Textile Workers in Roman *Venetia:* From Tools to Skeletal Remains

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Abstract

For years, the Padua University has carried out many studies on the textile economy in Roman *Venetia* (north-eastern Italy), an area famous for its wool industry according to the ancient literary and epigraphic sources. After investigating the topographic evidence and sheep breeding settlements, the *Pondera* Project focused on a systematic survey of archaeological textile tools found in the region in order to analyse technological and socio-economical aspects. After that, the TRAMA Project aimed to identify samples of organic and mineralised fabrics, for the first time offering a real picture of textiles produced in the area. Finally, the *Lanifica* Project is now focused on tools coming from funerary contexts to enlighten the ideological meaning and the connection with the socio-economical profile of the deceased, combining both the grave goods and the human remains. The results of these studies give us a comprehensive picture of the textile manufacturing, from the tools to the human beings involved. The new goal is to single out ancient textile workers and their health conditions, based on the study of occupational markers and pathological affects produced by textile activities. In addition, we will try to distinguish the skeletal modifications depending on the different kinds of looms in use. This approach could give an original contribution to the knowledge of both the occupational health in Roman society and the weaving technology in Roman *Venetia.*

Venetia: A Land Suitable for Sheep Breading and Textile Production

Wool economy played an important role in Roman *Venetia,* the main area of the Augustean X *Regio* (north-eastern Italy), thanks to its geography and natural resources (plains, alpine meadows, salt), thus, strengthening an economy already developed in pre-Roman times. This topic has been studied for years by scholars of Padua University, primarily with a topographic approach, identifying the routes of transhumance.[1]

The wool from the flocks raised in the Po valley, called *gallicae,* was famous for its whiteness and softness (Plin. nat., 8, 190). According to Columella (1st century AD), it surpassed even the wools of Calabria and Puglia (Colum. 7, 3). In *Venetia,* the wool most praised by writers was that from *Altinum,* which was held in high esteem up to the 3rd/4th centuries AD. In Diocletian's *Edictum de pretiis* it stood in third place along with the dark wools of Modena (200 *denarii*). The sources also note several products that reached the markets of Rome and *Noricum: Patavium* – where, according to Strabo (V, 7 e 12),

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the flocks produced a wool intermediate in quality between that of *Mutina* and that of Liguria (notoriously the worst in the Cisalpine region) – produced *gausapa, tapetes* and *trilices.* These cloths, famous for their weight and softness, were used to make blankets, tablecloths, cloaks and tunics (Strabo V, 1, 7 e 12; Mart. ep., 14, 143; 145; 147; 152; Petron. sat. 28, 4). A cloth similar to Patavium's *gausapa* was produced at Verona and known as *lodices* (Mart. ep. 14, 152). The epigraphic evidence from urban cemeteries mentions several workers involved in the wool processing (*lotores, lanarii purgatores, lanarii carminatores, lanari pectinarii, lanarii coactores, tinctores tenuarii, infectores, purpurarii*) and trade (*vestiarii* and *centonarii*).[2]

The rural settlements also suggest the importance of this economy, as the sheep farm discovered in the *Altinum* area (Ca'Tron), probably related to housing the *delicatissimae oves* of *Altinum* cited by Pliny.[3]

Research on Textile Production

Recently we have focused our research on the textile production looking for fabrics and tools, in order to investigate technological, economic, social and ideological aspects of textile craft.

Because of the climate and the terrain features, fibres, yarn and textile fabrics are rarely preserved in Italy. A piece of wool tissue from *Adria,* studied by M. Gleba in 2012, is the only Roman fabric known from the *Venetia* until now: It is a fairly coarse cloth, worked in tabby weave.[4] In the course of the TRAMA Project (Textile Roman Archaeology: Methods and Analysis) started in 2015, we increased the sample with more than 30 textiles mineralised on metal objects, mainly tabby fabrics from funerary contexts.[5]

Before, since 2009, the *Pondera* Project had started. The first goal of the project has been a systematic survey and study of the archaeological tools related to textile processing found in *Venetia:* shears, spindle whorls, spindle shafts, hooks and distaffs, loom weights and spools. We created a database using *open source* software (SQLite interfaced with Openoffice.org Base) to record context, morphometry, weight, decoration, condition, wear, chronology, bibliography and archive data of each tool;[6] the database was linked to a GIS, which allows us to proceed to spatial analysis and to link it to other data systems.[7] So far, almost three thousand items (2893) have been recorded, coming from eastern Lombardia (Brescia) and from the Veneto Region (fig. 1): Among these, the most numerous tools are the spindle whorls (292) and above all the loom weights (2352). Most of them (about 70%) were completely unpublished and most of the published materials is simply mentioned in the bibliography, lacking measures and weight.[8]

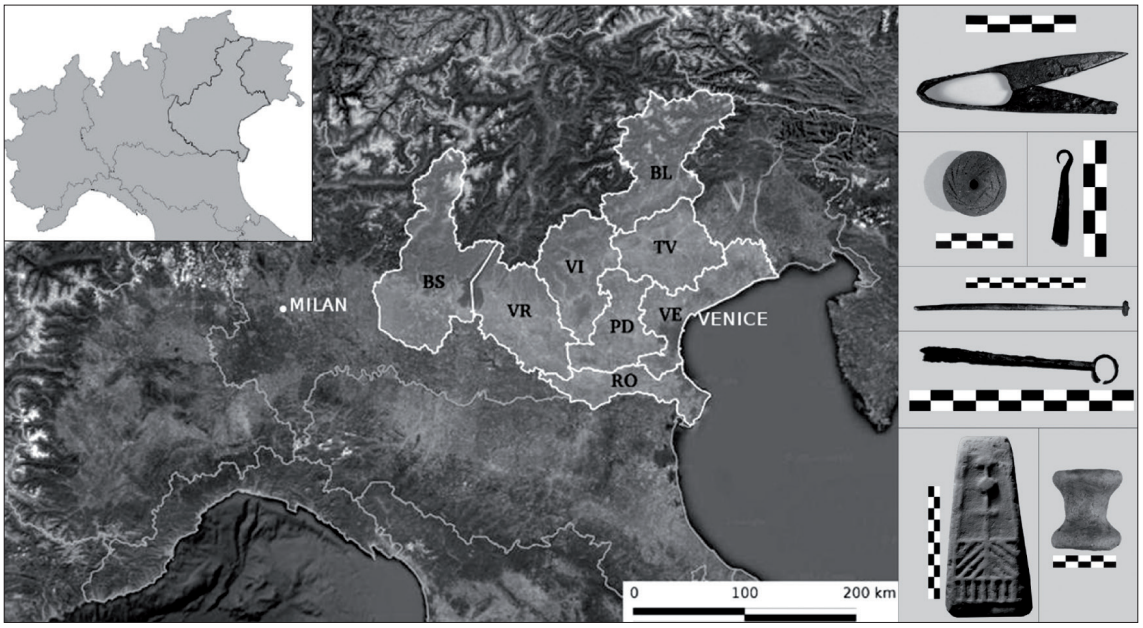

Fig. 1: Area of research and tools recorded.

Spindle Whorls and Loom Weights: Morphometric Features, Functional Parameters, Chronology

The research focused up to now on the spindle whorls and the loom weights, highlighting the functional parameters, which are useful to define the features of yarns and fabrics, based on CTR experimental tests: The weight of the spindle whorls[9] and the weight and the thickness of the loom weights.[10]

About the spindle whorls, six different morphologies have been recorded: Discoid spindle whorls are the more attested, followed by the truncated cone and spheroidal ones, while other shapes appear in lesser amounts (fig. 2a). The majority of items weigh between 16 and 30 grams, with a peak between 26 g and 30 g: We can imagine a production of a medium yarn size (fig. 2b).[11]

As concerns the loom weights, we distinguish two morphological macro-groups: The truncated pyramidal shape and the discoid shape. The truncated pyramidal shape, that represents the 85% of the weights recorded, includes three variants related to the thickness of the lower base: Thickness variations affect the position and, consequently, the space between the warp threads and, therefore, the fabric weaved (fig. 3a). As regards the weight, most of the items are between 400g and 900g (70%), with a peak between 600–700g (48%) (fig. 3b).[12] Comparing weight/thickness and morphology, we also notice some distinct groups of items, probably designed for specific production.

Such high values entailed a considerable effort to move back and forth the heddles to which the warp threads were tied, held in tension by the loom weights.

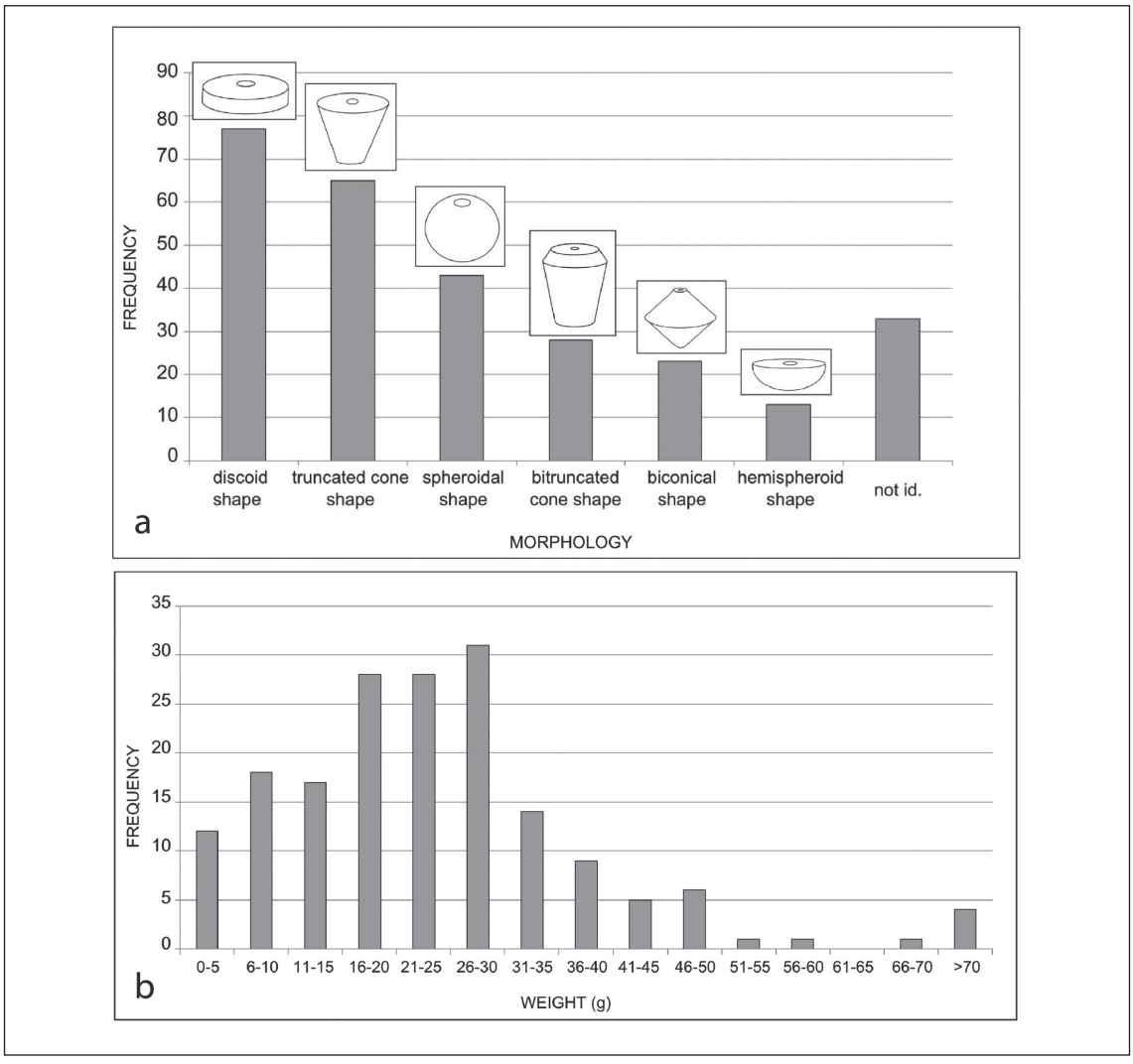

Fig. 2: Morphology and weight of spindle whorls.

The analyses of the weight of loom weights from Altino, Padua and Verona allow us to assume the productions of different fabrics for different purposes: The loom weights are on average gradually heavier in the three contexts, according to the literary sources on the wool and fabric quality.[13]

The analyses of the weight of spindle whorls and loom weight from urban and rural contexts suggest also the productions of different yarns and fabrics for different purposes, and maybe different customers: Both classes of objects are heavier and more standardised in the countryside than in the cities, where maybe there was demand for finest fabrics and for products of different quality.[14]

Chronologically, it should be emphasised that from the 1st century BC to the 1st century AD is testified the greatest variety of types, with a clear predominance of the trun-

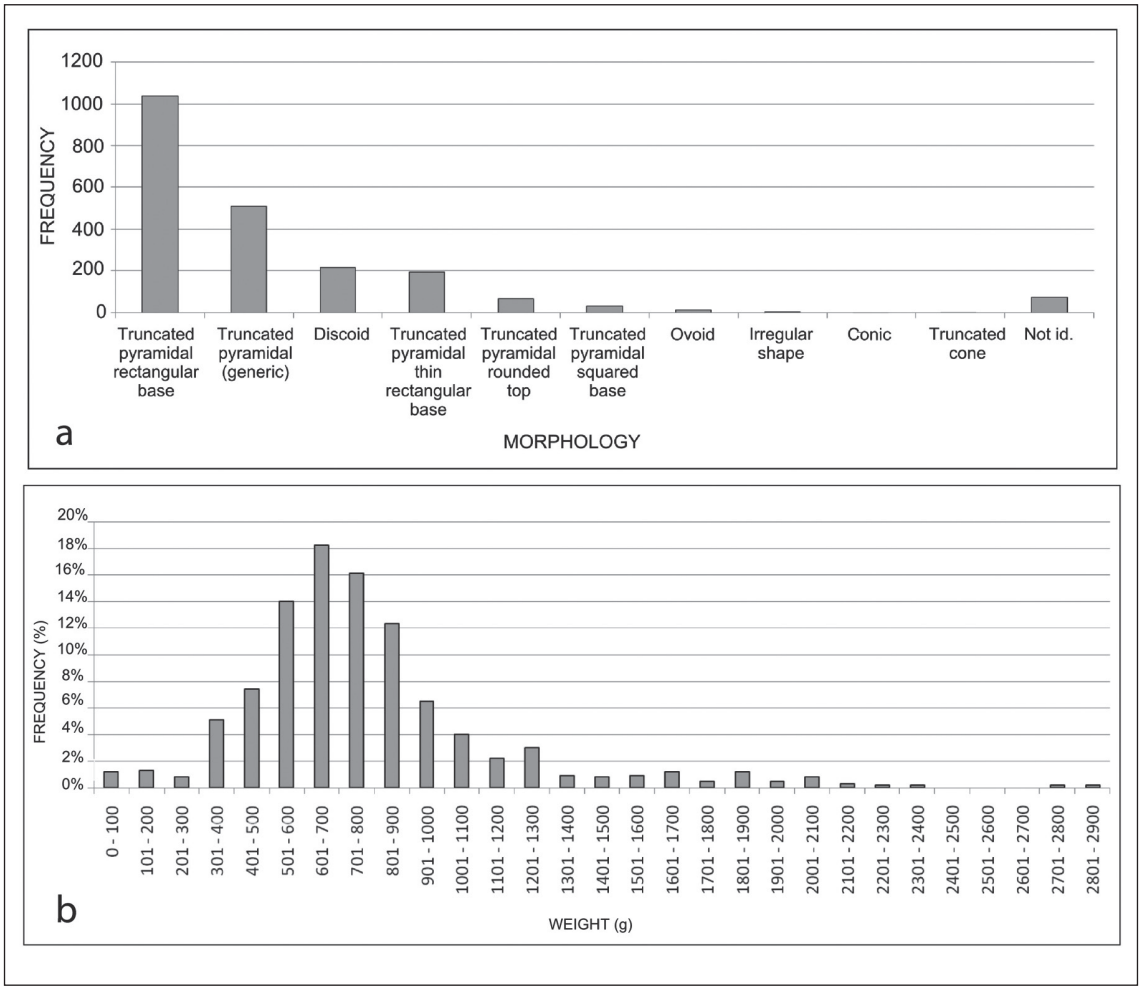

Fig. 3: Morphology and weight of loom weights.

cated pyramidal loom weights. No loom weight exceeds the 2nd century AD suggesting the probable decline of the warp weighted loom and the spread of the two-beam loom.[15]

M. S. B.

Spindle Whorls and Loom Weights: Contexts and Ideology

The *Pondera* project revealed that weaving tools were mostly recovered in settlements, while spinning tools came, for the most part, from graves.

What was the role of textile tools with regard to funeral celebrations? What social and economic rank were they referring to? What was the age group represented? What kind of woman was portrayed? The *Lanifica* project, whose name evokes the title used

in Roman epitaphs to praise the moral virtues of the deceased by means of a reference to the skillfulness in wool working, is designed to answer these questions; the aim is to provide broader insights into Roman society, with particular attention to the feminine world and the role of textile manufacturing in women's lives, on both the real and the ideological level.

This investigation includes a multidisciplinary analysis of tombs discovered in northern Italy and the north-western Roman provinces, characterised by the presence of textile tools among the grave goods.

A systematic survey is currently underway, implying a wide-ranging analysis of the evidence, which combines the position, the structure and the burial rite of each tomb, as well as the composition and nature of the grave goods, and the anthropological data.

Textile tools are quite unusual among the Roman grave goods, ranging on average between 1 and 20% in burial plots excavated in extension. When present, spinning tools are the most common and generally stand in lavish graves. Made up of breakable materials, most of them were hardly used in the everyday life. Some were even warped or altered in colour because of a contact with the flames and then placed inside the ossuary, just like a part of the human being. These elements reveal the high symbolic value the spinning tools were given within the cremation and the interment. Where preserved, the human remains belong to adult women or young ladies in marriageable age.

Considering this evidence, it is likely that in Roman funerary practices spinning tools were not aimed to convey the profession of the deceased. Rather, they were intended to suggest their moral integrity, establishing a sort of comparison between the women and the outstanding figures from the past or the myth. They could have even served to indicate the marital status of the woman, recalling the image of the bride entering the groom's house with her spindles and distaffs during the wedding ceremony.[16]

Textile Working as a Feminine Profession

It is impossible to say how much time the elite women actually spent working wool; *vice versa,* it is not unlikely that many women from the lower classes spun and weaved more regularly, for private use or to contribute with some income to the home finances.[17]

As the studies advance, the canonical portrait of Roman women, leading a secluded life, devoted just to the home and the care of offspring, turns out to be more and more distant from the true and appears to be strongly compromised by gender biases, social conventions and literary *topoi.* In everyday life, most women did not stay at home and often had to go out to earn a living.[18]

The number of occupational activities available to women was certainly lower than that for men, because of their lesser physical resistance and their greater commitment to run the household and to look after the children. Textile industry was one of the most

common options.[19] Among the job titles remembered in commemorative inscriptions for women, we find a fair number of spinners (*quasillariae*), weavers (*textrices/staminariae*), wool-weighters (*lanipendae*), tailors (*vestificae/sarcinatrices*) and even a sort of wool businesswoman (*lanifica circlatrix*) leading a small textile enterprise in the land of Aquileia (InscrAq, 69); according to the occupational titles, these jobs were performed seldom even by men.[20] Where the activities took place is still under debate: Most likely, the commercial production chain was held in a double manner, on piece-work, in small-scale and domestic settings, or on a more organised scale, within specialised workshops, rationally arranged for profit.[21]

In urban contexts, the textile craft could have been the sole feminine profession requiring women to make an actual huge physical effort. Besides it, the commitment was highly time-consuming and probably non-stop, implying a continuous repetition of mechanical movements for many hours a day. Suffice it to consider how much time was assessed in a recent study to produce a toga, the most distinctive garment of ancient Rome: Working non-stop ten hours a day, the production of this vest would have taken almost 120 days of a single person work.[22] Of course, in antiquity as today, several additional factors could affect the time consumption in textile craft: the technique chosen, the tools used, the type of fibers and, last but not least, the workers' level of experience.[23]

Reconstructing Gestures and Postures in Roman Textile Craft: Written and Iconographic Sources

In Roman Europe the most common way of spinning was the so-called suspended/drop-spindle spinning, i.e. working with a free hanging spindle, having a whorl stuck on the upper or lower end. In one of his most famous poems, Catullus gives a straightforward account of the spinning procedures in use in his time: He emphasizes the use of mouth and teeth to bite out the fibres flaws and to soften the resulting thread by wetting the yarn with saliva (Catul. 64, 311–319). The actions detailed by the poet correspond with the image on an attic vase found in Orvieto, dated to the early 5th century BC.[24]

Other sources concern the weaving techniques. The warp-weighted loom was the most common type till the end of the 1st century AD. It was made of two upright beams, placed slanting against a wall or a support in the roof, and a single horizontal beam to which the warp threads were fastened. Loom-weights held in tension the warp threads.[25] The image on a Corinthian aryballos (fig. 4a) and ethnographic parallels studied in Norway by M. Hoffmann in the mid-twentieth century (fig. 4b) prove that, while weaving, the worker stood in front of the loom, if necessary on a bench, pulling forwards the heddle rod, to change the position of threads, and weaving from the top downwards.[26] Most likely, in consideration even of the high weight values recorded for the Roman loom weights, a great effort was required, in particular at the back and at the upper

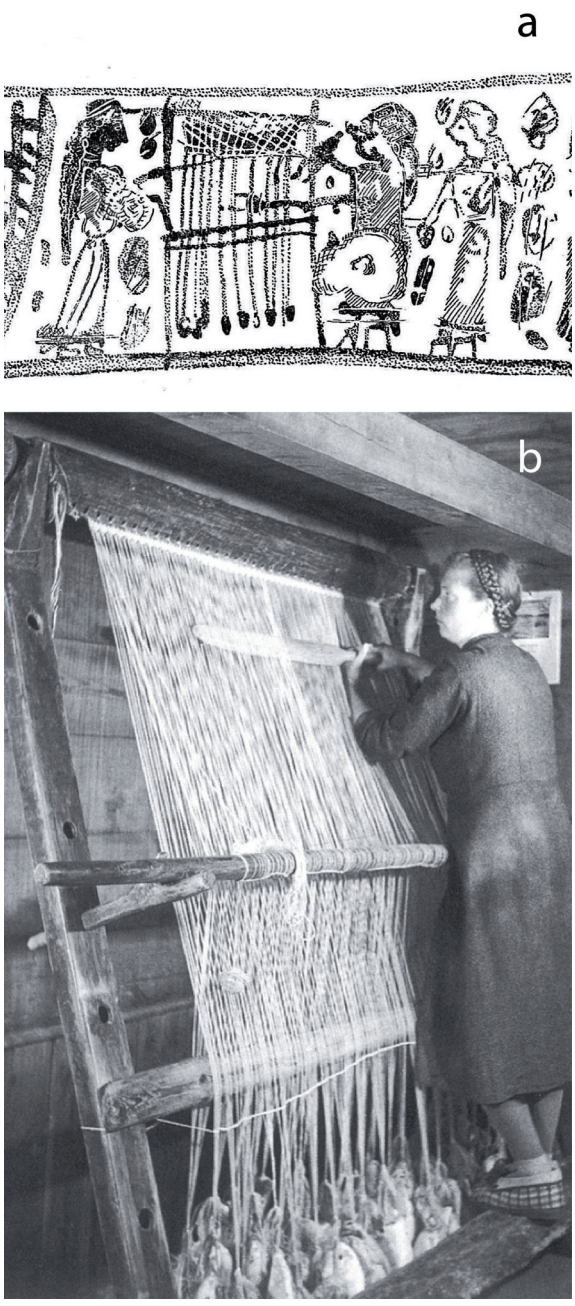

Fig. 4: a) Corinthian aryballos detail, 580–560 BC; b) Warp-weighted loom in Scandinavia, 1930.

Fig. 5: a) Rome, *Forum Nervae*. Detail of the frieze with Arachne's myth; b) Tapestry loom in Iran.

limbs, not only to pull the heddle rod, but also to beat upwards each insertion of new weft yarn against the woven web.

Conversely, the vertical two-beam loom is generally considered to have spread across Italy and the Roman western provinces by the 1st century AD. In this loom the warp was stretched between two horizonal beams, which were fixed to free-standing upright ones. The representation of a weaving scene on the frieze of the *Forum Nervae* in Rome clarifies the way of working with this new type of loom (fig. 5a): The worker sat in front of the loom, still pulling forwards the heddle rod, to change the position of threads, but weaving from the bottom to the top and packing the weft downwards just like nowadays in some parts of North Africa and the Near East for handmade tapes-

try and carpets[27] (fig. 5b). Even in this case, a great effort can be imagined, resulting in backaches and pains at the lower limbs, the latter due to the posture.

C. R.

Reconstructing Gestures and Postures in Roman Textile Craft: Skeletal Markers

Ethnographic research played and plays even today an important role in the resolution of archaeological issues, such as the recognition of skeletal markers related to the textile craft. As an example, the technique of spinning described by Catullus is still common in several parts of the world, such as northern Anatolia, where many old women still produce yarn in the traditional way, using teeth like a third-hand to grasp the thread while softening the fibres with saliva. This non-alimentary use of the mouth results in microtraumas of the soft tissues and even in grooves and scrapes on the occlusal surface of the anterior teeth. Similar wears on skeletal remains from archaeological context can prove the existence of yarn production among the ancient communities.[28]

A recent field of osteo-archaeological research consists in identifying markers of Musculoskeletal Disorders (MSDs) related to occupational activities in human skeletal remains. In short, a prolonged and strenuous physical activity can cause modifications recognisable on the bones. In these terms, enthesopaties (i.e. bone modifications consisting in bone spurs, osseous crests and erosions at the insertion of muscles, ligaments and tendons) are particularly important.

Modern researches of occupational medicine on the incidence of MSDs in communities from India and Iran, where the textile craft is still performed to large extent in a traditional way, show that, on average, people work at the loom ten hours a day, seven days a week. At these conditions, it is not uncommon for weavers to develop severe injuries. In particular, long-lasting static work in awkward position on hard benches or floor can produce traumas involving the vertebral column, because of an uncomfortable work place without back rest and with little space for legs; a prolonged crouching and kneeling work posture can cause bone modifications at the lower limbs, especially femur and patella, with additional onset of osteoarthrosis at the knee; the repetitive rotation of wrist and the intensive use of flexor tendons of the hand while weaving can cause osteoarthritis and bone crests in the hands.[29] In addition, the continuous inhalation of fibre dust, together with a poor hygiene of the work environment and a lack of proper ventilation, can lead to a severe impairment of breathing, resulting in bronchial obstruction and lungs restrictions.[30] Moreover, the synergy between the poor hygiene condition, the scarce ventilation and pulmonary weakening due to suspended particles of polluted fibers can place the weavers at risk of more serious infectious diseases, such as tuberculosis.[31]

Female Textile Workers in Roman *Venetia:* The Bio-Archaeological Evidence from Padua

In consideration of these aspects, we tried to evaluate the presence and the health state of female textile workers in Roman north-eastern Italy, starting from the skeletal sample recovered in Padua/*Patavium,* one of the main manufacturing and trade centres of the region. Ancient authors state that wool processing and cloth production played a pivotal role in the city's economy[32] and archaeological data seem to prove it.[33]

At present, the urban cemeteries of Padua are the best-known throughout the *Venetia,* thanks to a systematic study of the Roman funerary evidence recovered from the 18th century onwards:[34] The whole sample consists of more than 427 graves, around two-thirds of which received a bio-archaeological analysis. An in-depth evaluation of occupational markers was possible only in the case of inhumation graves, corresponding to 13% ca of the total amount and, for the most part, dating back to the 2nd century AD. The bone sample consists in 25 skeletons fairly well preserved, twelve of which belonged to females with average age at death of 30 years old. In spite of the small bone sample, some interesting considerations about the female skeletons were possible.

Fig. 6: a) Padova. Corso Vittorio Emanuele II, 141–143, Tb. 23. Severe dental wear due to a non-alimentary use affecting superior dentition; b) Detail; c) Non-alimentary use of teeth while spinning (after Erdal 2008).

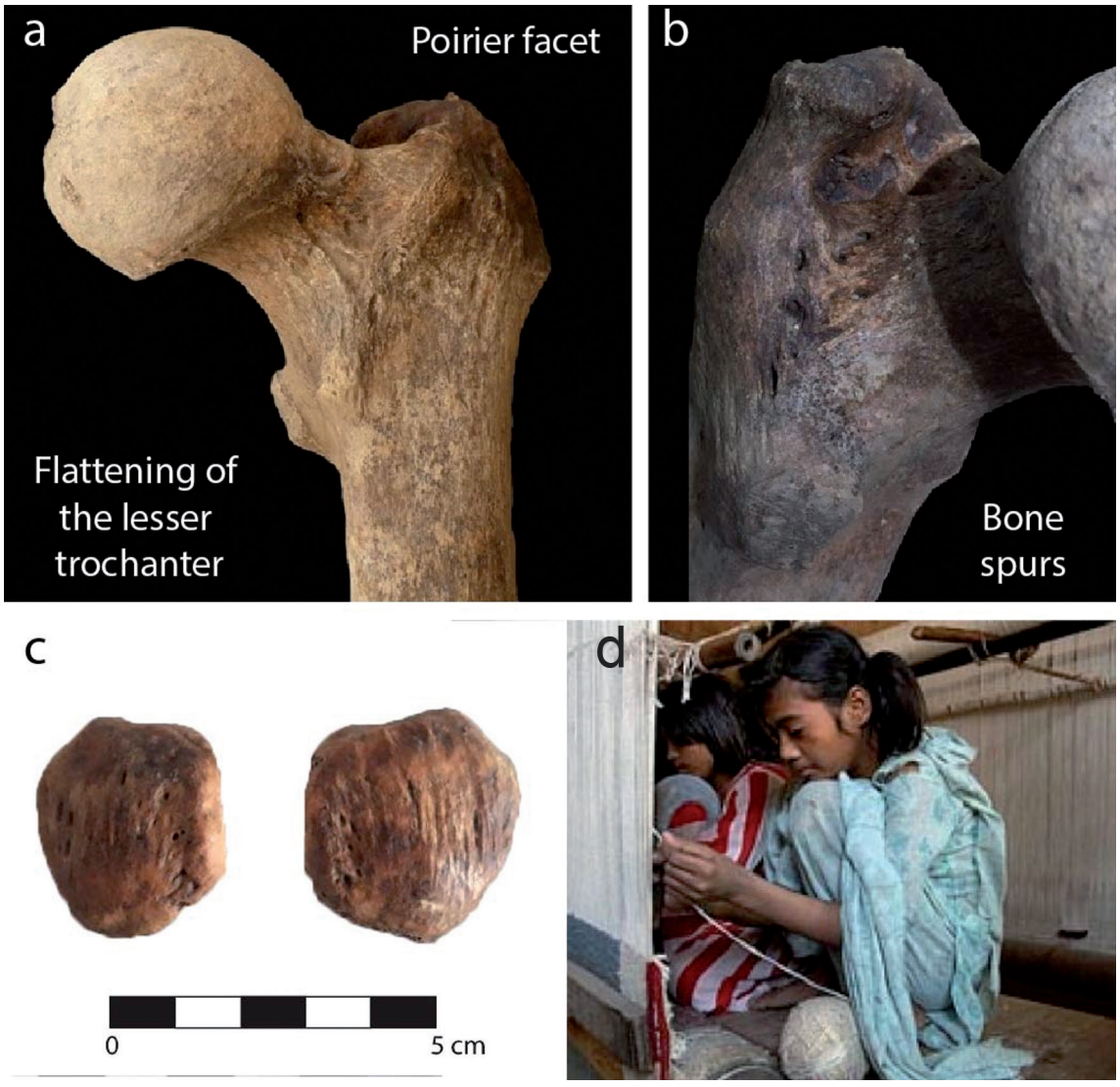

Fig. 7: a–b) Padova. Corso Vittorio Emanuele II, 141–143, Tb. 36. Enthesopaties at femur produced by stress related to the impact of the femural head to the hip's acetabular rim, in consequence of a repetitive crouched position; c) Padova. Corso Vittorio Emanuele II, 141–143, Tb. 23. Squeeze of the supero-lateral surfaces of the patellae, due to a posture with both lower limbs hyperflexed; d) an ethnographic example.

Fig. 8: Padova. Corso Vittorio Emanuele II, 141–143, Tb. 36. Pott's disease related to a probable tuberculosis with partial destruction of T11 vertebral body, fused to T12 vertebral body, collapse and forward bending (kyphosis) of the spine. On bottom TAC of T11–T12.

First of all, just in the female sample a marked dental wear on the anterior teeth was recognised, implying a use for regular and heavy non-alimentary activities, such as grasping the thread while spinning (fig. 6). The same wears are absent in the male sample. Therefore, the presence of grooves and abrasions only on feminine teeth could suggest that spinning was a mere feminine task.

Four female skeletons (44,4%) show enthesopathies at the lower limbs consisting in marked flattening and medial shifting of the lesser trochanter, bone spurs at the trochanteric fossa and notches to the superolateral corner of the knee caps at the insertion of vastus lateralis muscle. All these bone modifications are most likely due to repetitive crouched working posture or to a seated position with both knees hyper-flexed. Both postures are compatible with weaving activities and, first of all, with a continuous use of a vertical two-beams loom (fig. 7).

Finally, the paleopathological investigation on the female skeletons revealed a classical example of Pott's disease in a mature woman (fig. 8). This pathology, that affects the vertebral column, consists in erosive destruction of one or more vertebral bodies usually of the thoraco-lumbar tract of the spine that results in collapse and kyphosis. Pott's disease is the result of the spinal involvement by a tuberculous infection and it is not uncommon among spinning and weaving traditional workers. Among these workers tuberculosis is usually due to both the pollution of fibres used and the poor hygiene condition of the working place. Although it is not a conclusive proof, the existence of this disease, alongside with other aforementioned evidence provided by the analysis of the skeletal remains, allows us to consider the weaving activity as the potential occupation of this woman.

A. C.

Conclusion

In conclusion, even the human remains seem to prove the great relevance of textile craft in Roman Padua and, furthermore, the active role of women in this production chain.

Even if both the archaeological and the anthropological data are partial and inconclusive, the final picture seems to show a fair concurrence of results.

We can finally affirm that only the use of a multidisciplinary approach could help us to go beyond the documentation gaps, allowing us to reach more reliable results. While this paper will be published, the *Lanifica* Project will have been completed. In the meantime, several works have already seen the light. In particular, see Busana – Rossi 2020; Rossi et al. 2020. For an overview see also Busana – Francisci – Rossi (forthcoming).

M. S. B., C. R., A. C.

Notes

[1] Marchiori 1990; Bonetto 1997; Bonetto 1999a; Bonetto1999b; Modugno 1999; Rosada 2004; Bonetto 2008.
[2] Basso et al. 2004; Bonetto et al. 2011.
[3] Busana et al. 2012a.
[4] Gleba 2012, 331.
[5] Busana – Gleba 2018.
[6] Busana et al. 2015. Unfortunately, the manufacts were rarely *in situ* when they were discovered: Not *in situ* but inside the original context are the 25 or 27 loom weights from a Roman farm in Isola Vicentina (Vicenza).
[7] Busana et al. 2012b, 405–406.
[8] Busana et al. 2012b; Galiazzo 2012; Gottardi 2012; Paderno 2012; Zentilini 2012; Tricomi 2012; Tricomi 2014; Tricomi forthcoming.
[9] Mårtensson et al. 2005–2006; Mårtensson et al. 2006; Andersson Strand 2012, 208–210.
[10] Mårtensson et al. 2007; Mårtensson et al. 2009; Andersson Strand 2012, 210–212.
[11] Busana – Tricomi 2016; Tricomi 2018.
[12] Busana – Tricomi 2016; Tricomi 2018.
[13] Busana – Tricomi 2018.
[14] Busana – Tricomi 2016; Tricomi 2018.
[15] Busana – Tricomi 2016; Tricomi 2018.
[16] For the first results of this part of the Lanifica project, see Rossi 2012 and Rossi 2018.
[17] Groen-Vallinga 2013, 298.
[18] For this gap between imagery and actual life see Hemelrijk 2016 with bibliography.
[19] A huge literature flourished in the last decades, following the first studies by Susan Treggiari (1976, 1979). For an overview, see Buonopane – Cenerini 2003; Cenerini 2009, 165–183; Groen-Vallinga 2013; Larsson Lovén 2016 and Becker 2016.
[20] On the epigraphic evidence, with particular attention to the feminine textile craft, see Larsson Lovén 2013, 111–117.
[21] For a discussion on this topic, see Treggiari 1979, 67–70 and Dixon 2000–2001.
[22] For this assessment, based on the analysis of statues in scale 1:1, see Harlow 2016, 139.
[23] Andersson Strand 2015, 46.
[24] For a wider reconstruction of the spinning technique, see Wild 1970, 31–37; Andersson Strand 2015, 44–48; Grömer 2016, 74–81. On the image, see Barber 1991, 70 fig. 2, 36; Lipkin 2012, 70 fig. 32.
[25] For a reconstruction of the weaving technique with a warp-weighted loom see Wild 1970, 61–68; Barber 1991, 91–113; Ciszul – Hammarlund 2008, 122–123; Andersson Strand 2015, 52–53.
[26] Respectively, Davidson Weinberg – Weinberg 1956 and Hoffman 1964.
[27] For a discussion on two-beam looms see Wild 1970, 69–72; Ciszul – Hammarlund 2008, 124–127; Andersson Strand 2015, 54.
[28] On the recognition of this kind of occupational markers in ancient Mediterranean contexts, see Erdal 2008; Baker et al. 2012; Liston 2012, 134; Lorentz 2016.
[29] Choobineh et al. 2004; Motamedzade – Moghimbeigi 2012.

[30] Golshan et al. 2002; Rastogy et al. 2003.
[31] Goel – Tyagi 2012; Golshan et al. 2002.
[32] Basso et al. 2004; Busana – Tricomi 2018.
[33] E.g. two Roman floors entirely made with loom-weights and the presence of a fair number of Roman alum-amphorae, presumably linked to wool processing workshops. See Busana et al. 2012b, 423–424.
[34] For the Roman cemeteries of Padua, see Rossi 2014; Rossi 2016; Rossi – Marini 2018 with bibliography.

Image Credits

Fig. 1–3: by the author. – Fig. 4: a) after Davidson Weinberg – Weinberg 1956; b) after Hoffman 1964. – Fig. 5: a) AAR-Barbara Bini Collection; b) Google. – Fig. 6: a–b) by the author (courtesy of Soprintendenza ABAP per l'area metropolitana di Venezia e le province di Belluno, Padova e Treviso – Mic); c) after Erdal 2008 – Fig. 7: a–c) by the author (courtesy of Soprintendenza ABAP per l'area metropolitana di Venezia e le province di Belluno, Padova e Treviso – Mic); d) Google – Fig. 8: by the author (courtesy of Soprintendenza ABAP per l'area metropolitana di Venezia e le province di Belluno, Padova e Treviso – Mic).

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