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Textile and leather finds from the Swedish warship *Vasa*: A research program on common people's clothing from the early 17th-century

Anna Silwerulv, Fred Hocker, Josefin Lindegren and Cecilia Aneer

Abstract

Shipwrecks provide a rare chance to examine the clothing of ordinary people in their original context. The wreck of the *Vasa*, which sank on its maiden voyage in 1628, has produced one of the largest collections of everyday clothing belonging to the lower classes in Europe before 1700. This article presents the preliminary results of a comprehensive project to document and reconstruct the clothing, footwear, and accessories found on the ship, focusing on the clothing of one man found in a cask full of personal possessions. The methodology for documentation and reconstruction is discussed as well as the importance of context in the interpretation of the find.

Keywords: Early 17th century, ordinary peoples clothing, sailors, breeches, doublet

16.1. Introduction

Most of what we know about the physicality of clothing before 1700, its materials, cut, and construction, is based on the possessions of society's elites. It is their clothing which survived to be collected by museums, their portraits which were painted, and their papers which made it into archival collections. The little we know about ordinary people's clothing is largely based on the excavation of graves, such as the cemetery at the Dutch whaling station on Spitsbergen (Comis 2017) or churches in Finland (Lipkin et al. 2021). Although the whalers appear to have been buried in their working clothes, and soldiers buried in mass graves are usually in their uniforms or campaign clothing, the clothes present in a burial were not chosen by the deceased but by their family, friends, or comrades. This imposes a filter between the deceased and the clothes they wear which can be difficult to interpret, as there may be many conflicting motivations involved in deciding how to bury a person. Additionally, a full wardrobe was not necessary under the turf and useful equipment was often scavenged, and as such burial clothing may not always be representative.

Shipwrecks provide a rare source for how ordinary people dressed, if the preservation conditions allow for the survival of cloth and leather. The deceased remain dressed as they were in life, with their

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pockets full of everyday junk – keys, coins, and odd bits and bobs. Shipwrecks also preserve the spare clothing brought on board in chests, casks, and sacks, even when the crew itself survives.

The Swedish warship *Vasa* sank on its maiden voyage in 1628, barely a kilometre from where it was built, and was raised largely intact in 1961. During the excavation of the interior, hundreds of cloth and leather finds were recovered. Since the registration of finds was based on a lot and locus system, one find can contain many individual fragments. The collection of these clothing remains now comprises over 5600 textile fragments and 6300 leather fragments (in addition to textile and leather materials which constituted the ship's equipment, such as sails and pump gaskets). The conditions at the bottom of Stockholm harbour were excellent for the preservation of organic materials, especially protein-based items, so most of the surviving textiles are woollen (about 90 %), with a small amount of silk and only scattered fragments of plant fibres, such as linen or hemp.

In the 1960s, a reconstruction of a "typical *Vasa* sailor" was created based on a cursory examination of some of the better-preserved garments. This figure, known in the museum as "Jerker", wore a short doublet and baggy breeches. No whole breeches were thought to survive, so a pair of breeches was made up of several fragments from different locations. This pastiche has since been shown to include a skirt and the sleeve of a doublet that were both found with the skeleton of a woman (Silwerulv 2021a). It was assumed that the typical sailor's clothing was made of coarse, undyed grey-brown homespun cloth. Even after a more thorough examination of the material in the 1980s suggested a wider variety of weaves, colours, and finishing techniques, and near-contemporary images of Swedish peasants show dyed clothes, the drab image of a crewmember dressed in greys and browns remained the popular image of a peasant of the period (Figure 1).

Since 2017, the museum has engaged in a comprehensive project to document and analyse the entire clothing collection in as much detail as possible in order to provide a thorough and nuanced understanding of how the people on board *Vasa* were dressed when it sank nearly four hundred years ago. Historical records show that about 85% of Swedish naval crews were conscripts with limited maritime experience, and the state did not provide them with clothing. They served in their own clothes, and so what we have is broadly representative of how men eligible for conscription (generally lower class men in coastal districts) dressed. Additionally, the navy allowed sailors to have their wives on board while the ship was in home waters (Haverling 1948). Two of the fifteen skeletons found in the wreck are female. The collection thus encompasses not only the men one would expect to find on a warship, but women as well. Our research program offers a chance to examine how ordinary Swedish and Finnish people dressed, based on a large sample, possibly the largest collection of ordinary people's everyday clothes from any single use context before 1700.

Figure 1. One of the first depictions of how Swedish peasants were dressed, ca. 1675. Unknown artist. (Photograph: C. Heisser, Nationalmuseum Sweden. NMH THC 2570)

16.2. The Vasa clothing

Preliminary results indicate that there is no such thing as a typical *Vasa* sailor, as each man made his own choices about his clothing and accessories. They show some aggregate similarities, with a general preference for certain kinds of garments that were fashionable at the time, despite broad variation in material choices, cut, and accessories. Despite the centuries under water, it is still possible to see a range of colours in the material, from the sombre blacks and deep blues seen in contemporary portraits to madder red and violet-browns which were popular at the time. What is surprisingly rare is cloth which can be clearly identified as homespun.

In the course of the project, we have focused on identifying individual context groups of fragments which can be reconstructed into whole garments as the first stage. This chapter reports on one such context, a suit of clothes with shoes found in a cask of personal possessions, and what they can tell us about the owner.

16.3. Clothing and context

The clothing finds, both textile and leather, come from three different kinds of contexts. Most of the material was encountered as loose finds, lying on the decks and mixed with a wide variety of other kinds of objects, some of which may be related and much of which is not. A smaller number of finds come from inside closed containers, primarily chests and casks full of personal possessions. These include other finds, which can usually be traced to a single individual, and so can be used to broaden and deepen the picture of the owner. Finally, most of the human remains encountered inside the ship had associated clothing remains. In some cases, this included largely intact garments encasing the bones, while in others fragments of cloth or leather were found in close enough association with the remains to be confident of an association. In these cases, the clothing can be compared to the human remains to address questions of size. With shoes, some aspects of gait can be determined from wear on the soles and insoles, which can be compared to relevant features in the foot and leg bones.

Where textile and leather fragments were not found in closed containers, there can be some challenges in reassembling all of the fragments that belong to the same garment. Most of the woollen garments were sewn with bast fibre thread, which broke down relatively quickly, rendering whole garments into groups of pieces which could then be scattered by forces affecting the interior of the ship, such as the extensive salvage work carried out on the wreck in the 1660s. As the cloth itself broke down, the fragments could be similarly scattered, again seen in the salvage work of 1956–1961. Because the excavators could not determine which mud-encrusted fragments belonged together, they recovered all of the fragments in a particular area under a single find number. A single find number can include parts of different garments, and a single garment can be distributed among several find numbers. We must compare large numbers of fragments found over a wide area to be sure that all of the parts of a single garment can be identified. To systematise this process, the finds have been collected into context groups on the basis of proximity, and the initial documentation phase is an examination of the entire context group, which can include hundreds of fragments, to identify which belong together.

16.4. Method

The purpose of the documentation is to allow detailed research as well as to preserve as much information as possible, as the material is very fragile. At the beginning of the project we realised that we needed to collect more data than could be recorded in the museum catalogue, which is primarily used for curatorial rather than research purposes. We also needed to combine the information from the objects with contextual data.

While working with the textile finds we developed a comprehensive documentation system, SATin (System for Archaeological Textile in-depth documentation and analysis). The method is a further development of the techniques published by Walton and Eastwood in 1983, which was used when the finds were initially registered in the 1980s, and incorporates approaches from archaeology, dress history, material culture studies, cognitive psychology, and practical knowledge. The method is not yet published but has been presented at the Centre for Textile Research conference in 2021 and a number of regional and international seminars and workshops; this method will also be published in a separate article by the developers.

The documentation of each find encompasses fibre, thread, and textile technique through microscopy, measurement, and text description. Microscope photos were taken of all textiles. A Dino-Lite Edge AM7915MZT was used to take standard photos in x30 magnification to show the features of textile technique. If possible, a better-preserved fragment was chosen as a representative for the textile. If a specific textile quality contained a lot of variation, more pictures were taken to provide a comprehensive record. The standard photos were also used to measure thread thickness and spinning angles. If the fragments contained traces of seams or other important details, they were also photographed. To study the fibres and finer details, a NIKON Eclipse LV100ND microscope with up to x200 magnification was used.

Beyond this, fragments which had traces of cut, sewing, and decoration were subjected to more intensive study of details, to allow for broader analysis. Both sides of each such fragment were drawn at 1:1 to highlight all of the significant details. The drawings both preserve the information and are an essential tool in the analysis and reconstruction of whole garments. Traces of seams were recorded and described, and the fragment was photographed with either a SONY ILCE-7RM2 or a NIKON D750 camera to record both overall appearance and details. Most of the data was entered into the museum's curatorial database, which is accessible to the public via the platform Digital Museum (www.digitaltmuseum.se). This is only available in Swedish, but a much more comprehensive database in English has been developed within the project, and we hope to make this available on an Open Access platform.

The documentation also provides a basis for the reconstruction analysis of the garments. The information on the individual fragments was used to puzzle them back together to garment parts first and then, if possible, into whole garments to provide some idea of how these looked and were constructed. Practical experiments and full-scale reconstructions of whole garments also played a role in the interpretation of traces in the finds. Deeper analysis of pigments and finishing techniques will be carried out in the future.

16.5. Cask 08680 and Baltzar

Over twenty relatively intact chests and casks full of personal possessions were found in the ship, many of them piled on the two gundecks at the forward end of the ship, which were the main crew accommodations. This seems to be a temporary stowage solution at the start of the maiden voyage,

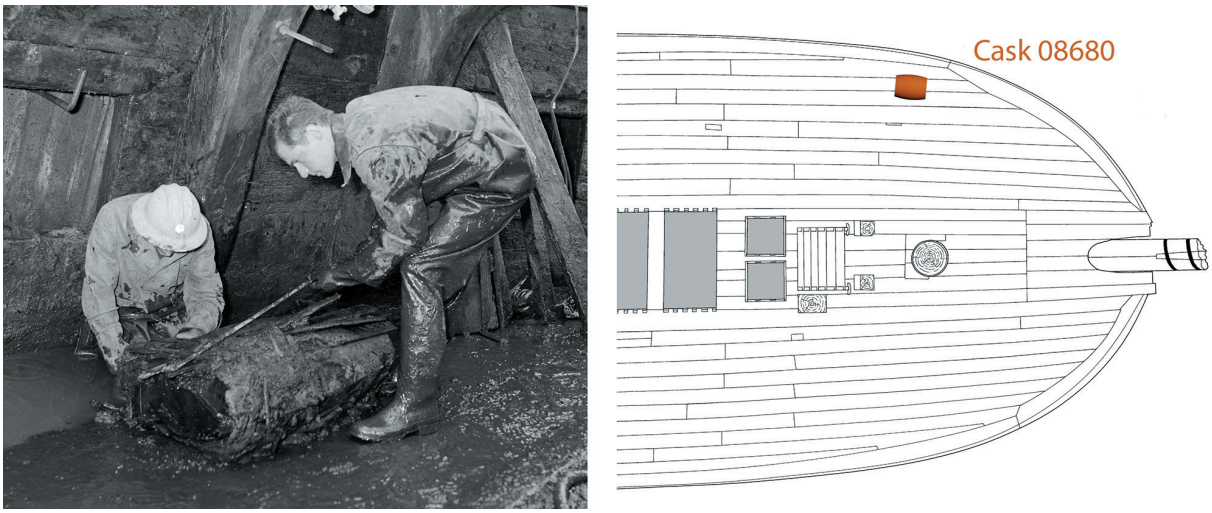

Figure 2. Archaeologists blocklifting cask 08680 during the excavation in 1961. It was found in the bow among a group of casks and chests of personal possessions. (Photograph: Statens maritima och transporthistoriska museer, Drawing: F. Hocker, SMTM)

and one can imagine that these containers would eventually have been stowed more carefully, as they were in the way of handling the anchors and the forwardmost cannon. Among these finds was a mostly intact cask (Find number 08680) which was block lifted and then excavated in the conservation laboratory (Figure 2). It proved to contain the possessions of a single person. In addition to a well-preserved doublet, fragmentary breeches and largely intact shoes, the cask contained a cooking pot, bowls and spoons, a small hammer, two awls, a lump of wax covered in marks left by drawing thread over it, a wooden bord game, and 295 copper coins (Figure 3).

The pieces of the board game were previously thought to be a *svepask* (bentwood oval box common in Sweden) Bentwood boxes were commonly used in Sweden to store small items for mending clothing and shoes, like needles, thread and wax, a sewing ring or thimble, and wooden shoe pegs. We have seen several examples of this practice in other closed finds on board *Vasa* (Forssberg 2021: 63–74;

Figure 3. Other finds from cask 08680. (Photograph: Statens maritima och transporthistoriska museer)

Figure 4. All of the textile finds from cask 08680. (Photograph: J. Lindegren, SMTM)

Silwerulv 2021b: 109–125). There was also a sword belt, made of cord wrapped in fine, embroidered leather, with brass clasp, buckles, and other hardware. This would be worn with a rapier; the correct type of rapier was also found nearby. It is too long to fit in the cask, and while it is not possible to make a clear association between the objects due to the number of containers in the area, this cask is the only container to include a sword belt.

We have given the fictive name of Baltzar to the owner. The people who were on board the ship are largely anonymous, except for the officers who survived to testify at the inquest and one older man, Captain Hans Jonsson, who died in the wreck (whose remains we believe we have identified). Baltzar may in fact be one of the surviving officers whose possessions were left behind, but in the meantime we have proceeded with a neutral assumption of his identity. This provides the interesting challenge of seeing how much we can determine about a person from their possessions alone.

16.6. From fragment to garment

Nearly 600 textile fragments were recovered from the cask (Figure 4). Analysis has revealed seven different types of woollen cloth, two types of bast fibre cloth, and tablet-woven silk banding. Most of the cloth is fragmentary, and while many of the fragments preserve cut edges and seams that indicate they were once part of garments, they must be reconstructed to determine what garments these once were. Two qualities of woollen cloth make up about 80 per cent of the fragments, and these were subjected to detailed study first. It was determined that they comprise two garments, a doublet and a pair of breeches.

The breeches consist of about 300 fragments of a thin, plain woven cloth, evenly made, of fine quality, and probably professionally woven (Table 1). The threads are s-spun in both directions and the fibre, thread thickness, and spin angle indicate that the same type of thread was probably used for both warp and weft (Figure 5). The nap has almost completely disappeared, but preserved in a few protected spots. These show that the cloth was brushed and sheared to produce a short, tight nap which concealed the weave. Today the cloth is very fragile. The colour, a plum brown, is still visible, although it has probably darkened due to tannins in the water from the cask's oak staves. Originally it may have had a more reddish violet cast, which can be seen in areas which have darkened less. The

Table 1. Find no. 14398f.

Woollen cloth	Thread count	Yarn thickness [median]	Spinning direction	Spinning angle [median]
Trs 1	8–10 tr/cm	0.60–0.94 mm [0.67]	s	16.86–29.53 [25.98]
Trs 2	7–9 tr/cm	0.66–1.06 mm [0.99]	s	10.22–22.24 [11.69]

colour was fashionable in Sweden in the early 17th century and may have been one of the two purple shades called *tanet* and *fiolenbrun* ("violet brown"). One of King Gustav II Adolf's preserved suits of clothes in the Royal Armouries collections is purple (Livrustkammaren; Aneer 2009: 184). We do not yet know what colourant or colourants were used, but hope that pigment analysis will prove possible.

Despite their deteriorated state, the fragments have abundant evidence of cutting, sewing, and other construction details (Figure 6). Many of the fragments have been "puzzled" back together by comparing thread thickness, weaving faults, cuts, seams, stains, and breaking patterns between fragments. Drawing at 1:1 was especially helpful in this work, as it allowed stitch holes to be matched and distortions in the weave caused by pleats and folds to be followed, as well as to match stains and other post-depositional features across fragments. The use of the drawings allowed objects to be returned to display cases, and minimised the need to handle the fragments themselves. Over-exposed photography was also useful to reveal discolorations and stains. The easiest and quickest way to produce these images while working is to use a cell phone camera (we used an iPhone 7 plus), and adjust the light

Figure 5. The woollen fabric from the breeches (Find 14398f), Dino-Lite USB-microscope x30 magnification. (Image: J. Lindegren, SMTM)

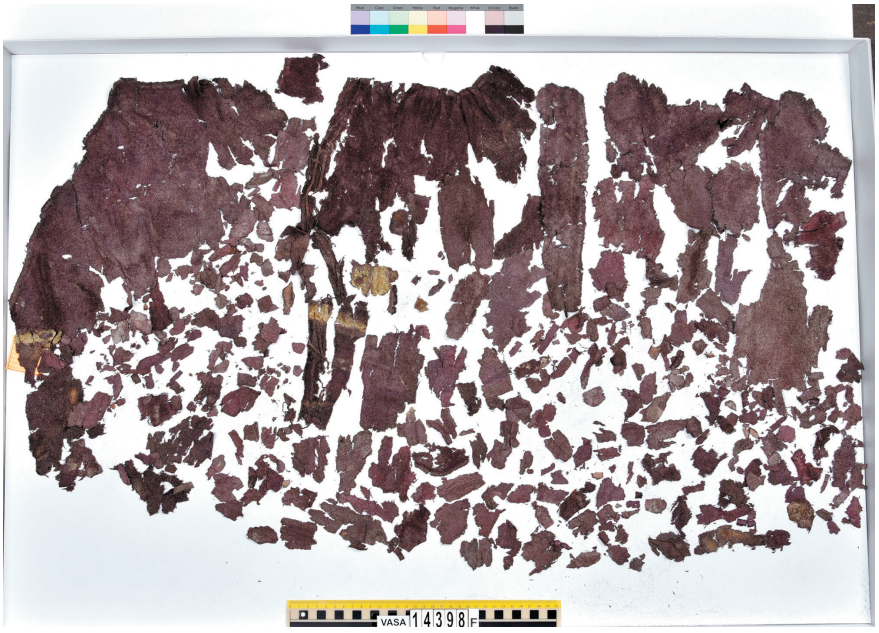

Figure 6. Breeches (Find 14398f) before reconstruction analyses. (Photograph: T. Andersson Berggren, SMTM)

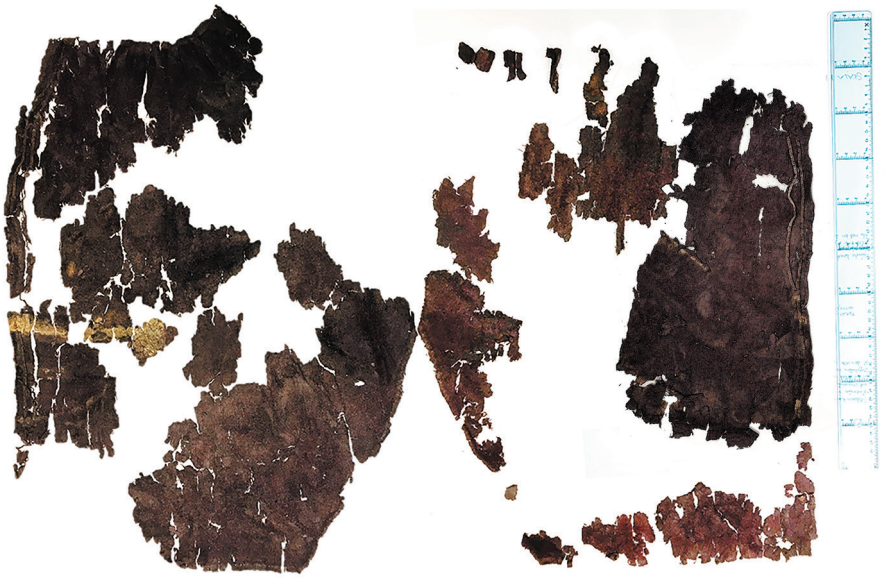

Figure 7. The result of puzzling fragments back together during reconstruction analysis. Front and back of one leg of a pair of breeches. (Photograph: A. Silwerulv, SMTM)

settings before taking the picture. Adobe Photoshop also offers a lot of possibilities for adjusting the light and colour setting to make stains and discolorations easier to see and analyse.

The fragments which could be reassembled came from two parts of a leg and parts of the waistband. The two leg parts seem to be cut in the same way, but too much of the crotch seam is missing from one piece to be certain that there was not some deviation. Even so, small irregularities in the cut edges show that the two parts were cut together from doubled cloth, which suggests that the crotch seam is likely to be the same in both the front and in the back. This, as well as the shape of the rise, led us initially to interpret the pieces as the two front parts of the legs, but closer analysis of the outer leg seam fragments shows that the stitch holes and form align, which means that the pieces are the front and back of the same leg (Figure 7).

A few narrow fragments of another cloth were found sewn into the outer leg seam, creating a small, raised ridge. These may be the remains of a pocket, but too little survives for the identification to be certain (Figure 8). Pockets could be placed in the outer leg seam or could be located at a slit in the front part, just in front of the outer leg seam. On the inside of the cloth nearer the wearer's skin, there are small fragments of a bast fibre fabric, which may be plain woven; this indicates that the breeches were lined. The fibre has not yet been analysed, but linen was commonly used in linings at this time (Aneer 2009: 218). In other parts of the outer leg seam it is apparent that the breeches were altered at some point, with the waist taken in. Gathering at the waist and a part of the waistband strongly suggest that this is the right leg. A similar pair of breeches, with the front and back cut identically, can be seen in the Spitsbergen material (Comis 2017: 521).

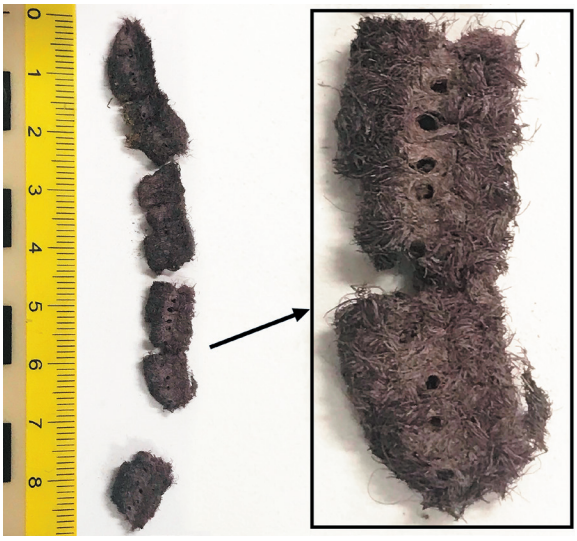

Figure 8. Even the smallest fragments can contain significant information. This tiny seam fragment includes trapped fragments of another component, probably from a pocket inserted in the side seam. (Photograph: A. Silwerulv, SMTM)

Figure 9. Left: Thin, waxed, single-strand, bast fibre thread, used to construct the breeches. Right: Two-ply silk thread, used for fastening the silk bands next to the side seams. (Images: SMTM)

Analysis of the seams shows that the garment was carefully made and sewn, with durability in mind. If one compares it with Gustav II Adolf's surviving clothes, the stitches are considerably shorter and tighter, recalling the fine stitching seen in linen garments of the period (Aneer 2009). This fine seaming appears in many of the woollen garments from *Vasa*. While there is not much left of the sewing thread, what does survive is single ply and appears to have been waxed, which was a common practice. The thread is so deteriorated that it is not possible to determine the spinning direction (Figure 9).

The full length of the outer leg seam is decorated with four lengths of a beautiful little tablet-woven silk band, only 3–4 mm wide. The bands are placed in pairs, symmetrically on either side of the seam, and sewn to the cloth with fairly coarse, two-ply S-twisted silk thread of a type usually called *sticksilke* in contemporary Swedish sources, similar in quality to modern buttonhole twist. It was commonly used for decorative seams and buttonholes (Aneer 2009: 230). These stitches are distinctly different from the seam stitching, much larger and more obtrusive (Figure 10). It may mean that the bands

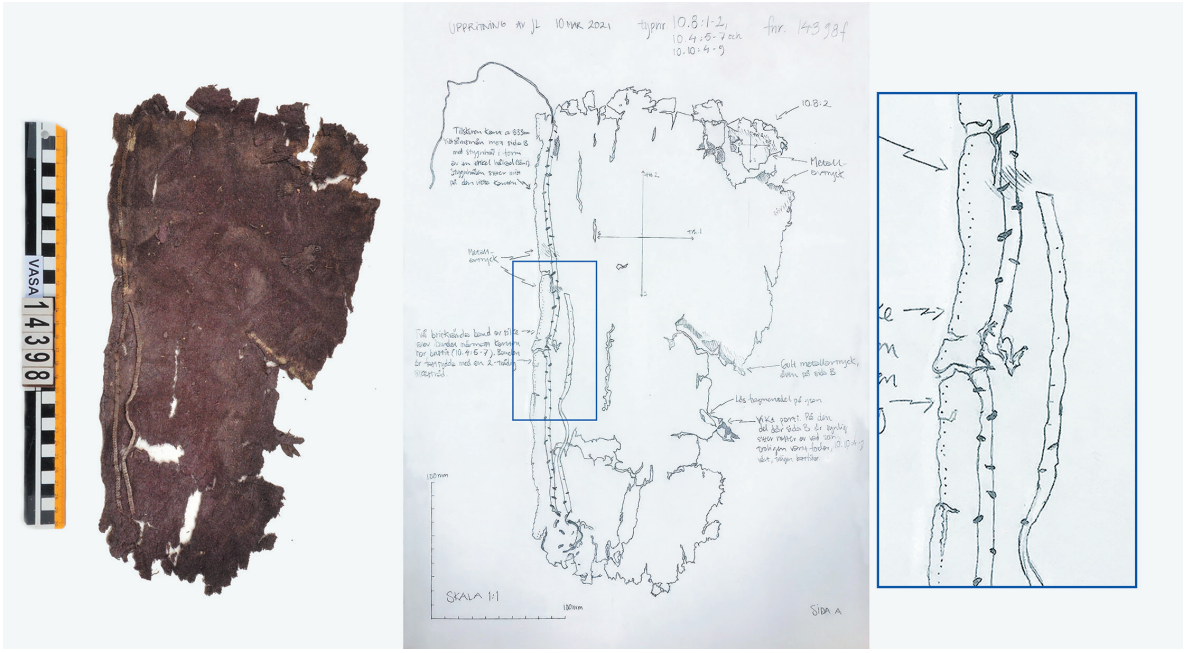

Figure 10. During documentation all important information is recorded in 1:1 scale drawings. The detail shows the fine stitching in the side seam and the coarser stitching fastening the decorative band. (Photograph: T. Andersson Berggren, Drawings: J. Lindegren, SMTM)

Figure 11. The tablet woven silk band in detail. (Photographs: A. Silwerulv and J. Lindegren SMTM).

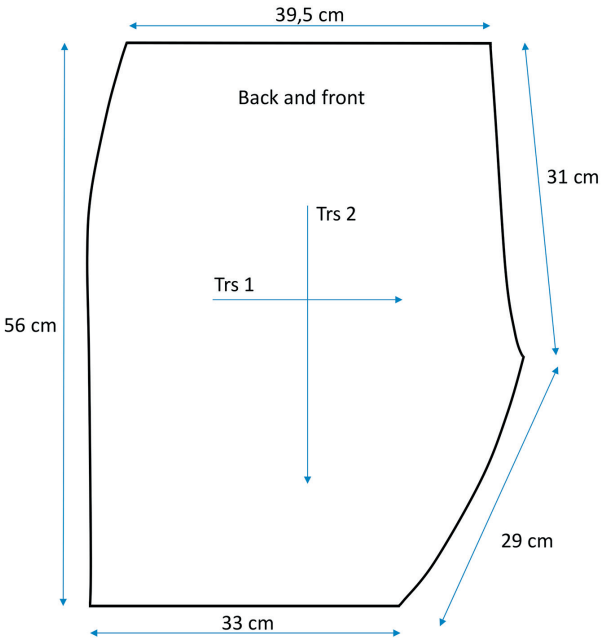

Figure 12. Reconstructed pattern of the breeches. (Pattern: Anna Silwerulv SMTM)

were not applied by the same person who constructed the garment, or that it was not only the bands but also the thread was considered an exclusive material. The banding is woven with three pairs of tablets, using reeled silk of two thread thicknesses. The pattern is a striped zig-zag, with alternating thick and thin threads, which gives the band a corrugated or wavy appearance (Figure 11). The colour is now beige, but its original colour has not yet been determined. X-ray fluorescence mapping (XRF), by Marei Hacke at The Swedish National Heritage Laboratory in Visby, shows no difference between the two thicknesses, which indicates they were of the same colour.

Analysis of the pattern shows that the breeches are of a full type ending above the knee, popular elsewhere in Europe since the 1610s (Aneer 2009: 146–154) (Figure 12). By the 1620s fashion had changed, and breeches were cut with a narrower, longer leg. However, the older wide type was briefly back in style in the later 1620s. Baltzar's breeches show that the style was in fashion in the 1620s in Sweden or that the owner simply liked the older or perhaps more comfortable and functional style.

The doublet is one of the better-preserved garments found on the ship. As it is still being studied, only a short summary is presented here. The right front, the single-piece back, and half of a two-piece sleeve survive nearly intact (Figure 13). The other parts, including the collar, shoulder wings, and parts of the skirt, are more damaged but still in better condition than the trousers. The doublet is well-made with a tightly fitting body. The two-piece sleeves with shoulder wings were made with the front seam open to show the shirt beneath. The standing collar has a straight upper edge, and the skirt is of

medium length. A large number of buttons which probably belong to this doublet were also found in the cask. The style came into fashion around 1625 and was still current when *Vasa* sailed (Figure 14).

It is noteworthy that the cloth is much coarser than in the breeches (Table 2). It is a dark brown, plain woven wool which was probably closer to mid-brown originally. The warp is made from noticeably thinner and harder z-spun threads than the looser s-spun weft. The cloth is relatively loosely woven, which makes it more compliant. The surface still has traces of a tight nap which made

Figure 13. The most well-preserved parts of the doublet (Find 14398i). Right front part, back piece, lower part of the right sleeve, collar, and shoulder wing. (Photograph: T. Andersson Berggren, SMTM)

Figure 14. This French portrait shows an unknown young man dressed in a doublet of similar cut, construction, and colour as the doublet in cask 08680. Painter: Mathieu le Nain (1607–1677). Royal museum of fine arts of Belgium. (Photograph: Saliko, Wikimedia common CC)

the uneven weave invisible, although the type of finish has not yet been determined (Figure 15). The back is cut on the bias, which may have given the wearer more freedom of motion. The inside of the cloth and the folds of the seam allowances include fragments of a bast fibre lining. The complete back allows an estimation of the owner's size, and suggests a man about 180 cm tall. This was significantly taller than the average of 166 cm at the time.

Table 2. Find no. 14398i.

Woollen cloth	Thread count	Yarn thickness [median]	Spinning direction	Spinning angle [median]
Trs 1	8–9 tr/cm	0.39–0.80 mm [0.52]	z	25.88–52.43 [34.25]
Trs 2	5–6 tr/cm	0.47–1.20 mm [0.85]	s	24.46–43.47 [34.82]

Figure 15. The woollen fabric in the doublet (Fragment 14398i), Dino-lite USB-microscope x30 magnification. (Image: J. Lindegren, SMTM)

16.7. Conclusion

A more comprehensive report on the two garments, in context with the other finds from the cask, is in preparation, but we can already say a great deal about the owner. He was an unusually tall man of some means. All his garments were of good quality, and his shoes were made in the more expensive of the two shoe construction types seen in most of the *Vasa* footwear, with rounded soles. They also had heels built up of separate lifts, a recent fashion development. He packed a large sum of money, the third-largest single assemblage of coins found on the ship, with a total value equivalent to two month's salary for an ordinary sailor. He owned a fancy sword belt, and most probably a sword, which would have marked him as a gentleman.

His doublet was current fashion for the later 1620s and well made, although not in the finest fabric. His breeches were of good fabric and very carefully made, with sumptuous decoration, even if they were slightly old-fashioned. It is important to remember when looking at these clothes that they are the owner's spare clothes, as he was wearing other clothes and shoes when the ship sank. Not many people could afford two full sets of clothing. Were these his nice clothes for going ashore, and he was wearing coarser working clothes, or was he wearing something even finer than these when he was forced to swim for it?

Since 2018, **Anna Silwerulv** has been head of the Dress research program at the Vasa Museum. She is a dress and textile historian and professionally trained tailor, specialising in historical reconstruction. Her research focuses on textile production and trade, craftsmanship, and the social and economic meaning of clothing in early modern society.

Since 2003, **Fred Hocker** has been the director of research at the Vasa Museum. He was formerly the Yamini Associate Professor of Nautical Archaeology at Texas A&M University. His research focuses on the development of shipbuilding and maritime technology, maritime economics, and the social structures of shipboard communities.

Since 2020, **Josefin Lindegren** has been a part of the Dress research program and is currently documenting the clothing collection at the Vasa Museum. She is a dress and art historian. Her focus lies in 16th- and 17th-century clothing and visual depictions of people in relation to social status and identity.

Since 2017, **Cecilia Aneer** has been part of the team researching the clothing finds at the Vasa Museum. She is a Senior Lecturer in Textile Studies at Uppsala University and a trained tailor. Her research focuses on tailoring techniques, craftsmen, organisation and networks for production of clothing in Sweden in the 16th and 17th centuries.

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