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Investigation and conservation of surface recovered artefacts from HMS Colossus

Angela Middleton, Kevin Camidge, Sarah Paynter, Margarita Gleba

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HMS Colossus
Protected shipwreck site
Isles of Scilly

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SUMMARY

The conservation and investigation of over 50 buttons, a bone brush/ shoe horn and a textile fragment forms the body of this report. The assemblage has been stabilised and in the case of the textile fragment examined and analysed.

CONTRIBUTORS

Dr. Sarah Paynter, Material Scientist, Historic England carried out the material analysis of the buttons. Gill Campbell, Head of Environmental Archaeology, Historic England, contributed to fibre analysis. Dr Margarita Gleba, ERC Principal Research Associate, McDonald Institute for Archaeological Research University of Cambridge carried out the fibre analysis report to be found in Appendix 1.
The archaeological illustrations were done by Judith Dobie, Historic England.

ACKNOWLEDGEMENTS

We are grateful to Judith Dobie, Margarita Gleba and Gill Campbell for their contributions to this report. We are further more thankful to Christopher Gale, National Museum of the Royal Navy for his advice on naval uniforms.

ARCHIVE LOCATION

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Introduction

HMS Colossus was a Courageux class 74 gun warship built in 1787 at Gravesend. In December 1798 *Colossus* was on her way home to England with a remarkable cargo including eight crates of Greek antiquities, wounded sailors from Nelson's victory at the battle of the Nile and the body of a dead admiral. What she did not have on board was one of her spare bower anchors, which had been given to Nelson's ship *Vanguard* in Naples. This would prove to be disastrous. She was sheltering from a gale in St Mary's Roads when the anchor cable parted and she was driven aground to the south of Samson. All but one member of the crew were taken off safely before *Colossus* turned onto her beam ends and proceeded to break up.

The wreck of *HMS Colossus* lies in 15m of water to the south of the island of Samson in the Isles of Scilly on a flat seabed consisting of light grey, coarse sand. To date two main areas of wreckage have been identified, the bow and the stern.

Roland Morris, a marine salver, began searching for the wreck of *Colossus* in 1967 using a small team of divers. In August 1974 they located material relating to *Colossus*. A large quantity of pottery – the remains of Sir William Hamilton's second collection of antiquities - was recovered and deposited in the British Museum (Jenkins & Sloan, 1996), where some of it is now on public display.

In 1975 part of the wreck (the bow) was designated under the Protection of Wrecks Act. This designation was revoked in 1984.

Areas of exposed timber and iron guns were discovered by divers in 2001; over 300m to the east of the area worked by Morris and turned out to be the stern half of *Colossus*. The discovery of these guns and a large carved human figure - part of one of the quarter pieces from the stern of the vessel - led to the re-designation of the site in 2001. What also makes this site so different from the many others in Scilly is the extent and remarkable preservation of the timber. When first uncovered, the timber appears perfect with fine surface detail visible. This was particularly apparent on the stern carving where much intricate detail was preserved intact (Camidge, 2002). It was clear that this timber had not been exposed on the seabed for the last 200 years. Indeed, by May 2002 it was apparent that timber which had appeared perfect when first seen in 2001 was exhibiting signs of decay. Furthermore, it was also clear that more of the wreck was emerging from the seabed as time went on.

The wreck had been preserved because it was buried in the seabed sediment. Observation of the site since June 2001 has shown a steady diminution of the

sediment levels over the wreck. It is unclear whether it is a cyclic phenomenon or a more long-term trend.

The site of *HMS Colossus* has been subject to several Historic England (previously known as English Heritage) commissioned projects. An overview of previous work, as well as project reports can be found at: http://www.cismas.org.uk/projects.php [accessed 01/06/2015].

2014 diving

In 2014 the Cornwall and Isles of Scilly Maritime Archaeological Society (CISMAS) was commissioned by Historic England to undertake maintenance work on the sediment level monitoring points around the wreck. During this work newly exposed material was discovered to the east of the wreck. Part of this material consisted of a small concentration of personal items. The personal items comprised a bone brush with a shoe horn incorporated into the handle [F1100], a leather shoe sole, an area of fabric [F1153] and a collection of 53 buttons (F1101-F1152). The items were all found within close proximity to each other (Fig 1) and as such may well have originally been constrained by a small container such as a bag. Apart from the shoe, which was left in situ, all above mentioned artefacts were recovered under a surface recovery license and handed over to the Historic England conservation lab, at Fort Cumberland, Portsmouth.

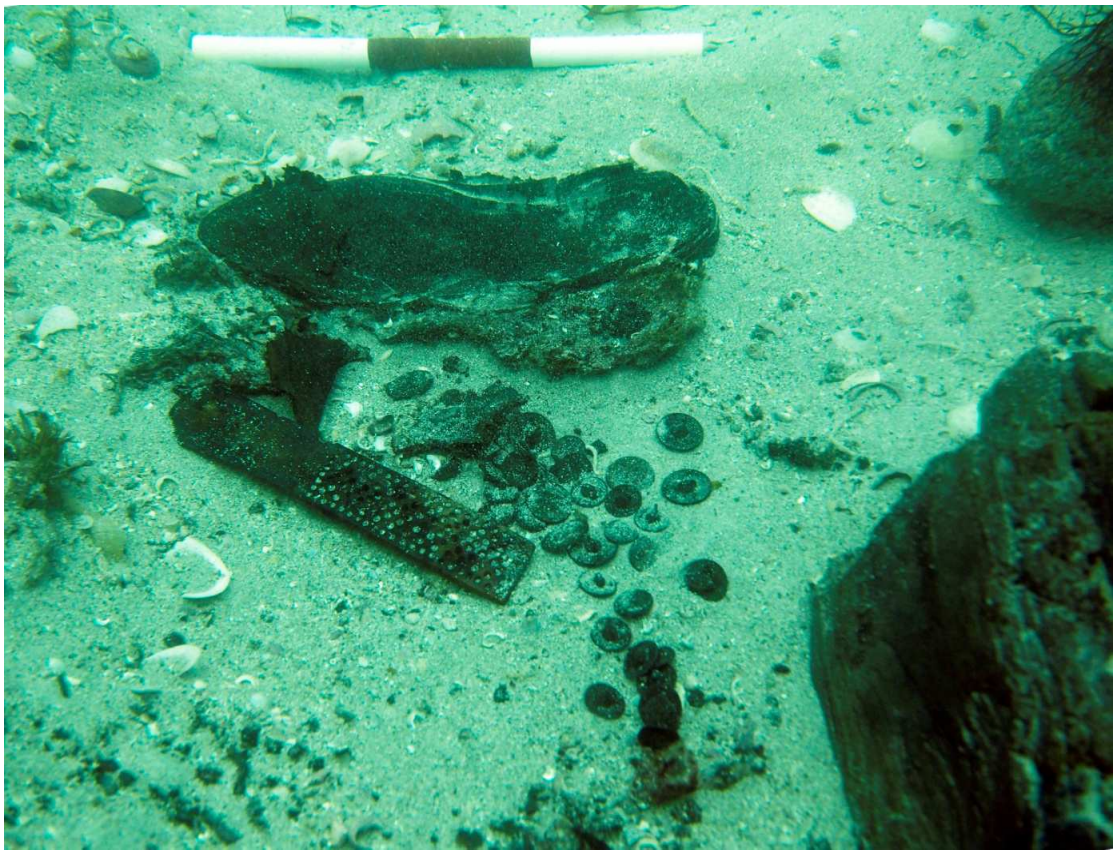

Fig 1: Leather shoe sole (next to scale), area of fabric (below the shoe), bone brush/shoe horn and a group of 53 pewter buttons

Conservation assessment

Artefacts were delivered wet. The assessment included an inspection, in most cases under the microscope and using X-radiography.

The brush

The brush is in a very good condition. It is made of an osseous material[1] (bone or antler) and copper alloy wire (Fig 2 and 3). The bristles have not survived.

[1] Identification by the zoo-archaeologist to species level was not possible, as the brush is heavily worked and most diagnostic features have been removed.

Fig 2: Brush, front, before conservation

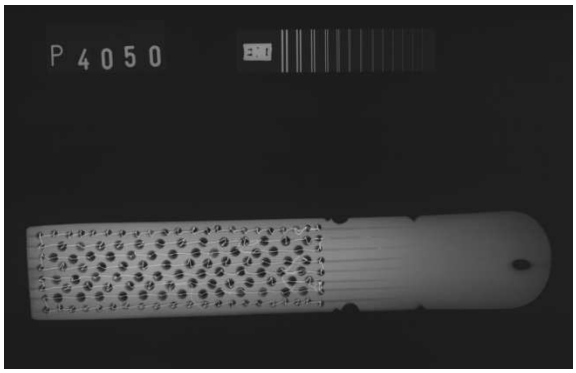

Fig 3: X-radiograph of brush

The buttons

The buttons are tarnished and some are obscured by grey corrosion products. There are four different types of buttons: large button with fouled anchor design (Fig 4), small button with fouled anchor design (Fig 5), Sussex Regiment (Fig 6) and plain small button (Fig 7). Apart from the two plain buttons (Fig 7), which have integrated eyelets, all others had added iron eyelets, which have not survived.

Fig 4: Button F1102, front, before conservation

Fig 5: Button F1147, front, before conservation

Fig 6: Button F1150, front, before conservation

Fig 7: Button F1152, front, before conservation

The textile and leather fragment

The textile was block-lifted in a small tub (Fig 8). It contained a lot of silt and was covered in some sort of black material. When X-rayed it became clear that the assemblage also contained 3 buttons. The plain weave of the highly fragmented textile is clearly visible on the X-ray (Fig 9).

On further examination it was established that the three buttons were not attached to the textile. They were removed and treated as described below.

When the content of the plastic tub, which the textile was block-lifted in, was tipped over, to examine the underside, a piece of leather was discovered (Figs 22 and 23).

Fig 8: Block-lifted textile

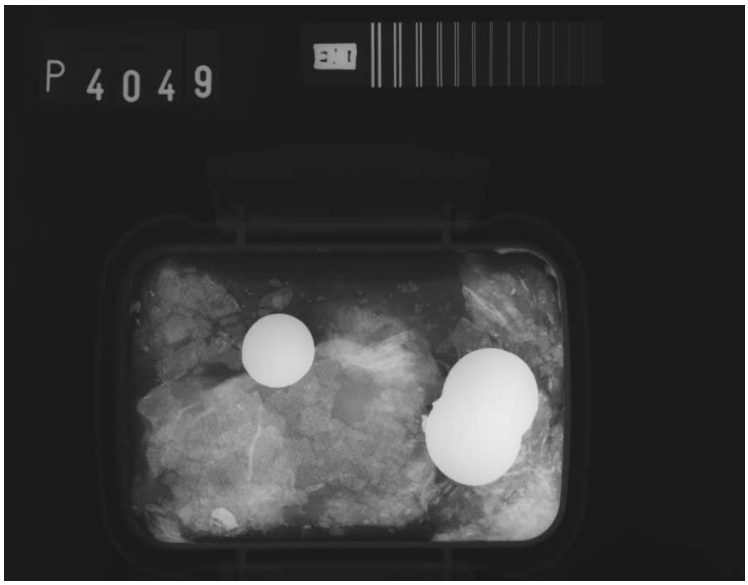

Fig 9: X-radiograph of block-lifted textile, with buttons

Conservation

Desalination

The brush and the buttons were desalinated in distilled water. The conductivity of the wash water was measured and once a stable reading below 100mS/ cm was achieved, the artefacts were slowly air dried.

Drying was undertaken at ambient conditions inside a box or on a tray with a cover. The condition of the artefacts was checked periodically and the lid was lifted off at intervals until drying was complete (Figs 10-17).

Fig 10: Brush, front, before desalination/ drying

Fig 11: Brush, back, before desalination/ drying

Fig 12: Brush, front, after desalination/ drying

Fig 13: Brush, front, after desalination/ drying

Fig 14: Button F1104, front, before desalination/ drying

Fig 15: Button F1104, back, before desalination/ drying

Fig 16: Button F1104, front after desalination/ drying

Fig 17: Button F1104, back after desalination/ drying

Analysis of the buttons

X-Ray Fluorescence (XRF) analysis was carried out to establish the composition of the buttons. One of each type were analysed (F1110, F1139, F1149, F1151) (Figs 18-21). Corrosion was removed in a very small area on the back in order to analyse the underlying un-corroded metal.

Apart from F1149, which is a tin button with traces of lead, the other three buttons (F1110, F1139, F1151) proved to be pewter with a low copper content.

Fig 18: Pewter button F1110

Fig 19: Pewter button F1139

Fig 20: Tin button F1149

Fig 21: Pewter button F1151

The textile and leather fragment

The leather was not attached to the textile and was removed for cleaning and a two-week impregnation with 30%PEG400, followed by vacuum freeze drying (Figs 24 and 25).

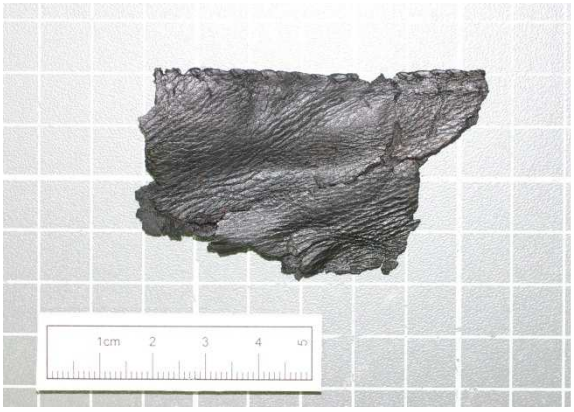

Fig 22: Leather found together with textile, grain side, before conservation

Fig 23: Leather found together with textile, flesh side, before conservation

Fig 24: Leather found together with textile, grain side, after conservation

Fig 25: Leather found together with textile, flesh side, after conservation

Examination of the fabric under the microscope revealed, that there were probably two layers of textile underneath the black substance (Fig 26). The red fabric was very soft and disintegrated easily. The white fabric appeared as plain weave on the X-ray, and broke up easily into chunks. The black substance has taken on the impression of the white textile underneath it. The textile is in a very poor state of preservation. Its potential for survival and conservation is very low.

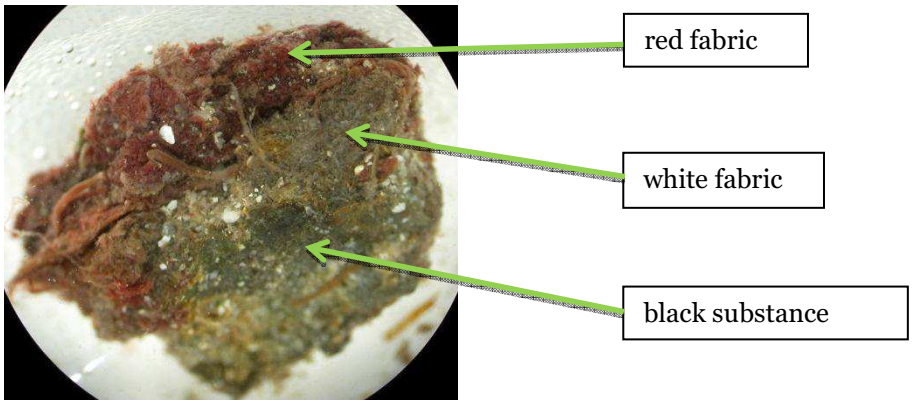

Fig 26: Layering of the textile

In an attempt to investigate the materials used for this artefact, fibre identification was undertaken. Transmitted light microscopy revealed plant fibres for both fabrics (Fig 27 and 28). A partially processed stem or leaf fibre was used for both fabrics. A more precise analysis is not possible due to the poor state of preservation.

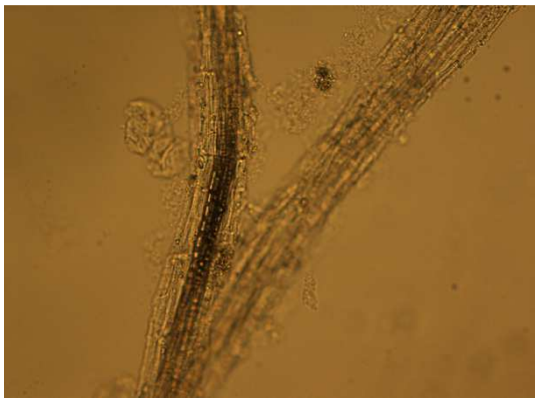

Fig. 27: Fibre sample of the white fabric at x200 magnification

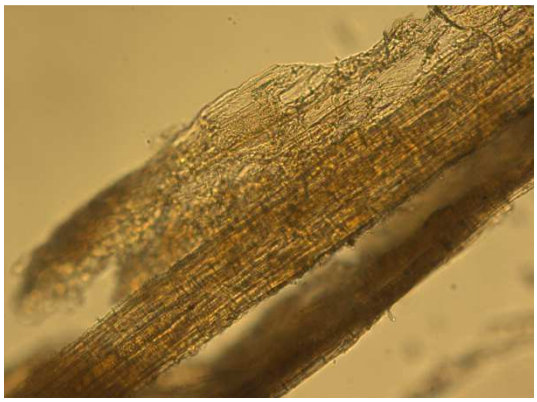

Fig 28: Fibre sample of the red fabric at x200 magnification

Samples of both fabrics were analysed by M. Gleba, University of Cambridge. Her full report can be found in Appendix I.

Fig 29: Circular striations running around the inside of the hole as evidence for drilling (hole diameter 5.5mm). The longitudinal/ vertical striations are from deposits that formed around the bristles.

Description/ Interpretation of Assemblage

The brush

The overall dimensions of the brush are 180mm long by 33mm wide. The handle is as wide as the brush itself and curves slightly towards the back (Figs 30 and 31). The width and curvature suggest that it could have been used as a shoe horn as well as a clothes/ shoe brush.

Channels/ grooves have been cut into the back to accommodate copper alloy wire, which once held the bristles in place (Fig 30). The wires run along channels in the back of the brush, and when looping into the hole, turn 90º. Several pieces of wire have been used and "knots" can be observed.

Holes were drilled to accommodate the bristles, which have not survived. The holes around the outer edge are slightly smaller in diameter (2.5mm) than the holes in the middle (3.5mm). The smaller holes form a rectangular "box" of holes alongside the outer edge. The holes in the middle are offset. Furthermore the holes taper in diameter from front to back suggesting that holes were drilled from the front of the brush. Circular striations from the drilling can be observed inside the holes (Fig 29).

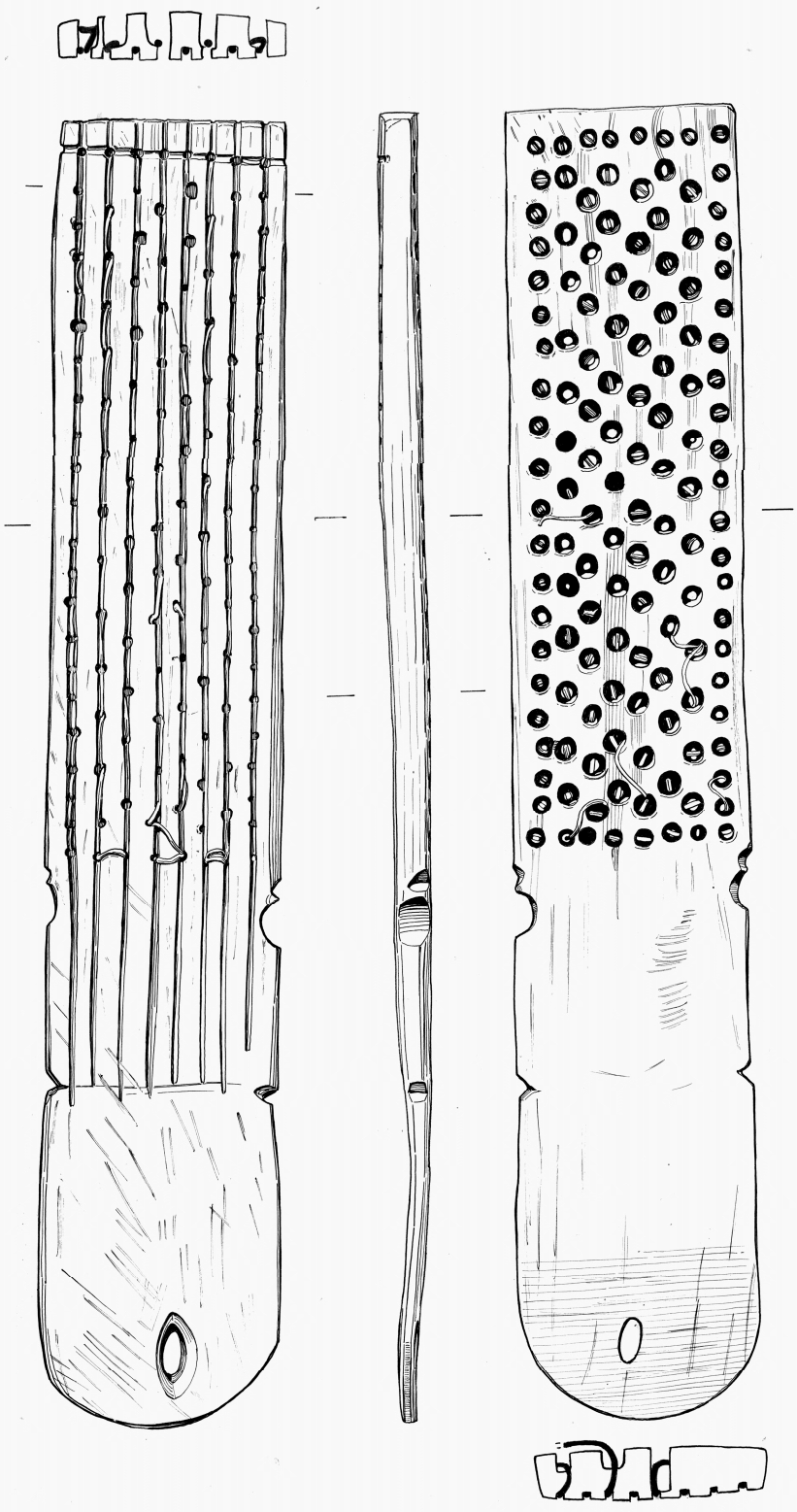

Fig 30: Illustration of the brush (printed at roughly 1:1)

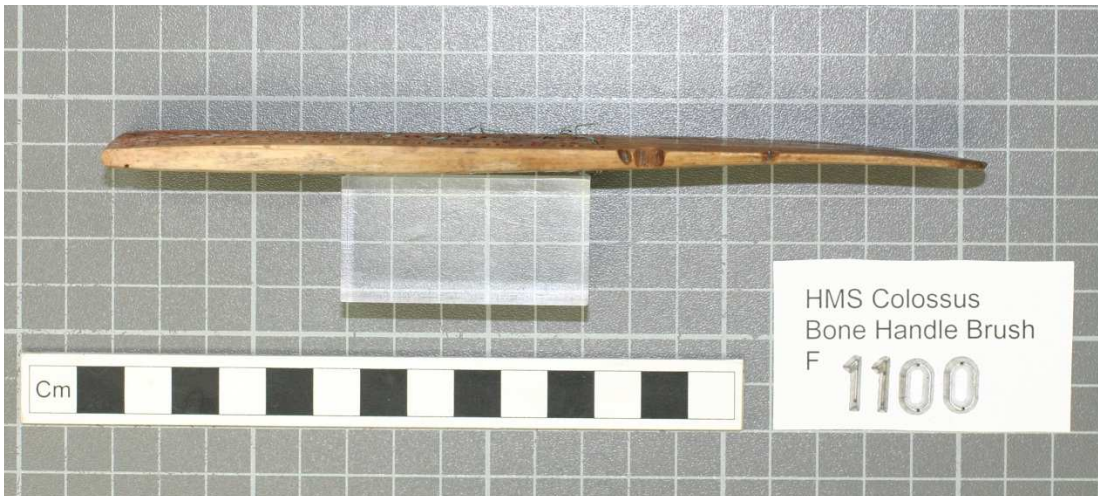

Fig 31: Side view of the brush illustrating the curvature of the handle.

Similar brushes have been found on the *Invincible and HMS Colossus* during previous excavations. Brush 339 from the *HMS Colossus* (Fig 32) is almost identical, in that the holes are of two different sizes and similar placement; down to the carved decoration at the bristle/ handle junction. Quite different though are the initials 'CP' carved into the handle. The brush fragment (Inv/88/315) from the *Invincible* (Fig 33) also tapers at the bristle/ handle junction but has regularly placed holes of the same size.

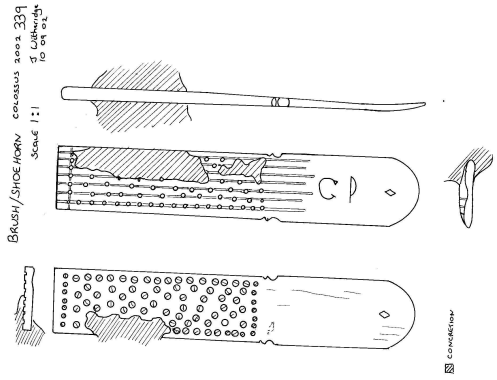

Fig 32:Brush (339) from the *HMS Colossus*

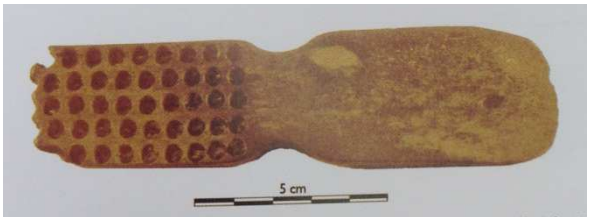

Fig 33: Brush (Inv/88/315) from the *Invincible*

The buttons

The buttons were all found in close proximity to the fabric remains. Indeed some of the buttons appeared to be incorporated within the fabric – three additional buttons were found to be within the fabric sample [F1153] when this was x-rayed (Fig 9).

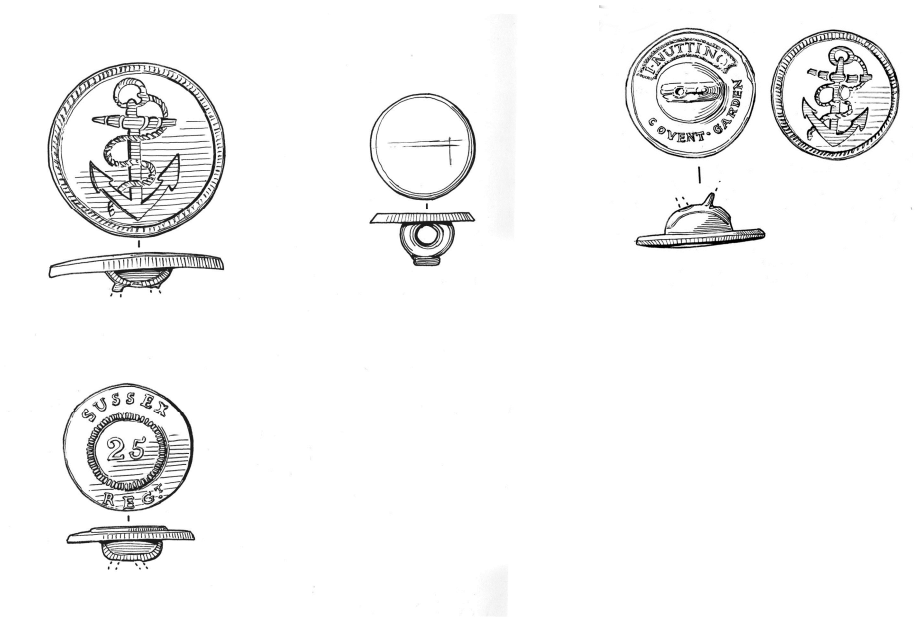

Fig 34: Illustrations of the four button types (F1102, F1147, F1150, 1152) (printed at roughly 1:1)

In total, 53 buttons were recovered and, in terms of their construction and decoration, these fall into four distinct types (Fig 34): large fouled anchor buttons, small fouled anchor buttons, small regimental buttons and small plain buttons. These buttons are all made of grey metal, which can be loosely grouped as lead / tin alloys (Read 2010), however pXRF analysis has identified their composition more accurately as either tin or pewter.

The first type consists of 14 larger (23mm diameter) pewter buttons with a fouled anchor design on the face (Fig 18). An almost identical pewter button (In/85/005) was recovered from the wreck of *Invincible* (Bingeman, 2010).

The second and most numerous type of button recovered was 35 smaller pewter buttons (17mm diameter), again with a fouled anchor design on the face. The majority (30) of these have a maker's name stamped on the reverse 'I NUTTING COVENT GARDEN' (Fig 19). Joseph Nutting is a known military button maker working in Covent Garden, London in the 18th and 19th centuries (Nayler, 1993).

By the time of a 1791 directory, it was Joseph Nutting "army button maker". The "J" was shown in the Roman form "I" on the backs of buttons (Dorgan, 2014).

A similar 17mm fouled anchor button was found on *Invincible* (Inv/83/0124) – but in that example the maker's mark reads 'I NUTTING AND SON COVENT GARDEN' (Bingeman, 2010).

The third type found consisted of only two smaller tin buttons [F1149 and F1150]. These are marked on the face with '25 SUSSEX REGT' (Fig 20). The 25th regiment were renamed the 25th (Sussex) regiment of foot in 1782. A clue as to how these came to be on *Colossus* is given by the following – taken from the Kings Own Scottish Borderers Association web site:

At the outbreak of the French Revolutionary War the 25th was in Plymouth, and between 1793 and 1797 supplied marine parties for service aboard warships in the Mediterranean, the English Channel and the North Sea. (Kosba, 2014)

The three button types described above (the small and large pewter fouled anchor buttons and the small tin regimental buttons) are all composite two piece cast buttons with separate embedded drawn iron wire shanks (Read 2010).

The final type of button consists of two small buttons (14mm diameter), which are both plain flat cast disks, with an attachment hoop on the rear (Fig 21). These two fall into the following category: cast one-piece pewter buttons with simple looped shank (Read 2010).

Pewter fouled anchor design buttons were worn by marines from 1770 up until 1802. Naval and Marine officers also wore fouled anchor buttons, but these would have been gold or silver, so the pewter buttons of this design probably belonged to a rank and file marine. These are not likely to have been worn on the same uniform as the 25th Sussex Regiment buttons. This suggests that the collection of buttons found may represent a collection of 'spare' buttons rather than the remains of a uniform jacket. (Personal Correspondence with Christopher Gale of the National Museum of the Royal Navy).

The textile

The textile is in a poor state of preservation. No technical information could be revealed about the red fabric. The white fabric, which is slightly better preserved, can be described as an even tabby weave, made from z-twisted yarn (see Appendix, page 5 for further information). A fibre from a plant not native to the UK is possible, given the route *HMS Colossus* travelled. No further features, such as edges or closing mechanisms were noted on the fragments. The interpretation as a bag containing spare buttons is an assumption but most likely.

Conclusion

This report shows how a multidisciplinary approach can be used to research and conserve an assemblage. The results will contribute to the already existing archive from the *HMS Colossus*. One of the challenges working on surface collected material is that observations and analysis are often carried out by different institutions or personnel and often with considerable time gaps in between. The chance to look at the whole assemblage is in most cases not possible. It is therefore even more important to report on findings and results along the way. Some interesting results came out of the analysis of the buttons. Sadly the fibre analysis and interpretation of the textile fragment remained inconclusive. Further work on the site in the future may be able to address this.

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Appendix I

Report 2015/5 Fibre Analysis	Analyses by: Margarita Gleba	Submitted to: Angela Middleton (Historic England, Fort Cumberland, Portsmouth PO4 9LD)	Date: Submitted 9 November 2015 Updated 12 April 2018

Fibres from HMS Colossus

Report on Fibre Analysis

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1. INTRODUCTION

The present report concerns fibre identification of three small samples from a block-lifted textile fragment found at the protected shipwreck site of the *HMS Colossus* near Isles of Scilly. According to the Historic England online entry (http://www.historicengland.org.uk/listing/the-list/list-entry/1000078), "HMS Colossus was a 74-gun third rate ship-of-the-line built at Gravesend, and launched in 1787. Her last naval engagement was at the Battle of Cape St Vincent (1797), during the course of which she was badly damaged. The Colossus was stripped of her stores to repair the serving ships, and ordered to return to England, carrying wounded from the battle, along with prize items and part of a collection of Greek antiquities amassed by Sir William Hamilton. The Colossus approached the Channel in December 1798, and Captain Murray decided to take anchorage in St Mary's Road in the Isles of Scilly to await favourable winds. On the 10 December the main anchor cable parted in the gale, and the ship dragged her remaining anchors to come aground on Southward Well Rocks. The Colossus was subject to extensive salvage in the year following her wrecking, before she finally broke up."

A small fragment of what appeared to be a textile was found on the site in the summer of 2015 and block-lifted. An initial X-ray was carried out by Angela Middleton, which showed that the block contained a rather fragmented textile (**Fig. 1**). According to Angela Middleton (e-mail communication 25.08.2015), "There were 3 buttons and a piece of leather together with the textile fragment. They were not attached to the textile and have been removed and conserved separately. There were over 50 buttons in total, of different design." It is thus unlikely that the textile was part of a uniform but rather part of a bag that originally contained the buttons. Initial cleaning revealed several layers of organic material covered in brown matrix (presumably silt and other organic matter), including top dense and almost black layer with clearly visible tabby textile impression; areas of fugitive red layer of mushy consistency; and a whitish layer of the textile itself preserving fibres (**Fig. 2**). As it proved impossible to clean the textile without it completely disintegrating, a few fragments were air-dried and consolidated, and samples were taken for fibre identification and further analyses, while the rest of the block remains waterlogged.

Three samples were sent for fibre identification: 1) several strands of dried fibrous material, the longest 5 mm in length, in a glass tube; 2) white fibres spread and dried on a glass slide and placed in a plastic box; 3) reddish fibres spread and dried on a glass slide and placed in a plastic box.

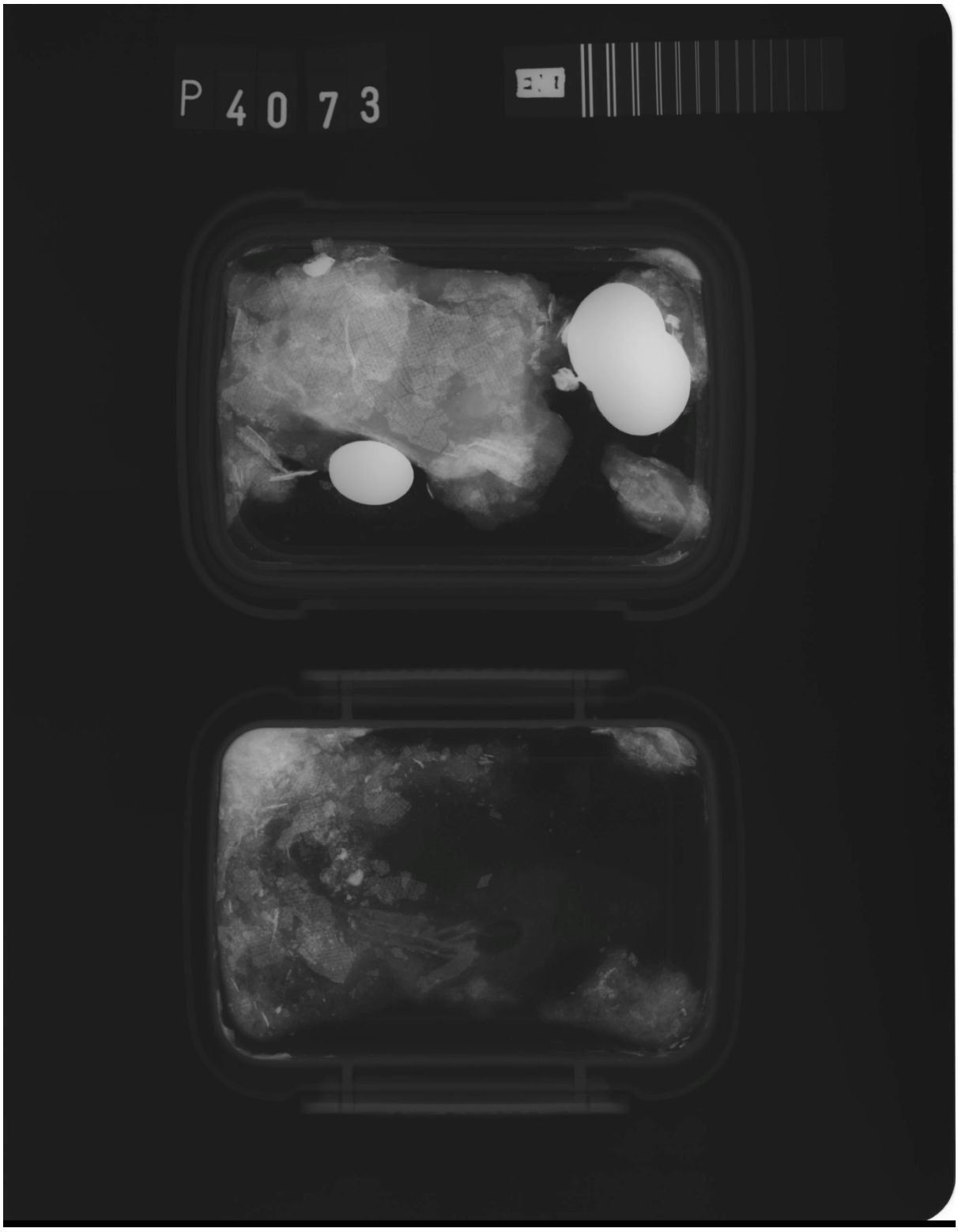

Fig. 1. X-ray of the block-lifted textile (Image: Angela Middleton).

Fig. 2. Block with the dark layer on the surface which preserves well legible textile imprint, and the red layer visible in centre-left (Image: Angela Middleton).

2. ANALYTICAL PROCEDURES

2.1 Structural analysis

Structural analysis of the textile was carried out on a small, consolidated fragment of the textile (**Fig. 3**), as well as using the x-ray image. Textile characteristics recorded during analysis included textile weave and structure, thread count, thread diameter and twist direction as well as any other visible features. This was done through visual observation and using portable Dino-Lite digital microscope. Micrographs were taken at different magnifications (20x, 50x, 230x).

Fig. 3. Consolidated textile fragment under low magnification (Image: Margarita Gleba).

2.2. Fibre analysis

Fibre analysis of the samples was carried out on 03.11.2015 at the McDonald Institute for Archaeological Research, University of Cambridge. The samples were analysed using Hitachi TM3000 TableTop Scanning Electron Microscope (SEM) in order to determine the morphological characteristics of the fibre and to acquire more detailed surface information for possible fibre identification. The following instrumental settings were used: analytical condition mode at 15.00 kV accelerating voltage, compositional imaging and working distance of 5-10 mm. The fibres were examined longitudinally for morphological features. The features were compared with the author's reference collection of plant and animal fibres. The reference collection includes processed and unprocessed fibres from plants and animals. It includes the standard plant and animal fibres expected for the prehistoric (flax, nettle, various types of tree bast, sheep wool, goat hair, horse hair) and later periods (cotton, hemp, silk, ramie, camel hair, yak hair) plus hair moss fibre (*Polytrichum commune*) and cotton grass (*Eriophorum angustifolium*).

3. RESULTS

3.1. Structural analysis

The textile is woven in a balanced tabby or plain weave, with approximately 20 threads/cm in both systems (**Fig. 4**). Yarn is z-twisted with medium twist angle

in both systems. Threads visible in the consolidated fragment examined measure approximately 0.2-0.3 mm in diameter (**Fig. 5**). As there are no edges preserved, it is impossible to determine warp and weft direction.

Fig. 4. Close-up of the consolidated textile fragment with clearly discernible tabby structure (Image: Margarita Gleba).

Fig. 5. Close-ups of the different areas of the consolidated fragment with well discernible z-twisted threads and their diameter measurements (Image: Margarita Gleba).

3.2. Fibre analysis

All three samples appear to be of plant origin but diagnostic features observed are insufficient for species identification.

Sample 1

The raw material of the sample fibres appear to be of plant origin (**Figs. 6-8**), but does not show the characteristic knee-joint dislocations of plant bast fibres such as flax, hemp, nettle or esparto (Catling and Grayson 1982), or helical ribbon structure typical for cotton. The overall shape, appearance and relatively good preservation (in comparison to the other two samples) of the sample may indicate that this particular fibre fragment might not belong to the textile but is instead intrusive plant matter. Further study by a plant biologist may be helpful in further identification.

Fig. 6. A fragment of sample 1 in the SEM under lowest magnification (Image: Margarita Gleba).

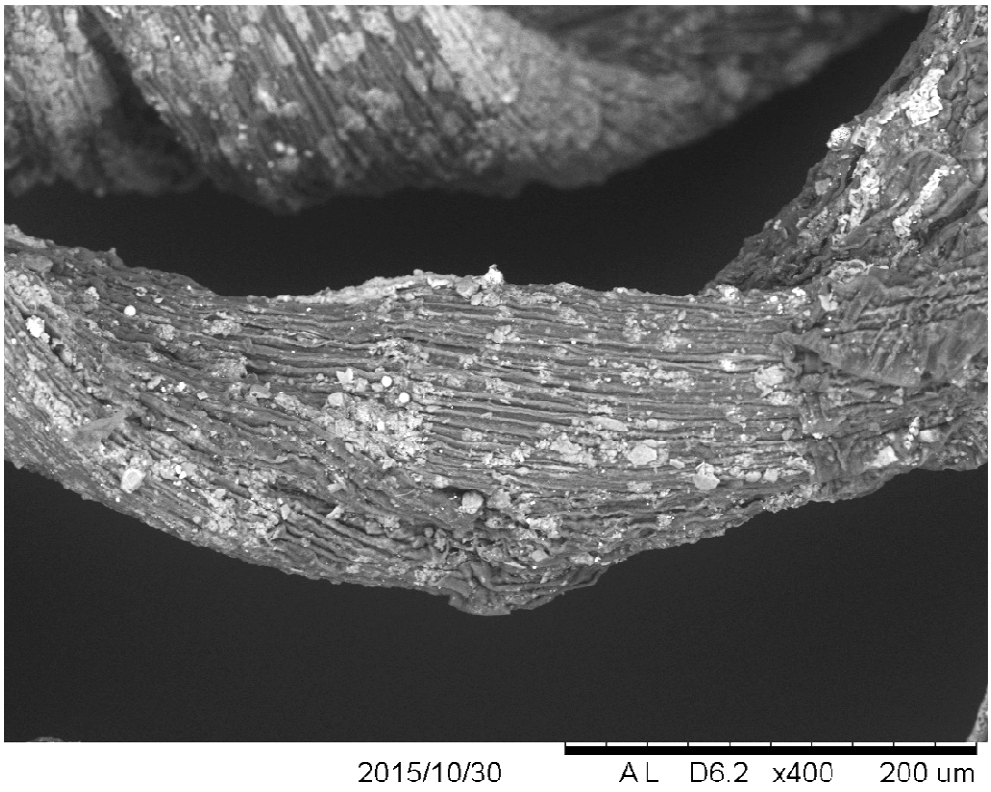

Fig. 7. Leaf-like structure with parallel grooves of sample 1 in the SEM (Image: Margarita Gleba).

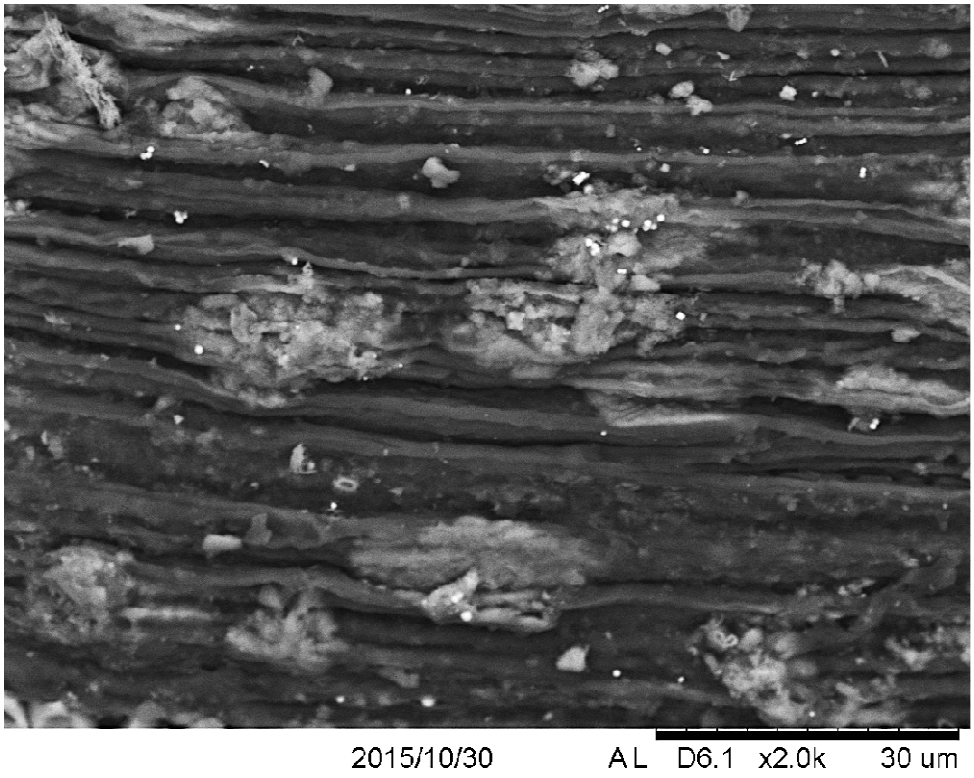

Fig. 8. Parallel grooves of sample 1 in the SEM under high magnification

(Image: Margarita Gleba).

Sample 2

The white colour of the tiny fragments when viewed in the SEM appears to be due to incrustation with silt/dirt, but at the edges fibres are clearly visible (**Figs 9-10**). The fibres are badly degraded and do not show any features characteristic for known textile fibres. Instead, there are clearly visible of primary tracheary elements of plant stem xylem in the areas where the surface is broken or is splitting (**Figs 11-14**). The observed wall thickenings are helical. The fibres are thus of plant origin.

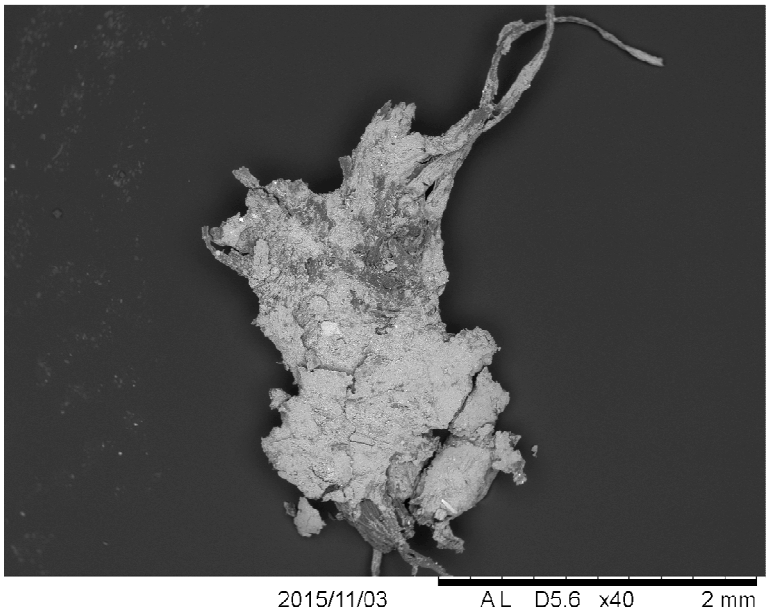

Fig. 9. Fragment of the sample 2 in the SEM under lowest magnification with dirt/silt encrustation visible on the surface and fibres sticking out at the edges

(Image: Margarita Gleba).

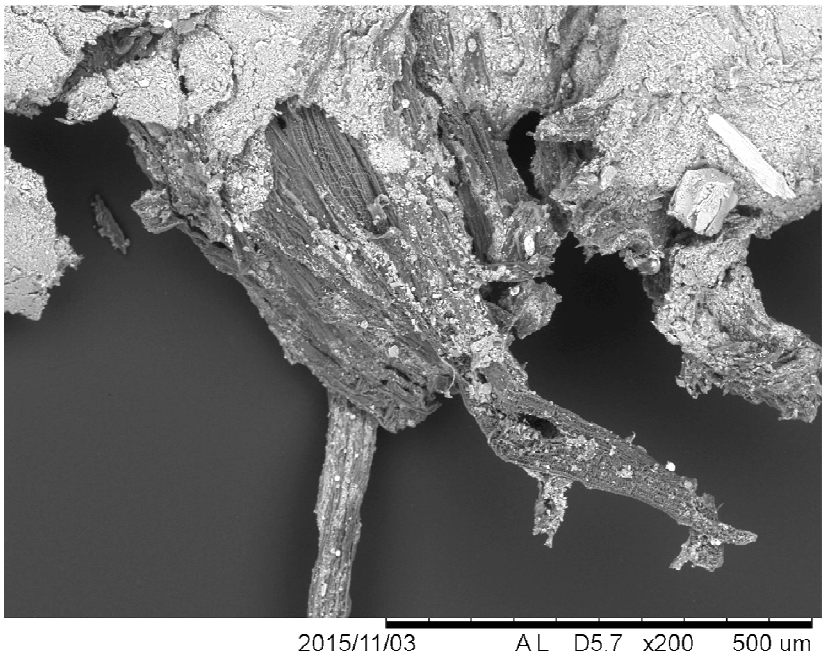

Fig. 10. A close-up of one sample 2 fragments in the SEM with one of the threads composed of fibrous matter visible at the edge (Image: Margarita Gleba).

Fig. 11. Primary tracheary elements of plant stem xylem with helical secondary wall thickenings in sample 2 (Image: Margarita Gleba).

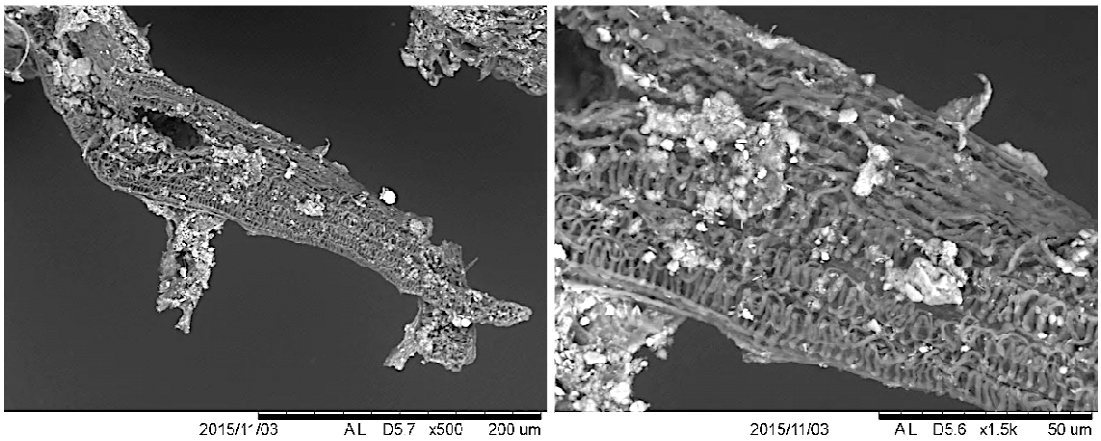

Fig. 12. SEM micrographs at various magnifications of another area with primary tracheary elements of xylem with helical secondary wall thickenings (Image: Margarita Gleba).

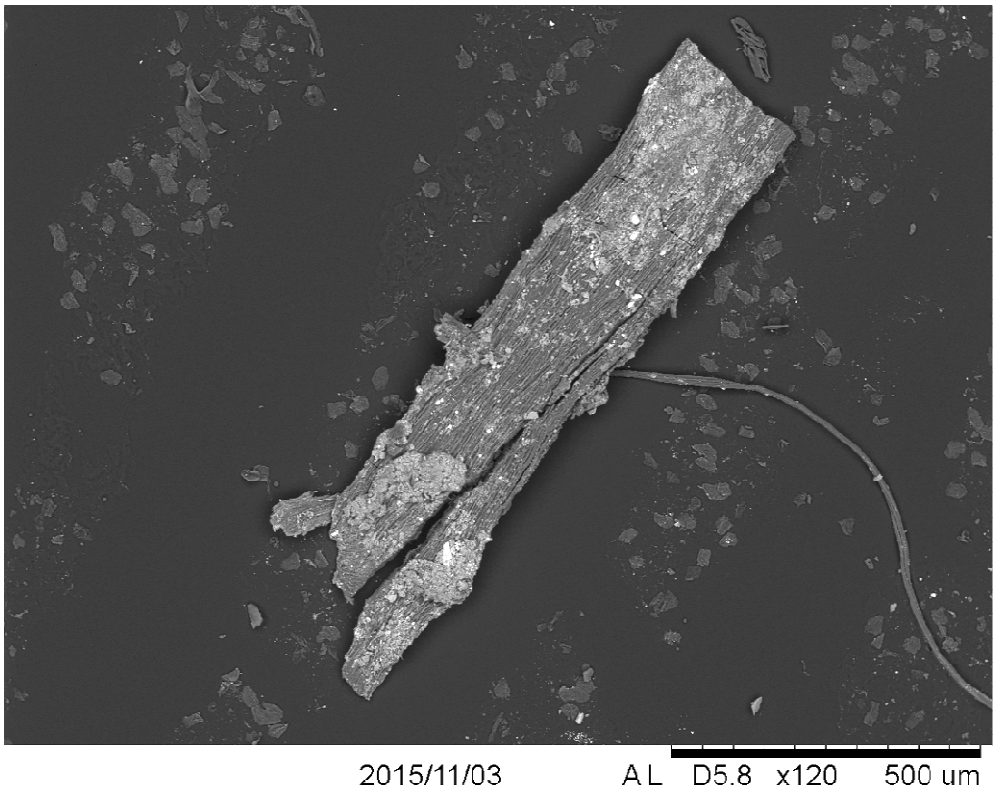

Fig. 13. SEM micrograph of a separate ‘thread’

(Image: Margarita Gleba).

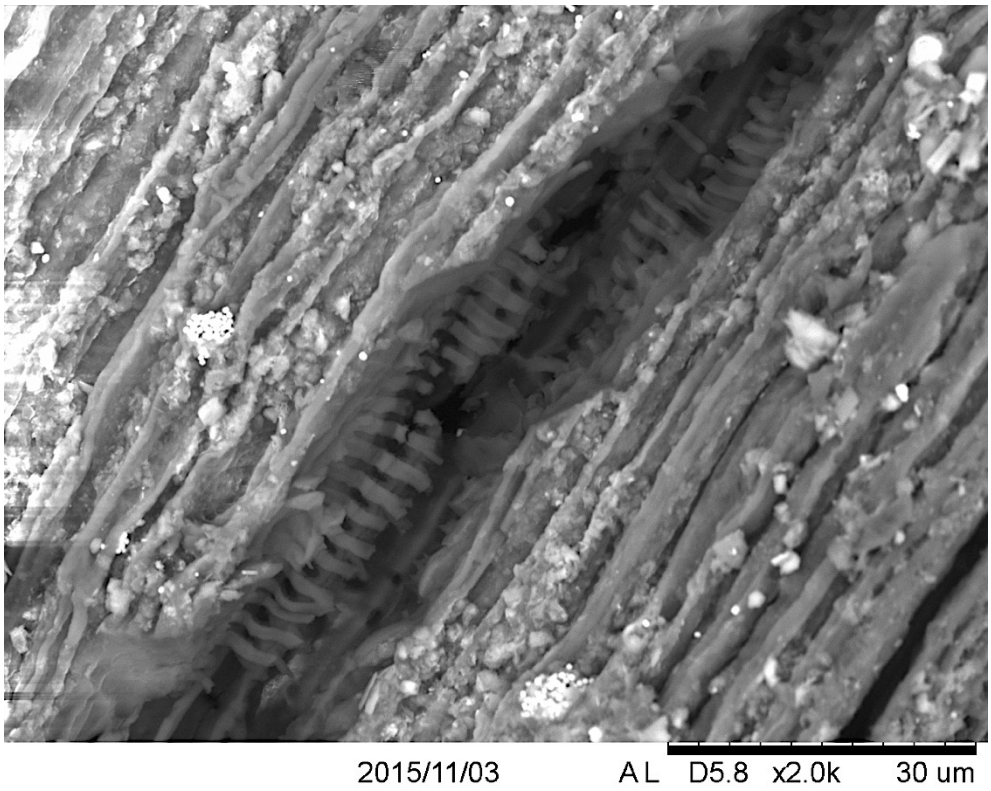

Fig. 14. Close-up of the helical secondary wall thickenings visible in the split of the 'thread' in Fig. 13 (Image: Margarita Gleba).

Sample 3

The tiny reddish specks of Sample 3 show structure reminiscent of crossing fibres (**Fig. 15**), confirming the identification of the reddish matter observed in the block as a likely textile. The visible fibres do not present any recognisable structure or any features that could serve as identifying characteristics (**Fig. 16**). It is likely that they are too degraded for any species identification.

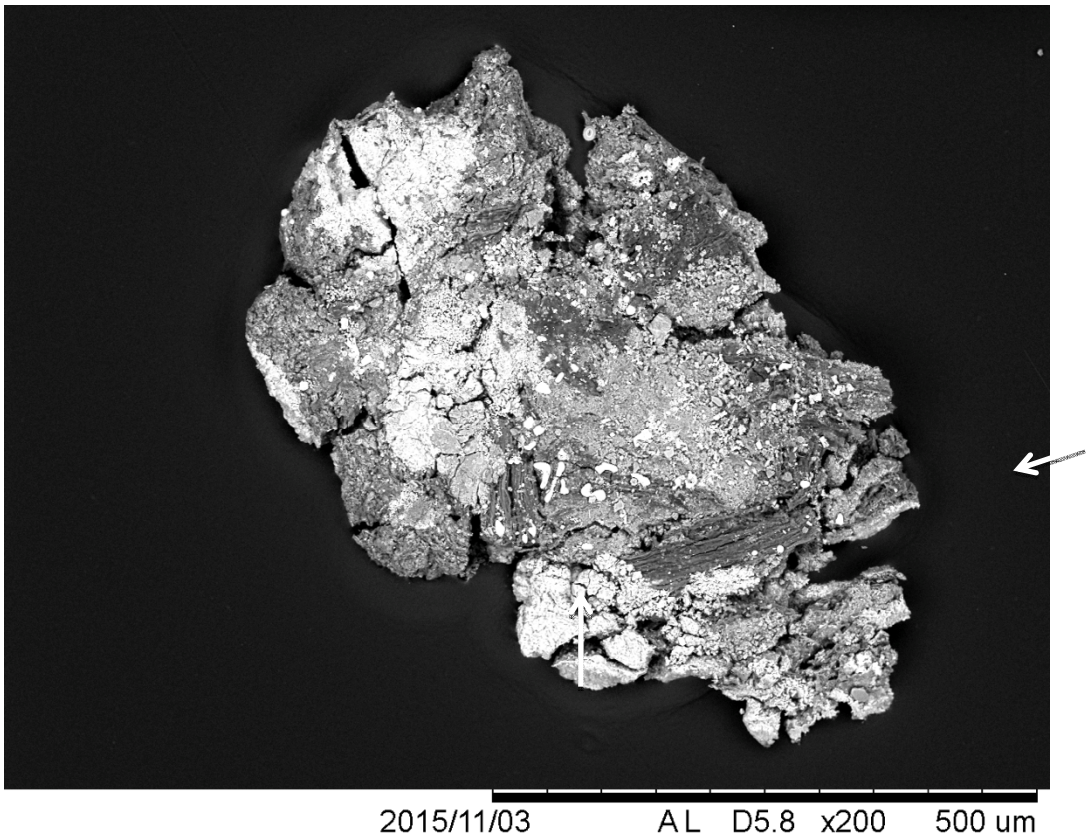

Fig. 15. Fragment of the sample 3 in the SEM under lowest magnification showing fibres at right angle to each other (Image: Margarita Gleba).

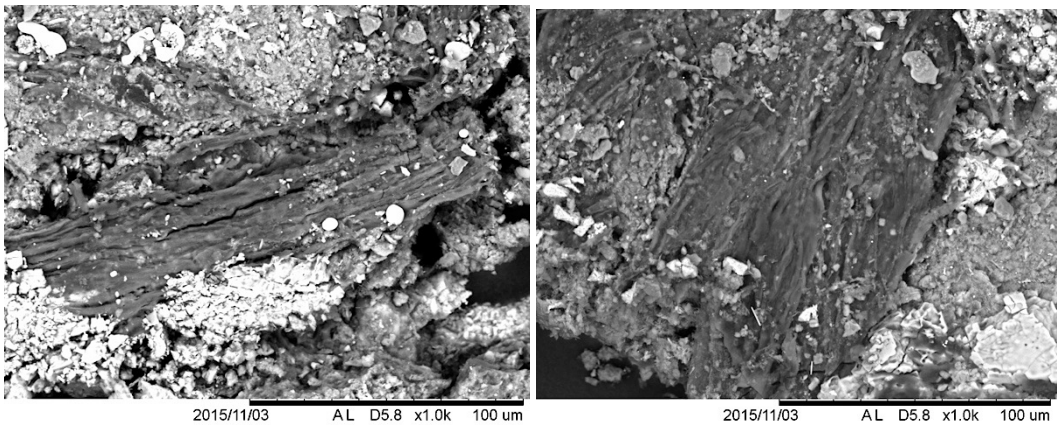

Fig. 16. Amorphous appearance of the fibres in Sample 3 (Image: Margarita Gleba).

4. DISCUSSION

Despite the highly degraded state of preservation of the textile, structural analysis did not pose any challenges, although the simple tabby structure and an average thread count do not permit any further conclusions regarding the possible function of the textile, the original theory of it being a sack intended to store the brass buttons remaining the most likely hypothesis.

Fibre identification, on the other hand, was quite problematic as none of the three samples presents any diagnostic features typical of the common textile fibres. There is little doubt that the samples are of plant nature, as indicated by their general morphological features. In Sample 3 this is particularly clear from the presence of primary tracheary elements with helical wall thickenings. Tracheary elements are the cells that comprise the water-conducting system of a vascular plant, xylem. Protoxylem tracheary elements with annular or helical secondary cell wall thickenings form during primary plant growth (Karam 2005). Thus, the presence of helical thickenings in Sample 2, the primary material of the tabby textile, suggests that the plant from which they derive was not woody, i.e. has not undergone secondary growth. Such tracheary elements with helical cell wall thickenings are present in many bast fibre plants, including flax, hemp and nettle. However, insufficient research has been carried out into whether they are taxonomically specific. It is therefore not possible to identify the fibre species of Colossus samples.

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