Medieval textile sleeve: Discovery, conservation and treatment assessment

Liz Goodman*
Museum of London Archaeology
150 London Wall
London
EC2Y 5HN
E-mail: lgoodman@mola.org.uk

Jill Saunders
UCL Qatar
PO Box 23689
Georgetown Building
Education City
Hamad bin Khalifa University
Doha
Qatar
E-mail: jill.saunders.09@ucl.ac.uk

Abstract

Two pieces of a rare example of a medieval sleeve were discovered during the conservation of hundreds of textile fragments from a Thames riverside revetment site: Three Quays House (TEQ10). Many items including the sleeve pieces were crumpled and covered in a black tarry deposit, perhaps pitch, indicating a secondary use as caulking material. The sleeve consisted of woollen twill outer, a linen tabby-woven lining and twelve fabric-covered buttons attached with thread. The survival of linen in the archaeological record for London is rare, with only a few fragments present within our collection. It is likely that the pitch enabled the linen to survive in the damp burial conditions.

The sleeve was minimally wet cleaned as the object was vulnerable to physical damage and to retain the resin impregnation. It was then immersed in a 4% v/v polyethylene glycol (PEG) 200 solution for four weeks then frozen and vacuum freeze-dried. A number of waterlogged samples were analysed using a Philips XL-30 ESEM on an environmental setting to confirm piece association and identify key fibres prior to treatment. These samples were retained and were compared with new samples from the treated object to assess and provide a record of different treatment aspects. This enabled the comparison of the various treatment stages.

Keywords: archaeological textile, wool, linen, Medieval clothing, caulking, PEG 200, freeze-drying

Introduction

Two pieces of a rare example of a medieval sleeve were discovered during the conservation of hundreds of textile fragments from a Thames riverside revetment site: Three Quays House (TEQ10). Many items including the sleeve pieces were crumpled and covered in a black tarry deposit, perhaps pitch, indicating a secondary use as caulking material. The sleeve consisted of a woollen twill outer, a linen tabby-woven lining and twelve fabric-covered buttons attached with thread. The survival of linen in the archaeological record for London is rare, with only a few fragments present within our collection.

Object description and significance

The object was comprised of two fragments of the lower portion of a buttoned sleeve, each with a twill-woven wool outer and tabby-woven linen lining joined with a woollen seam (Figure 1 as a cross-section). There were nine fabric-covered buttons on Piece 1 and three on Piece 2, attached with thread. Fibres could be seen protruding from a button on Piece 2 (Figure 1).

The sleeve pieces were discovered amongst hundreds of waterlogged wool rags and sailcloth scraps excavated in 2011 from a Thames riverside revetment site (TEQ10). These were saturated with suspected pitch indicating use in caulking (Robinson et al. 1987). Evidence of textile caulking is scarce with other materials being more common e.g. moss and animal hair (Bremen Cog c.1380 etc. (Borsig 1978)). Due to their relation to the history of shipbuilding and the relative rarity of textiles in the archaeological record, all TEQ10 rags are valuable specimens. However, as a fragment of clothing the sleeve is invaluable in its contribution to historical knowledge about medieval costume e.g. fashion, fibre trade, and methods of manufacture as examples of everyday wear are limited. The only confirmed surviving linen from this

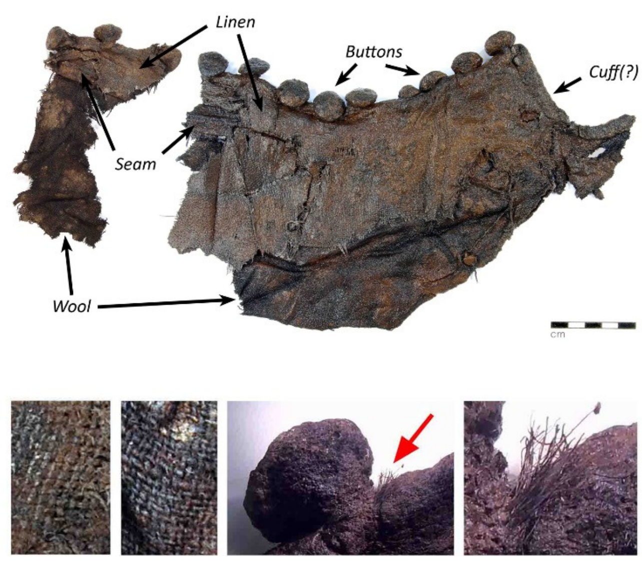

__Figure 1__. (above) Piece 1 (right) and Piece 2 (left) waterlogged after light cleaning (linen side up); (below) from left: linen tabby-weave, wool twill-weave, unidentified fibres protruding from button on Piece 2 and close up of the fibre bundle.

period are scraps excavated in 1974 at Trig Lane in the City of London. Like the TEQ10 fragments these were also "partly coated in a black substance, possibly pitch" which is believed to have aided preservation as is suspected with the sleeve (Crowfoot et al. 1992).

Treatment context

The TEQ10 textiles were conserved according to a batch treatment system involving light washing in running water with a natural sponge, controlled air-drying in blotting paper, and standardised packaging for long-term dry storage at LAARC (Goodburn-Brown and Langfeldt 2005). Due to the historic value and fragility of the linen, the sleeve received a tailored conservation plan. It was also important to make packaging that allowed the object to be seen and facilitate regular physical access.

Treatment

The object was received with other textile fragments together with mud, sand and deposition debris in a compacted bundle. The sleeve pieces were slowly prised apart from other items and opened under gently running water before light cleaning with a natural sponge. A brush was used to remove mud and debris lodged around the buttons. The waterlogged object was gently laid into an appropriate shape suggested by the fabric and guided by the textile and costume curator and Melinex was placed between the different fabric layers. After sampling (see below) the object pieces were treated in a 4% v/v PEG 200 solution. After four weeks the pieces were removed to a tray and sealed in a polyethylene bag before being frozen at -30°C overnight. They were then placed in a freeze-dryer and dried over three days. The finished object was then packaged in a card frame fitted with Melinex windows in a book-like design and was cushioned with Plastazote covered in Tyvek.

Sampling

For fibre identification, seven 2-4 mm^2 samples were cut from the untreated waterlogged object using a scalpel. Samples constituted: suspected wool fabric (P1W & P2W); suspected linen fabric (P1L & P2L); material over buttons (P1BM); fibres protruding from buttons (P2BF); seam material (P2S) (P = Piece; W = Wool; L= Linen; BM = Button Material; BF= Button Fibre; S = Seam). Samples were analysed using a Philips XL-30 ESEM on a fixed pressure environmental setting to control the humidity in the chamber and prevent sample drying. Images were generated via a 4.8 spot size and operation was optimum at 3.9 Torr providing about 80% relative humidity (RH) and 20 KeV.

For treatment assessment, a pair of untreated samples (one linen and one wool) was left in a 4% v/v PEG 200 solution for four weeks and then control air-dried between blotting paper. A second pair was frozen and freeze-dried without the PEG and a third pair was control air-dried with no treatment. These were assessed (ESEM variable pressure mode kept roughly at 0.7 Torr 15 KeV) together with a pair of samples cut from the treated object (PEG and freeze-dried).

Treatment outcomes

The object was separated from the other textiles without causing perceptible material damage and the gentle cleaning successfully removed the bulk of mud and burial deposit which was obscuring the garment. During the PEG bath a fragment became detached and it is possible that the solvent chemical may have leached out original material e.g. fabric dyes and/or "historic" resin. The object responded well to the drying process with no fabric warping or button collapse/distortion/detachment and textile flexibility was retained. Macroscopically both wool and linen fibres appeared in excellent condition; the deposit remained sticky and retained its distinctive tarry smell, and the revelation of the previously obscured button attachment was an unexpected positive outcome (Figure 2). The packaging provided some protection to the object although the access-directed design necessitated some compromise and expected movements due to frequent turning may result in damage in the future.

Analysis

In comparing samples it is important to note that fibre qualities are likely to have been affected by varying amounts of caulking resin, position on the garment and variability in the burial environment.

Fibre identification

The suspected linen lining fibres were long, slender and straight with characteristic nodes and, though in good condition, had inflexible breakages as opposed to bends/curves (Figure 3). The mean average fibre diameter of 13.87 µm (with the widest recorded at 27.1 µm and the narrowest at 7.82 µm) accords with expected measurements for linen. The suspected wool outer fibres appeared flexible and thicker than the linen with characteristic scales and cross-

***Figure 2**. (above) Piece 1 after treatment; (below) from left: note the white fluffy quality of the conserved linen fibres and the button stitch detail.*

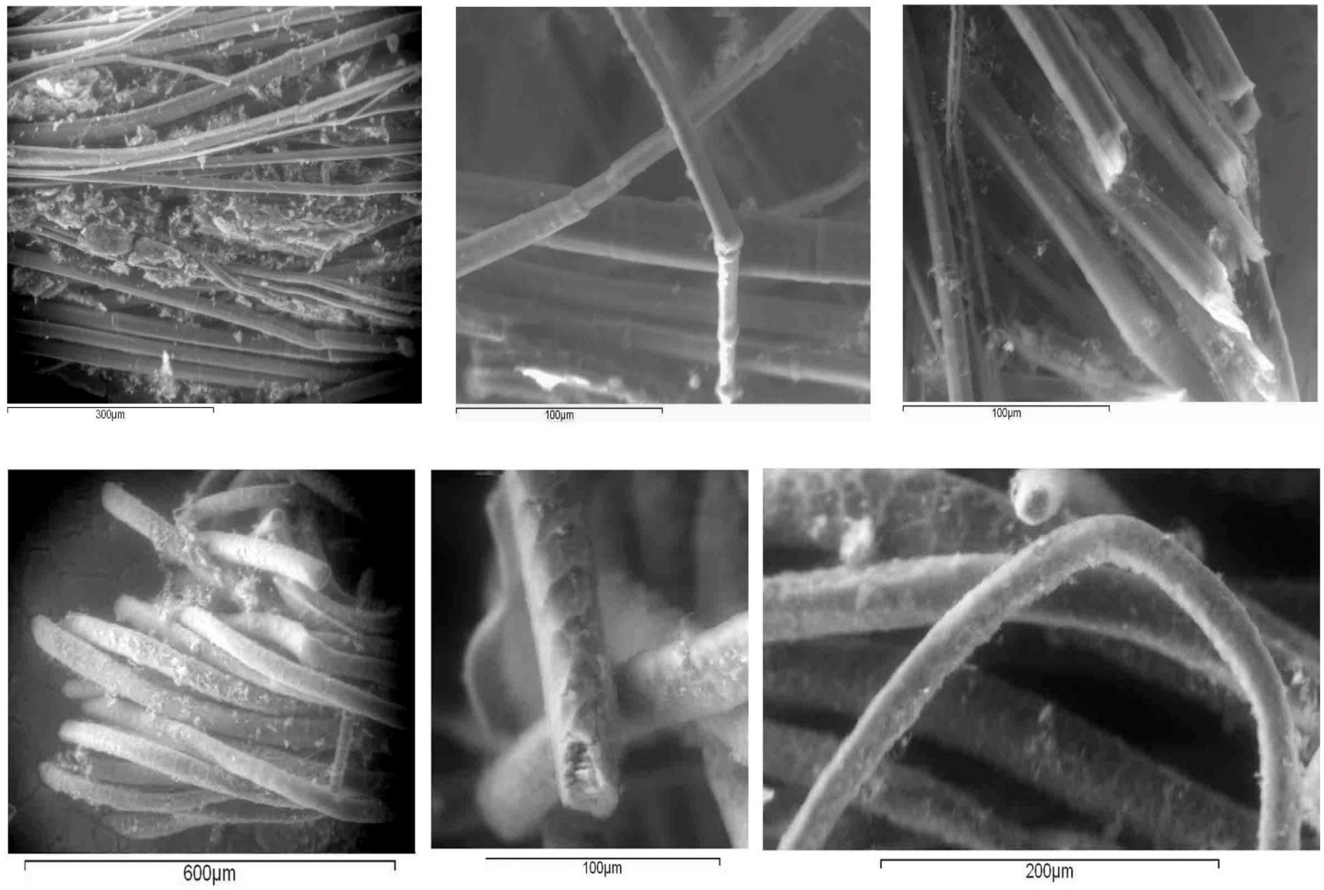

Figure 3. *(above) ESEM images of waterlogged linen (from the left: x200, x200, x600). The fibres are long, slender and straight with characteristic nodes; (below) ESEM images of waterlogged wool (from the left: x100, x500, x300). The fibres appear flexible and are thicker than the linen with characteristic scales and cross-sections of the ends revealing hollow fibres.*

sections of the ends revealing hollow fibres (Figure 3). The average diameter of 31.28 µm (the widest recorded was 45.2 µm and narrowest was 19.3 µm) supports the wool identification. The seam fibres also demonstrated the characteristic scales, flexibility and size (average fibre diameter of 26.18 µm; widest recorded = 48.6 µm; and narrowest recorded = 15.7 µm) of wool. Analysis of the fibre bundle protruding from the button of Piece 2 is inconclusive as it was badly degraded and contaminated by debris/dirt (average diameter = 101.65 µm).

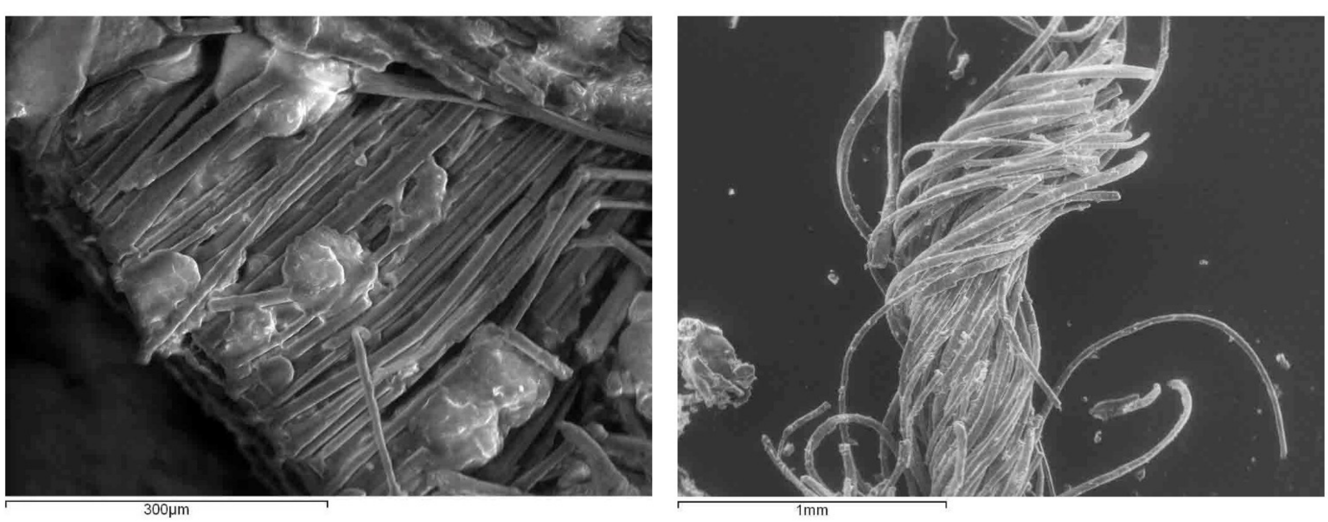

Figure 4. *(left) ESEM image of treated linen (x 200); (right) ESEM image of treated wool (x 50).*

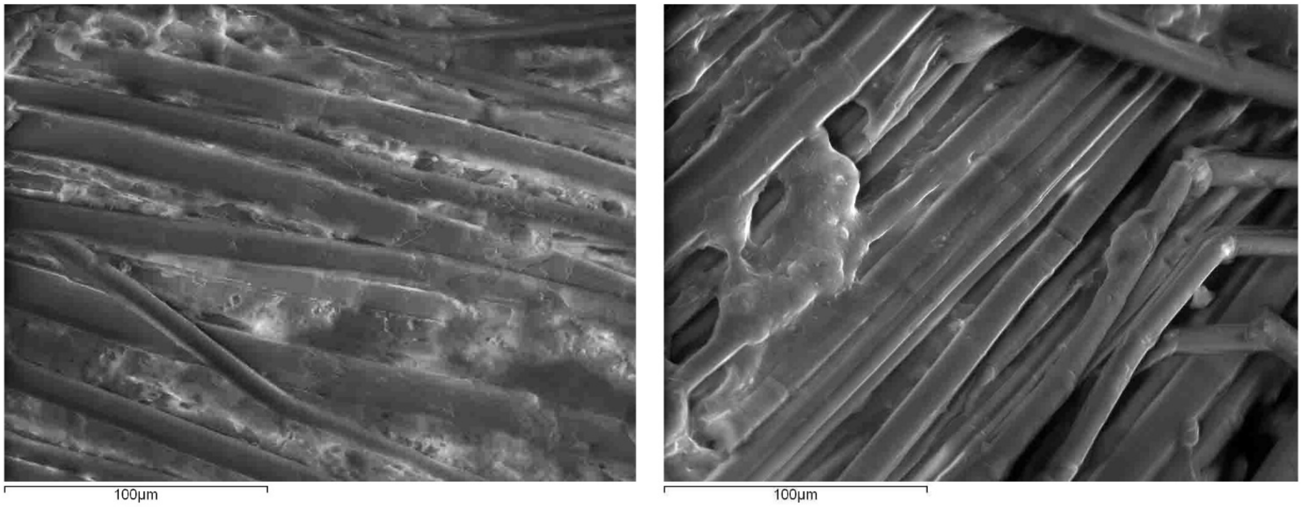

Figure 5. *(left) ESEM image of untreated linen and (right) fully treated fibres (both at x500).*

Treatment assessment

The weave of the untreated linen sample remained tight but the fibres appeared flat and compressed. Several breakages were apparent and in one high magnification image (x800) multiple horizontal lacerations can be seen across the fibres potentially due to uncontrolled dimensional changes during the natural drying process. The untreated wool sample weave also remained intact but the fibres have the same flat appearance. The PEG-treated air-dried linen sample partially disintegrated in the PEG bath as it was too small to tolerate immersion. Once again the fibres appear compressed with multiple breakages apparent. The PEG-treated air-dried wool appeared in good condition and slightly less flat than the untreated sample. The freeze-dried only linen weave was intact and demonstrated a solid appearance with fibres appearing less flattened and matted together. The freeze-dried only wool also appeared in good condition with scales still clearly visible. The PEG-treated and freeze-dried samples both retained the weave with linen fibres appearing rigid and strong and wool fibres appearing full and flexible (Figure 4). At higher magnification, the fibres of both the freeze-dried only and fully treated samples appear rounder and more separate compared to the flattened appearance of the untreated or PEG-only treated fabrics, though the difference is more notable regarding the linen (Figure 5).

Conclusion

The results suggest that freeze-drying was the most important element of treatment in protecting the linen fibres from collapse. However the potential benefits of PEG regarding flexibility cannot be properly assessed on samples of this size and the flexibility exhibited in the treated sleeve may be dependent on the PEG bath and contribute significantly to the longevity of the sleeve. For the wool, the results suggest that though potentially beneficial, archaeological woollen textiles excavated in good condition can be reasonably well conserved through controlled air-drying alone without the resource expenditure of further treatment. Thin sectioning to allow cellular analysis would help to further assess the role of the PEG and freeze-drying processes with regard to fibre condition.

Acknowledgements

The archaeological excavation at Three Quays House and subsequent research has been funded by Cheval Property Holdings Ltd. We would also like to thank Hilary Davidson (Museum of London), Inger Bojesen-Koefoed, Anette Hjelm Petersen, and Dr. Kristiane Strætkvern (specialists in waterlogged organics conservation, National Museum of Denmark) for their advice regarding the percentage strength and duration of the PEG pre-wash. Anna Harrison and Peter Kevin (British Museum) for their advice about packaging for the saturated textile.

References

Borsig, F., 1978. Untersuchung von Kalfatklammern der Bremer Kogge. Deutsches Schiffahrtsarchiv, 2.

Crowfoot, E., Pritchard, F., & Staniland, K., 1992. *Medieval Finds from Excavations in London 4: Textiles and Clothing c.1150-1450.* London: HMSO.

Goodburn-Brown, D. & Langfeldt, J., 2005. A Pragmatic Solution to Packing Textiles. *Icon News*, pp. 50-51.

Robinson, N., Evershed, R., P., Higgs, W., J., Jerman, K., & Eglinton, G., 1987. Proof of a Pine Wood Origin for Pitch from Tudor (Mary Rose) and Etruscan Shipwrecks: Application of Analytical Organic Chemistry in Archaeology. *Analyst*, 112, pp. 637-644.