustrating some key points of the historical development of the industry in Bronze Age Crete.

After an initial survey of the archaeological evidence, the basic nature of the Neopalatial textile industry can be outlined as follows: strong territorial radication and decentralised or even «private» organisation, although a central or palatial role can not be absolutely ruled out. With few exceptions, work areas are not specialised, but are generally multi-purpose, and workers most probably acted in accordance with domestic habits and traditional systems. Some of these features are evidently shared by the Mycenaean textile industry as is illustrated by the surviving Knossos texts: work-groups are located mainly in local centres and are probably linked to traditional operating forms<sup>55</sup>. Decentralisation and various articulations characterise the complexity of the administrative records.

<sup>52</sup>SCHOEP 2001, p. 99. See SCHOEP 1996, pp. 80-82.

<sup>53</sup>SCHOEP 2002, p. 199. See also J.-P. OLIVIER, Structure des archives palatiales en Linéaire A et en Linéaire B, in E. LÉVY ed., *Le système palatial en Orient, Grèce et à Rome (Actes du Colloque de Strasbourg 19-22 juin 1985)*, Strasbourg 1987, pp. 227-237.

<sup>54</sup>«La complessità globale del sistema non deve necessariamente trovare rispondenza in una diversificata collocazione delle attività specialistiche in rapporto alla decrescente dimensione dei singoli elemen-

ti costitutivi del sistema stesso.» (LIVERANI, *Uruk...cit.* in note 10, pp. 35-36).

<sup>55</sup>An archaeological survey of LMII-III evidence is in progress. Some interesting insights can be offered by the evidence of the Unexplored Mansion at Knossos (LMII) and House X (until LMIIIA1) and Oblique House (until LMIIIA2) at Kommos. They are all multi-purpose contexts with equipment for liquid processing and textile tools. In the Unexplored Mansion, more than three looms could have worked at a time.

Consequently, we can suggest some degree of continuity of the basic productive structure of the Minoan textile industry from the Neopalatial into Mycenaean times concerning territorial radication and traditional working habits. Such a continuity must be viewed only in a general way, and can not be extended either to the localisation of the single productive units (which can and did shift during the intervening centuries), to regional operative and economic hierarchies, or to the general management system. This last system is, in fact, a major example of discontinuity, since Neopalatial administration essentially seems to collect the fruits of the production while Mycenaean palace administration is clearly oriented towards direct productive involvement and drainage of the finished products<sup>56</sup>.

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#### ABBREVIATIONS

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<sup>56</sup>As has been illustrated by the analysis of Pietro Militello (MILITELLO, *Textile...* cit. in note 29).

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## ABSTRACT

### THE MINOAN TEXTILE INDUSTRY AND THE TERRITORY FROM NEOPALATIAL TO MYCENAEAN TIMES: SOME FIRST THOUGHTS

The textile industry of Bronze Age Crete is well documented for Mycenaean times by many lots of Linear B tablets from Knossos. The question whether some of the productive characteristics of the industry could have developed from similar features of Neopalatial industry has been raised many times and deserves a re-examination.

After a short outline of the textile productive organization as illustrated by the surviving administrative documents of Mycenaean Knossos (conventionally LMIIIA1), some particular features are taken into account. Different hints of decentralization, territorial radication and internal articulation are observed, underlining the importance of local communities within the productive organization. Location of the work-groups, wool management, status of the work-force are some of the aspects under examination. Other specific characters of the Knossos administration illustrate very well the complexity of the structure, especially in comparison with the more centralised and tight organization deducible from the Pylos archive. This complexity is probably an historical product, related to the socio-historical transformations and stratifications occurred in Crete between the Neopalatial and Mycenaean periods. Indeed, many scholars pointed out the possibility to see this particular productive structure as the adaptation of a pre-existing Neopalatial industry to Mycenaean administrative forms.

While many aspects of Minoan textile production have been illustrated in recent years on the basis of the archaeological evidence, a global picture of the production units, their typology and their geographical distribution is still lacking. Since textile industry is only poorly documented in Linear A texts, the effort has to be made on almost exclusively archaeological ground. Aim of the present work is to give some insights on the question, starting from a re-examination of the evidence for textile working areas in Neopalatial Crete.

Identifying such work areas is not very easy, and various archaeological indicators have to be used to form an interpretative grid. Activities such as washing, dyeing and fulling are included in the textile operations to be considered, along with the more obvious spin-

ning and weaving. For each context, both the presence of indicators of functional specialization and some quantitative parameters have to be verified. Once built the interpretative grid, it is applied to the Neopalatial evidence, looking for textile work areas. According to various combinations of indicators, the sites can be separated into six different groups (I-VI). A separate case has to be made of some other contexts, where major concentrations of loomweights are documented, while other indicators of textile processing seem to be missed.

As far as textile activities are concerned, the more interesting groups are I, II, IV and V. In these contexts, fibre-processing and textile-making were carried out on a large- or medium-scale amidst other domestic or food production activities. This is not a definitive picture, because many others sites have still to be analysed, but it is clear that these productive units cover a large part of the island, being widely distributed over the territory, from Western to Eastern Crete and through all the central part of the island, from North to South. It is also clear that they have a wide range of typologies: houses in palatial centres or in towns or in large settlements, «villas», isolated stations, isolated farmsteads and even necropolis.

This plurality of attestations fits very well with the socio-economic developments of LMI period (especially LMIB), when apparently a general productive and storing reorganization on local basis takes place. Such a decentralized productive structure seems to match quite well the widespread distribution and typological differentiation of Linear A administrative documents.

After a first survey of the archaeological evidence, the main characters of Neopalatial textile industry can be outlined: strong territorial radication and decentralised or even «private» organization, though a central or palatial role can not be absolutely ruled out. With few exceptions, work-areas are not specialized, but generally multi-purpose, and workers should have act following domestic habits and traditional systems.

Some of these features are apparently shared by the Mycenaean textile industry as illustrated by the surviving Knossos texts: work-groups are located mainly in minor centres, and are probably linked to traditional operating forms. Therefore, some form of continuity of the basic productive structure can be suggested for Minoan textile industry from Neopalatial into Mycenaean times, implying territorial radication and traditional working habits.

