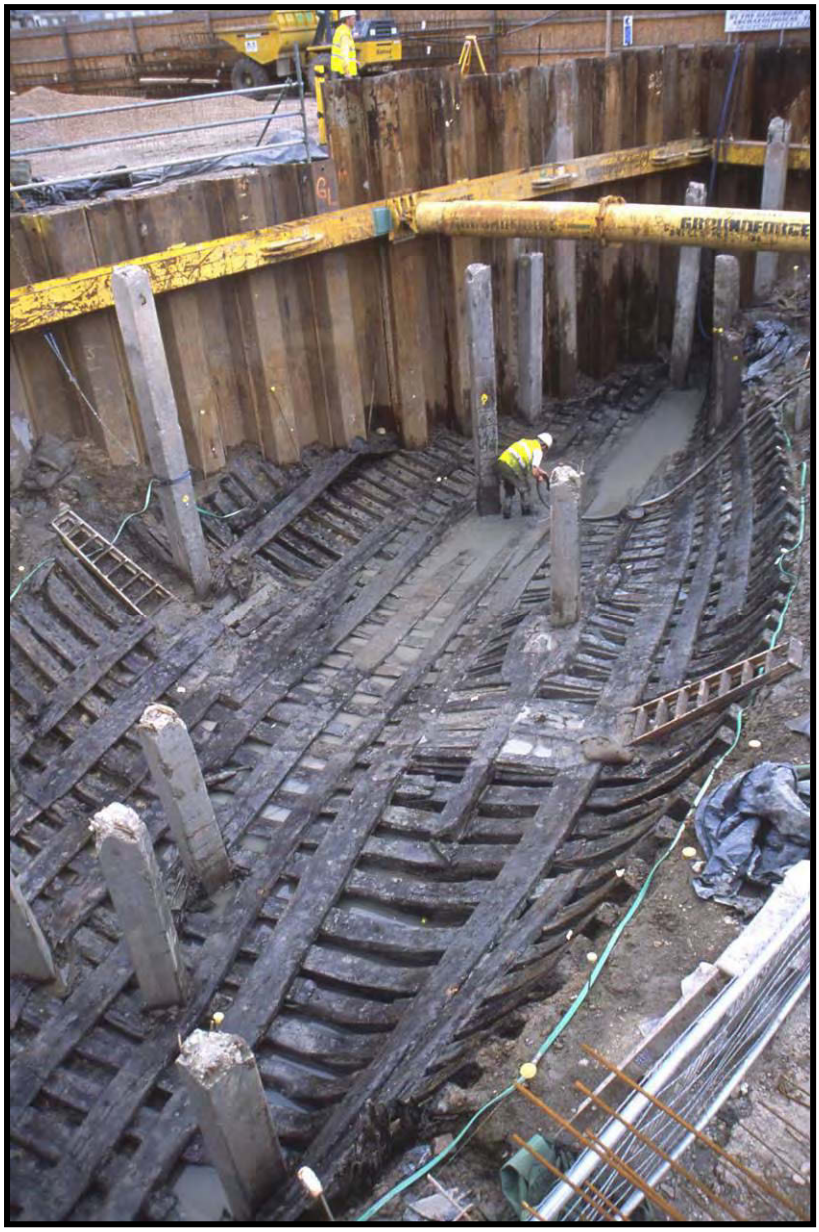
Newport Medieval Ship Project

Specialist Report:

CAULKAGE



Site number: GGAT 467
Site location: NGR: ST 31286 88169 Kingsway, Newport, South Wales, UK.

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Fibre Products from the Newport Ship, Gwent, (v) Caulking Materials

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26 March 2013

The Newport Ship Project

Introduction

In 2002, during the construction of the Riverfront Theatre, on the banks of the River Usk in Newport, South Wales, an archaeological find of great significance was unearthed. In the summer of that year, while undertaking the excavations for the theatre's orchestra pit, the well-preserved remains of a 15th century clinker built merchant vessel were discovered.

The site, which was surrounded by a cofferdam, was being monitored by the Glamorgan Gwent Archaeological Trust at the time of discovery. The ship lay in what is locally known as a pill or small inlet, with its stern closest to the river and its bow facing into the inlet. The timbers were covered in thick alluvial mud, which created an ideal anoxic environment for successful preservation. Seventeen strakes of planking remained on the port side and thirty-five on the starboard side of the ship. The vessel was approximately 30m in length.

A silver French coin was found purposely inserted into the keel of the vessel, dating the ship to after May 1447. Dendrochronological research has shown the hull planking to be from the Basque country and after 1449 in date.

After a much publicised 'Save Our Ship' campaign, it was decided that the ship would not be recorded and discarded but excavated with the aim to conserve. The riders, stringers, braces, mast step, frames and overlapping clinker planks and keel were dismantled one by one and lifted. Almost 2000 ship components as well as hundreds of artefacts were excavated.

This report examines the caulking materials recovered during the Newport Medieval Ship excavation.

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incorporating Textile Research

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REPORT

Fibre Products from the Newport Ship, Gwent:

(v) Caulking materials

On behalf of Toby Jones, Newport Medieval Ship Project

Penelope Walton Rogers

26 March 2013

Penelope Walton Rogers asserts her right to be identified as the author of this work

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Caulking materials

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26 March 2013, incorporating material from our report of 5 December 2003

Introduction

Samples of the fibrous materials used to caulk the ship were analysed in two phases. In the first, in 2003, ten samples were taken from different areas of a single starboard timber, S9.4 No.099 (Samples 2003/1-10), which was thought to be part of the original build. Four samples were taken from the scarfed ends of the timber (2003/1-2 and 2003/9-10) and the rest came from different points along the lands. They were compared with an eleventh sample from the keel, considered part of a refit (2003/K). In 2013, a further five samples were taken from the original build, one from a scarf joint (2235) and four from between strakes (2514, 2587, 2484, 2673); and five were taken from areas of repair, one an inboard lead tingle (MSG184) and four from outboard wooden tingles (2544, 1635, 1452 and 1145). The aim was to compare the original material with the refit and to look for any evidence that would indicate where the work had been carried out.

Method of analysis

In each case, a tuft of fibres was cleaned in chloroform to remove tar, air-dried and mounted in water for microscopy. The fibres were viewed by means of a microscope with transmitted light and incident light at x40-x160 magnification and transmitted light only at x400-x640 magnification. Cross-sections were prepared and viewed in the same way. Identification of species was based on the cuticular scale pattern, the cross-sectional shape, the range of fibre diameters, the presence or absence of medullas (central channels) and the distribution of pigmentation. Four samples (2003/8, 2003/10, 2235 and 2514) were difficult to determine and were passed to Dr P.Greaves, Microtex International, for a second opinion. His comments are incorporated below.

Where sheep's wool was identified, further work was conducted on select samples, in order to identify the fleece type. The diameters of 100 fibres from each sample were measured and plotted as a histogram. According to the range, mean and distribution of the measurements, the sample could be allocated to one of Ryder's seven fleece-type categories, Hairy, Hairy Medium, Medium, Generalised Medium, Semi-Fine, Fine and Fine/Generalised Medium. These roughly correspond to modern breed groups (but not to individual breeds).

Results

Some samples (2003/2, 2003/10, 2013/2587 and 2013/MSG 18) had more than one fibre type present, so that there were in total 26 specimens for identification, 19 from the original build (for details, see catalogue). Disappointingly, there was no obvious distinction between the fibres associated with the original build and those incorporated in the repairs. In the first build, there were at least seven examples of sheep's wool, six of cattle hair, two (or more) of goat-fibre and one (or two) of horse. In the repair group there were three examples of wool, two of cattle and one of goat.

Sub-categories could be identified within the different species. The cattle hair was a uniform brown, except for a single example of near-white calf hair (2003/4), and 2013/2587 probably came from the tail (the rest being body hair). The goat hair was mostly dark brown or black, although clumps of both black and white fibres in 2003/7 might indicate a piebald animal. The horse hair in 2003/8 was dark brown mane hair, and horse body hair was less confidently identified in 2003/10, mixed with wool. Wool was mostly white, but two samples, 2003/1 and 2013/1145, were originally grey (that is, white with a proportion of black fibres). Three samples of wool had been dyed blue (2013/2587a, 2013/2544 and 2013 1145) and one possibly red (2013/MSG 184). This means that at least twelve different fibre sources were used in the caulking of the original build and five in the refit. The use of so many different fibre-types in one vessel is unusual when compared with ships from northern waters.

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Comment

Caulking materials have been identified in a number of vessels, and in broken-up timbers, recovered from harbours, docks and wreck sites in Scandinavia and the British Isles (Schjølberg, E, 1984; Walton 1988; Walton Rogers 2005; Walton Rogers and Hall 2009). A pattern has emerged from the evidence which can be summarised as follows. Long sausage-shaped rolls of fibre were dipped in tar and laid between the overlapping strakes before riveting. These were mostly single rolls in Britain and plied cords in Scandinavia. In both regions they were predominantly made from sheep's wool in the 12th and early 13th century, but other animal fibres were incorporated in the 13th and early 14th centuries and cattle and goat hair emerged as the most common material by the end of the medieval period. At this time there was a shift to plant fibres in carvel-built vessels, the changeover being best demonstrated in the *Mary Rose*, sunk in 1545 (Walton Rogers and Hall 2009), although animal-fibre caulking rolls continued in use in clinker-built vessels. Aside from the caulking rolls, raw wool and wool felts were often placed in scarf joints, loom-woven fabrics were used to seat spars and stanchions and a wide range of material, including textiles, raw fibre, and in one instance the cut-up remains of a fur-lined boot, were stuffed into areas of repair.

It was difficult to discern the structure of the caulking materials in the Newport ship, which had only survived in small patches adhering to the timbers, but the conservator noted that sample 2003/5 had a rope-like appearance, which probably indicates that this was a caulking roll or cord. No felts or woven goods were present and many of the samples were still in the original 'staples' (the locks into which an

animal coat naturally falls). These last included some of the dyed wool samples, which indicates that these were dyers' or spinners' waste, rather than re-cycled textiles.

The wide variety of fibre sources used is distinctively different from the caulking materials previously examined from northern vessels. The latter tend to be more uniform within individual vessels, except where repairs are concerned. This suggests a different boat-building tradition and may well be a further indication that the Newport ship was foreign to these waters. Where the ship originated cannot be identified from this evidence, since all these animal species were farmed widely in Europe. The sheep's wool, however, is of Hairy and Hairy Medium type, indicating mountain breeds (such as the Scottish Blackface and the Swaledale) and hill breeds (such as the Cheviot and the Welsh Mountain) respectively. Similar fleece-types are found in the primitive 'northern short-tail' sheep of the islands of the North Atlantic, although these breeds are less commonly white (Ryder 1981).

It can be tentatively suggested that the wool caulking materials for the Newport ship were collected in a port with a hilly or mountainous hinterland. The commingling of wool with fibres from other species may represent a particular local tradition at the place of origin.

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I. PROBABLE ORIGINAL BUILD

Sample 2003/1, S9.4 No.099, scarf, inboard face

Felted layer of fibres. The scale pattern is irregular mosaic, waved, with smooth near margins; cross-sections are circular-oval; continuous medullas are present in 12% and 2% are kemp. Fibre diameters (measurements in microns): range 15-89, 118-174; mode 25; mean 44.0±26.5; coefficient of skew +0.10, continuous; 14% medullated (including kemp); 25% pigmented.
Sheep's wool, Hairy fleece type, grey.

Sample 2003/2, S9.4 No.099, scarf, around trenail hole, inboard face

Felted layer of fibres. The scale pattern is not very clear on this sample, but other features of the fibres are diagnostic. They are 24-94 microns wide; c40% have medullas, most of which are narrow and continuous. Cross-sections are circular and oblong, with medullas fine and centrally placed. Pigmentation is a mixture of moderate and dense. Long tapering fibre tips are present. Some white wool fibres, comparable with those in Sample 1, are also present.
Cattle hair, possibly from a young beast, brown; and white sheep's wool.

Sample 2003/3, S9.4 No.099, inboard face

The scale pattern is irregular mosaic, rarely waved, with both smooth and rippled margins, mostly near, getting closer towards the fibre tip. The fibres are 22-82 microns wide, with one example at 103 microns; medullas are rare. Cross-sections are circular and oblong, with medullas, where present, fine and central. Pigmentation is a mixture of none, moderate and dense. Long tapering fibre tips are present.
Cattle hair, brown.

Sample 2003/4, S9.4 No.099, inboard face

Disaggregated fibres. The scale pattern is poor, but where visible it is irregular mosaic with smooth near margins. The fibres are mostly 21-67 microns diameter, with a small number in the region of 100 microns. Medullas are present on almost all fibres and are continuous and segmented. Cross-sections are mostly oblong, occasionally circular. Pigmentation is light. Long tapering fibre tips and fibre roots are present.
Cattle hair, from a young calf, near-white.

Sample 2003/5, S9.4 No.099, inboard face

Described by conservator as ‘rope-like’. The scale pattern is poor, but the other features are diagnostic. There is a fine white undercoat of 9-24 microns (most common measurement 14 microns), an outer layer of densely pigmented medium fibres 26-70 microns, and kemp of 137-150 microns. All the medium fibres have medullas, some fine, some wide, some interrupted. Cross-sections are round in the fine fibres and circular, oval, elliptical, triangular and bean-shaped in the medium ones.
Goat hair, black.

Sample 2003/6, S9.4 No.099, outboard face

This sample was poorly preserved, but the patches of irregular mosaic scale pattern with smooth near margins and the presence of kemp suggest sheep or goat. It is non-pigmented.
Sheep's wool or goat hair, white.

Sample 2003/7, S9.4 No.099, outboard face

The scale pattern on fine fibres is irregular mosaic with smooth distant margins and on medium fibres it is irregular mosaic with smooth near margins, changing to waved mosaic with close margins along the length of the fibre. There is a fine underwool of 10-30 microns (most commonly 16 microns) diameter; an outer layer of medium fibres with medullas, 30-100 microns; and kemp 123-134 microns. Cross-sections are round in the fine fibres and circular, oval, triangular and 'squashed ring' in the medium ones. Pigmentation was observed to vary through the specimen provided. Of three fibre tufts examined, one proved to be non-pigmented and the other two densely pigmented, although they were all of the same fibre type.
Goat hair, probably from a piebald (black-and-white) animal.

Sample 2003/8, S9.4 No.099, outboard face

These are coarse densely pigmented fibres, mostly 24-100 microns, with a number around 125-137 microns diameter. The scale pattern is difficult to see, but the cross-sections are round and oval. The coarse fibres are not kemp, but have very wide and irregular medullas. This sample was tentatively identified as horse hair and was sent to Microtex for a second opinion. Dr Greaves commented that 'The medullary structures (where visible), diameter range and uniformity suggest that they may be horse mane hair'.
Horse mane hair, dark brown.

Sample 2003/9, S9.4 No.099, scarf joint

These are non-pigmented fibres with the scale pattern and cross-sectional shape of sheep's wool (see Samples 1 and keel, above). Fibre diameters (measurements in microns): range 14-90; modes 19, 20; mean 32.5±18.3; coefficient of skew +1.10, skewed to positive; 15% medullated (no kemp); 3% pigmented.
Sheep's wool, Hairy Medium fleece type, white

Sample 2003/10, S9.4 No.099, scarf joint

There seem to be two different fibres present in this sample. Some are white sheep's wool, comparable with Sample 9, and others are coarse pigmented fibres which have an irregular mosaic waved scale pattern with close rippled-crenate margins, probably horse. The sample was sent to Microtex, where the presence of sheep's wool was confirmed.
White sheep's wool and brown ?horse.

2013/2235: from S5 scarf, frame station F35 (inboard side)

A thin flat pad of fibre, 2mm thick, felted, but not a true felt. The fibre tufts are mostly 16mm long. Some fibres have roots, others tips, but the full length is present on none. Fibres 19-60 microns diameter; scale pattern not well preserved, but where visible, it is mosaic with smooth, sometimes distant, margins, waved on the coarse fibres. Medullas are fine and fragmented on fine fibres and wide and continuous on coarser ones. Pigmentation even throughout.
Brown, probably cattle hair.

2013/2514: from S15 to S16 land, frame station F35

Loose tufts of broken fibre, c.20mm long. Includes fine fibres, 14-19 microns diameter, coarser ones, 40-87 microns diameter; with some kemp around 100 microns wide. The scale pattern on fine fibres was irregular mosaic with smooth distant margins; on coarser fibres it was closer with areas of crenate margins. Continuous medullas were present on medium fibres and in the kemp the medullas were latticed with thick struts. Cross-sections were round, bean-shaped and the collapsed-ring type. Fine fibres were non-pigmented, the rest moderately pigmented.
Brown goat-fibre.

2013/2587: from S24 to S21 land, frame station F35

Loose tufts of three different fibre-types.

(a) Crimpy staples 35 mm long. The fibres are mostly 12-45 microns diameter, with the occasional fibre 55-60 microns. These have the typical scale pattern and cross-section of wool (see above). They are non-pigmented and have been dyed blue.
Sheep's wool, white dyed blue.

(b) Straight staples, 45-50 mm long with fibre roots present on all fibres. The fibres are coarse, 75-110 microns wide, with a narrow medulla present on all; cross-sections are consistently elliptical. The scale pattern is eroded and unclear, but where visible it is irregular waved mosaic with smooth near-to-close margins. Medullas are narrow and interrupted in some fibres, wider and continuous in others. Cross-sections elliptical. Pigmentation was even throughout.
Brown, probably calf tail hair.

(c) Pointed staple 40mm long. The fibres are 17-62 microns diameter, with kemp 125-170 microns wide. They have the typical scale pattern and cross-sections of sheep's wool (see above) and they are non-pigmented.
White sheep's wool.

2013/2484: from S25 to S26 land, frame station F21
Several short, broken tufts of poorly preserved fibre. Includes fine, 16-40, and coarse, 82-150 microns diameter, fibres, the latter including kemp. Most fibres were non-pigmented fibres, the coarser ones densely pigmented. Scale patterns were poor and cross-sections difficult to produce.
Grey, probably sheep's wool.

2013/2673: from S30 to S31 land, frame station F33
Several short, broken tufts of poorly preserved fibre. Diameters 25-72 microns; medullas continuous narrow or interrupted; pigmentation moderate throughout. Cross-sections robust circular and oval. Numerous fibre tips present. Scale pattern poorly preserved.
Brown adult cattle.

II. REPAIRS/REFIT

2003: the keel

The scale pattern is regular and irregular mosaic, often waved, with smooth near margins; the cross-sections are circular-oval; continuous and fragmented medullas are present in 9% of the medium fibres and 2% are kemp (broad fibres with wide latticed medullas). Fibre diameters (measurements in microns): range 15-73, with kemp at 173 and 183; mode 32; mean 38.5±25.8; coefficient of skew +0.76, skewed to positive; 11% medullated (including kemp); no pigmentation.
Sheep's wool, Hairy fleece type, white.

2013/2544: P10-4/5, outboard wooden tingle
A thin layer of crimpy fibres, 2 mm thick. The fibres have the typical scale pattern and cross-sections of wool (see above), but lack the coarse fibres seen in other samples. The maximum diameter was 40 microns (not well-enough preserved for a fleece-type identification). The wool was originally white (non-pigmented) and has been dyed blue or green.
Sheep's wool, white, dyed blue/green.

2013/1635: P12-4/5, outboard wooden tingle
Loose pad of brittle fibres, some with roots present, others with broken ends: the longest pieces, 15 mm long, probably do not represent the full length. The fibres are mostly 30-55 microns in diameter. The scale pattern is irregular waved and non-waved with smooth margins, rippled in places. Medullas, where present,are either narrow and continuous or fragmented. Cross-sections are robust circular and oval. Pigmentation moderate on all.
Cattle body hair, brown.

2013/1452: P9-4/5, outboard wooden tingle
Loose tufts of fibre, staple length 40-45mm long, with roots and tips present. Fibres 25-57 microns diameter. Scale pattern waved and non-waved with smooth margins. Medullas, where present, mostly narrow and fragmented. Cross-sections robust and mostly circular, sometimes oval. Moderate pigmentation throughout.
Brown cattle hair

2013/1145: S26-3 B, outboard wooden tingle
Heavily tarred fibres with scale patterns and cross-sections of sheep's wool, although the scale pattern eroded in places. Underwool non-pigmented, coarser fibres densely pigmented (black); deep blue dye present.

Grey sheep's wool, dyed dark blue.

2013/MSG 184: P6-4, F25-26, inboard lead tingle

(a) A single staple, 75 mm long. Scale pattern and cross-sections typical of sheep's wool. Non-pigmented apart from 2% moderately pigmented fibres; tawny colour may be dye. Fibre diameters (measurements in microns): range 17-77, with kemp at 109, 129; mode 25, 31; mean 32.9±16.2; coefficient of skew +0.56, skewed to positive; 4% medullated (2 kemp); 2% pigmented.

Sheep's wool, Hairy /Hairy Medium fleece type, white, possibly dyed red.

(b) Several black tufts of fibre, 25-30mm long; roots and tips present. Fibres are fine, some around 11 microns diameter, and non-pigmented; or medium-coarse, around 60 microns diameter with moderate pigmentation; or very coarse and densely pigmented. There are several kemp fibres present, up to 190 microns wide, which have lattice medullas with coarse struts. The scale pattern is irregular mosaic with smooth margins, changing to crenate margins along the same fibre. Cross-sections are flat oval, irregular, collapsed-ring type.

Goat fibre, brown-black.

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