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CONSERVATION OF SELECTED ARTEFACTS FROM STARE KOLNIE SITE

INTRODUCTION

This article presents a selection of artefacts from a medieval site of Stare Kolnie 4 (the Opolskie Voivodeship), their state of preservation and the conservation process. The main emphasis will be put on the stages of conservation and preservation of the aforementioned objects, while the chemical and environmental causes of destruction will not be considered. The description of the artefacts will be limited to their shape and state of preservation, thus no attempts to identify types of the finds will be undertaken. Chronology will be considered only for comparison purposes.

Archaeological finds collected from the site were conserved in two stages, after each phase of excavations – in preliminary examination of the site in December 2009 and May 2010 and during the excavations held in September 2010. Initially, the artefacts were maintained in the laboratory of the Institute of Archaeology of the University of Wrocław by Beata Miazga, PhD and Katarzyna Smoleń, a student under supervision of Dr Miazga. After the second stage of excavations, the artefacts are still being conserved by students: Martyna Kowalik, Barbara Grabny, Joanna Kulawinek, and K. Smoleń, MA. Current maintenance is performed under the supervision of Beata Miazga, PhD and Magdalena Konczewska, MA.

1. MATERIAL

There are three groups of conserved artefacts, according to the types of material that they were made of:

1.1. Iron (steel) is the most common material found at the site. Among many artefacts, those, which have been deemed the most important or the most fragile, were conserved first: arrow- and bolt-heads; a goat's foot; armour fragments: brigantine plates and riveted mail ring; spurs fragments; horse riding equipment: horseshoes, a stirrup, horse bits; a falchion side-guard; buckles; a caltrop; keys;

1.2. Two padlocks made of bronze and iron: the first is dated from the 12th to the late 15th century and was found during excavations in December 2009, the second one – from th 17th century – in September 2010. Both were incomplete, but parts of their lock mechanisms were preserved.

1.3. Iron and wood – among numerous arrow- and bolt-heads; three had remains of wooden parts of shafts inside the socket.

2. CONDITION OF ARTEFACTS

2.1. Iron artefacts are preserved in various condition: there are some that are well preserved, sometimes even containing some organic material. Most of them are covered in general corrosion, on whole surface of the artefact, some are preserved in bad condition, covered in pitting corrosion, but the iron

Fig. 1. Stare Kolnie. Bolt-head, inv. No. 2, obtained in December 2009 – before conservation process (photo K. Smoleń)

Fig. 2. Stare Kolnie. Bolt-head, inv. No. 2, obtained in December 2009 – after conservation process (photo K. Smoleń)

Fig. 3. Stare Kolnie. Bolt-head with pieces of wood, no inv. No., obtained in December 2009 – before conservation process (photo K. Smoleń)

Fig. 4. Stare Kolnie. Bolt-head, inv. No. 69, found during fieldworks in December 2009 – after conservation process (photo L. Marek)

core is still present. Several artefacts are so deteriorated that there is no metal core left.

2.1.1. Arrow- and bolt-heads. We can divide this category of artefacts into 2 parts:

– artefacts that have not been previously conserved: artefacts obtained during excavations (Figs. 4–10) and some of the artefacts regained from illegal exploration (Figs. 1–3)

Fig. 5. Stare Kolnie. Falchion crossguard shield, inv. No. 55; found during fieldworks in December 2009 – after conservation process (photo L. Marek)

– artefacts that were preliminary conserved (Figs. 1–2); 13 regained arrow- and bolt-heads were previously conserved and corrosion products were removed. There was a thin film of brown substance (passivated) on the surface of the object. Only two of them have been localised precisely (inv. Nos 2 and 3).

2.1.2. Four brigantine plates, all of which were covered in thick corrosion which made it impossible to define their shape and the location of rivets. That was the reason for making X-ray photographs before the beginning of conservation process. Three of them have been already conserved by B. Miazga, PhD.;

2.1.3. Fragmented spur containing spike and yoke, one spur rowel and one complete spur were found at the site. Except the rowel, surface of the spur and one spur fragment was strongly oxidised; all of them have been conserved. Three of them – spike, yoke and spur rowel – were conserved by B. Miazga, PhD, one spur was conserved by K. Smoleń, as discussed below.

2.1.4. A falchion crossguard fragment was a very well preserved example of this kind of artefact. Although covered in thick corrosion layer, the object occurred to be very well preserved; after conservation process, the shape of the artefact and structure of metal is clearly visible.

2.1.5. Horse riding equipment. One whole horseshoe (Fig. 6) and several horseshoe fragments, a stirrup and two horse bits have been found at the site so far; not all of the horseshoe fragments have been conserved yet, but the process of preservation on two of items (inv. Nos. 48 and 56) has been described.

2.1.6. Five buckles: three of them were medieval belt buckles, one is probably from a later period, one artefact is only likely to be a belt buckle – it could also be a spur or shoe attachment. Two of those artefacts have been conserved already – one of them (inv. Code Nmet 216) by B. Miazga, PhD, the other (inv. Nos. 92, fig. 7) by K. Smoleń. Conservation process of the second one will be discussed below.

2.1.7. Well preserved caltrop, conserved by B. Miazga, PhD.

2.1.8. Other artefacts: five staples, a goat's foot, a fragment of a knife blade, a fire-striker (Fig. 8), a fragment of pipe clasp, a sickle fragment, two keys, and numerous nails were also in very good condition, with almost entire metallic core preserved and thin corrosion layer; conservation process of the two staples, knife and sickle fragments will be discussed below.

2.2. Artefacts made of iron and bronze are two padlocks – mentioned above. The older one is seriously damaged, bronze parts are hardly preserved (Figs. 9–10). The second padlock was in better condition, though bronze fittings needed to be refastened.

2.3. Among four bolt-heads that had wooden parts of shafts left, three were conserved, two shaft parts were removed (in order to examine type of wood that they were made of). There are attempts to preserve whole shaft remains in the socket of one of the bolt-heads, the conservation of it is still in progress (Fig. 3).

3. PROCESS OF CONSERVATION

The stages and methods of conservation of the artefacts will be presented below, as performed by the author of the article.

3.1. Documentation

3.1.1. Photo: before, in progress for selected artefacts, when the conservation process was complicated, and upon completion

3.1.2. Sketches

3.1.3. Measurements of most of the artefacts have been taken after the conservation. Some of them have been measured before the process, e.g. when the shape and amount of encrustation made identification of the artefact impossible.

3.2. Preliminary conservation

3.2.1. Washing in tap water

3.2.2. Removing loose corroded layers, sand, stones, ceramics and other objects attached to the artefact using chisels, needles and brushes

3.2.3. Mechanical removal of following corrosion layers with milling cutters, wire brushes, needles

3.3. Chemical cleaning

3.3.1. Electrolytic reduction in 3% or 5% solution of sodium hydroxide, then rinsing and clearing with steel and polymeric brushes (if necessary, the whole process was repeated, lasting for approx. 2–12 hours);

3.3.2. Boiling in de-ionized water – twice

3.4. Final mechanical cleaning with steel, cooper or polymeric brushes in a rotate tool (Dremel type)

3.5. Drying – all of the artefacts were dried for min. 5 hours.

Fig. 6. Stare Kolnie. Horseshoe, inv. No. 48, found during fieldworks in December 2009 – after conservation process (photo L. Marek)

Fig. 7. Stare Kolnie. Buckle , inv. No. 92, found during fieldworks in December 2009 – after conservation process (photo L. Marek)

Fig. 8. Stare Kolnie. Fire-striker, inv. No. 83, found during fieldworks in December 2009 – after conservation process (photo L. Marek)

3.6. Consolidation.

Some of the artefacts needed to be consolidated (applicable when the metal core of the artefact was not preserved or when its surface was heavily damaged) – for metal objects, Chester Molecular Metal Super SL was used (2 ingredient adhesive, then left for approx. 7 days to dry and gain physical and chemical durability), those and the ones with no metal core preserved, tannin (Cortanin F) was used: 3 layers in 0.5 h intervals, approx. 72 hours of drying.

For most of the artefacts the use of tannin was necessary. For those which were severely damaged, immersing in tannin agent (Cortanin F) was used:

Fig. 9. Stare Kolnie. Padlock, inv. No. 54, found during fieldworks in December 2009 – after conservation process, front view (photo L. Marek)

artefacts were put in the vessel filled with agent or thoroughly covered with it. They were left for approx. 3 days for drying in fresh air. Then loose dry tannin film was slightly brushed and preserving layer spread.

For artefacts with metal core left, tannin was used in hardly accessible spaces– e.g. it pits or joints. After drying, tannin was removed with steel (or cooper/ brass) brushes and steel wool, then the artefacts were covered with protecting solutions.

3.7. Degreasing and dehydrating – using acetone or acetone dissolvent. Rinsing artefacts with this solvent was helpful during final mechanical cleaning – it was used to reveal the surface of the object which was covered with dust. Acetone was also used for dehydration – e.g. for decreasing the dimensions of the wooden shaft parts in bolt-heads sockets in order to oust them without destroying the structure of the wood.

3.8. Preserving layers.

All the artefacts have been covered with Paraloid (acryloid) B–44 and B–72. Paraloid B–72 (Acryloid B–72 in USA) is a thermoplastic acrylic resin with many features (durability, transparency, high temperatures resistance) appreciated by the conservators of archaeological artefacts (Hamilton 1999). For the artefacts discussed, 10 % toluene or xylene solution of Paraloid B–72 and B–44 was used.

For some artefacts, microcrystalline wax (Cosmoloid H 80) has been used. Covering with the wax has been done for two reasons: better protection of the artefacts and reduction of gloss on surfaces after usage of previous solvent.

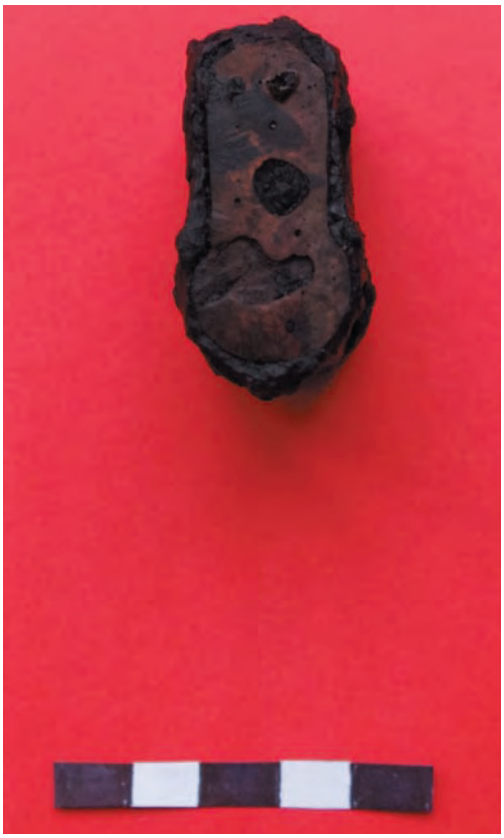

Fig. 10. Stare Kolnie. Padlock, inv. No. 54, found during fieldworks in December 2009 – after conservation process, side view (photo L. Marek)

4. CONSERVATION STEPS OF SELECTED ARTEFACTS

As mentioned above, documentation of each artefact was done before and after the conservation process. After preliminary mechanical cleaning (washing and removing loose corrosion products), each artefact was treated with electrolytic reduction – for c. 1 hour (e.g., both padlocks, strongly corroded bolt-heads), 3–8 hours (e.g. the stirrup, horse bits) or longer, up to 12 hours (e.g. horseshoes, many bolt-heads). For reduction, 3% or 5% solution of sodium hydroxide as a electrolyte was used. The process was disturbed several times in order to wash the artefact and estimate the progress of corrosion removal. If the artefact's core has not been preserved well, electrolysis was stopped when much of encrustation was still attached to the object. Afterwards each artefact was boiled in distilled water twice, and then dried; remains of corrosion products were removed mechanically – with a needle and a small hammer or a rotary tool.

Starting with this stage of conservation, some differences between particular artefacts would appear– the way of treatment was determined by size of the objects, their shape, material and stage of preservation. Some of those differences will be discussed below.

Several regained artefacts (inv. Nos. 2 and 3 and seven bolt-heads found in unknown place) that were previously conserved, did not have such a thick layer of corrosion products as other artefacts. They were treated with electrolytic reduction only for about an hour – in order to remove passivated film left after the previous conservation process. Afterwards they were boiled twice, cleaned using a rotary tool with steel and polymer brushes and degreased in acetone. After 5 hours of drying, each bolt-head was covered two times in Paraloid B 44 acrylic polymer in xylene; two artefacts (inv. Nos. 2 and 3) were also covered in one layer of microcrystalline wax Cosmoloid H80 dissolved in toluene.

Despite their various sizes and functions, one horseshoe (inv. No. 48, fig. 6), one knife fragment (inv. No. 36), the falchion crossguard fragment (inv. No. 55, fig. 5), one buckle (inv. No. 92), the fire-striker, the sickle (inv. No. Nmet 90), four staples (inv. No. 52; inv. code Nmet 126, Nmet 192, Nmet 197) and several nails were treated the same way. The electrolytic reduction lasted for 3 – 6 hours – until all corrosion products were removed. As all the artefacts treated with electrolysis, those were also boiled twice afterwards, cleaned using a rotary tool with steel and polymer brushes and degreased in acetone. They were dried (for at least 5 hours) and covered twice in Paraloid B 44 acrylic polymer dissolved in xylene; and once in microcrystalline wax Cosmoloid H80 in toluene. Condition of mentioned artefacts was very good, their surface was relatively smooth, so there was no necessity to use tannin.

Those objects which have been severely damaged and had partially preserved metallic cores – for example a horseshoe (inv. No. 56) and spur (inv. No. 16) – after short electrolysis (2–3 hours), mechanical cleaning (rotary tool with milling cutters and steel brushes), boiling and drying, but before covering with protective layers, were immersed in tannin agent (Cortanin F). After drying in open air for about 36 hours, loose tannin film was thoroughly rubbed off with a brush.

Two horse bits found on the side were in different stage of preservation – the one found in December had a well preserved metal core, so after mechanical and electrochemical cleaning it was immersed in tannin agent several times and cleaned with steel wool, which led to revealing metal structure of the artefact. The second object, found in September 2010, was in bad condition, so possible and "safe" amount of corrosion products was removed from the surface of the objects by electrolytic reduction and mechanical cleaning.Then it was covered with tannin agent and left to dry in the fresh air.

Each of padlocks found was treated in different way; the older one (Figs. 9 and 10) after boiling and drying was cleaned with rotary tool (steel milling cutters), afterwards covered with tannin, dried and sealed in acrylic polymer. After preliminary cleaning the second padlock was covered with a tannin layer; after drying, the layer with dissolved corrosion products was thoroughly removed by precise milling cutter and brush (rotate tool). This process was repeated for several times, until outer metallic surface was entirely visible. The method chosen in second case was determined by state of preservation of the object –bronze sidings were slightly attached to the padlock, one of the sidings fell off at the preliminary stage of conservation, so it needed to be reattached.

Not all artefacts from the excavation in Stare Kolnie in season 2009 and 2010 have been preserved yet; conservation process is still in progress and it is possible that more information may be given when a greater part of the material will be cleaned and protected.

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