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CHANGING CONTEXTS: FROM ENVIRONMENT TO IDEAS

Roman Iron Age hoard from Virumaa

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Introduction

In April 2015 hobby archaeologists in Estonia came across a hoard, which consisted of coins and ornaments. The coins (51 pieces) were apparently sestertia from the times of the Roman Empire.

State of the coins

The coins were delivered in plastic bags together with moist soil, to prevent the coins from drying.

The coin material seemed to be in good condition, the surface damage was more difficult to assess, because of soil residue and corrosion products (Fig. 1).

Figure 1. Coins prior to cleaning and conservation (AI-7484:33-38)

The method of radiography affirmed, that genereally the coin metal had preserved well.
Initial observation suggested two groups of coins:

1) Coins with surfaces covered with historical patina and a fairly thin layer of corrosion, surface relief identifiable. Such coins were in minority (Fig. 2).
2) Coins with surfaces densly covered with a thick black layer of corrosion products, surface relief un-identifiable. Such coins formed the majority (Fig. 3).

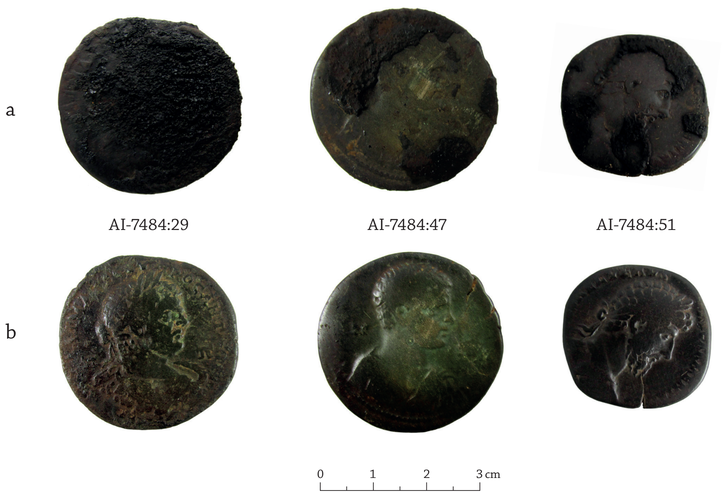


Figure 2. a) Before cleaning – surfaces partly covered with corrosion.
b) After cleaning – primary patina has survived on the surfaces.

Figure 3. a) Before cleaning – surfaces are covered with a corrosion layer.
b) After cleaning – primary patina has not survived.

Cleaning the coins and stabilizing the material

The process of conservation should distinguish between different layers of patina, focusing on preserving primary patina as much as possible, and removing later corrosion products.

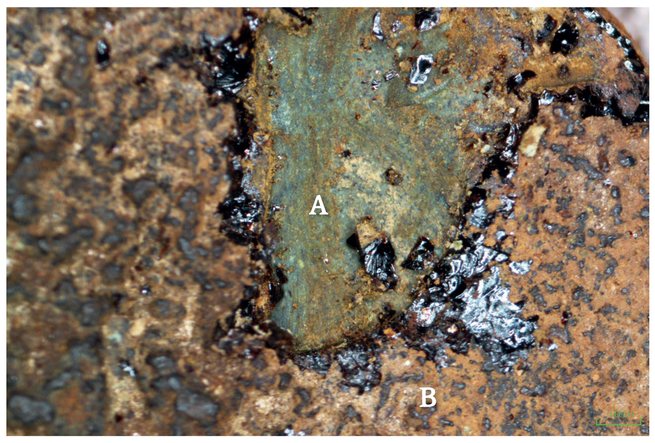
First, the coins were cleaned under running water from traces of soil. The next task was removing distortive corrosion products in such a way that historic patina on the coins could survive.

The first group of coins presented no major problems. The corrosion layer could easily be removed mechanically.

The majority of coins (Group 2), covered with a thick corrosion layer, required more attention to remove distorting material from their surfaces (Fig. 4). After cleaning, it appeared that the surface relief had almost entirely disappeared and no primary patina could be preserved on those coins.

In order to remove corrosion products several chemical agents were experimented, but the black dense corrosion did not surrender to chemical treatment. Electrolytic, plasma and laser treatements were ruled out as too brutal. Galvanic treatment was tested without trustworthy results and the desired outcome could not be achieved also by mechanical methods.

Finally a combined cleaning method was worked out with satisfactory results. At first the coins were kept in hot sodium bicarbonate solution with frequent treatment in ultrasonic bath. The corrosion products started to partially detach already then, also the remaining corrosion layer became softer and easier to treat. The final cleaning of the coins was done manually under the optical microscope.



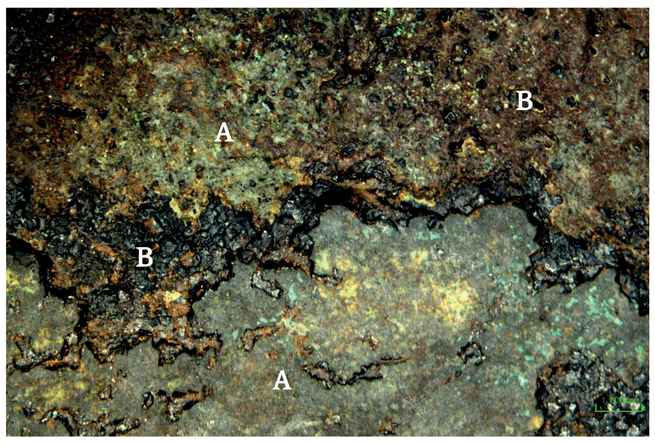


Figure 4. Some coins were covered with several corrosion layers – the layer (A) was soft, whereas the layer (B) was very hard, glass-like and difficult to remove.

Figure 6. Coins from the Varudi – Vanaküla hoard (AI-7484:1-51) after cleaning and conservation. (Photo: Mauri Kiudsoo)

Analysis of the corrosion products

The composition of the corrosion products was analysed by the XRD. The results showed that the corrosion layer consisted of a mixture of copper and iron oxides (Table 1). It is evidently the iron (oxide) that explains the unusual apparence and properties of the corrosion layer on the coins.

The question was raised about the iron content in the corrosion layer weather it may originate from completely decayed iron items that had been buried together with the coins. To clarify that, two soil samples were taken for analyses – one from the excavation and another from a few dozen meters away. The samples were comparatively analysed. It appeared that both samples contained an equal amount of iron. Therefore the iron compounds in the coins corrosion layer evidently originate from the soil.

Table 1. Content of corrosion products

Compound	Content (wt %)
CuO	47.3
Cu_2O	21.9
Fe_2O_3	21.9
$CuFe_2O_4$	8.9

Analysis of the coin metal

The metal of the coins was analysed by SEM-EDS method. It appeared that all coins were made from a copper alloy with different additives - mainly zink, tin and lead. The alloy of some coins may be classified as brass as their main alloying element was zinc. Another group of coins remained somewhere between brass and bronze as their alloying elements included both zinc, tin and lead.

The comparison of the content and condition of the coins clearly demonstrated that the first (well preserved) group consisted of bronze or near-bronze coins, and the second group (poorly preserved) was dominated by coins of pure brass (Fig. 5).

Results of the content of the analysed coins are presented in Table 2.

Table 2. Composition of the coin metal in weight percentage

Nomination*	Find marker	Cu %	Zn %	Sn %	Pb %	Fe %	S %
Julia Paula (218–222), Tarsos , provincial	AI-7484:10	73.1	12.0	10.4	4.5	–	–
Caracalla, Tarsos, provincial	AI-7484:7	75.2	7.5	11.5	5.8	–	–
Caracalla, provincial	AI-7484:33	86.4	13.4	–	0.2	–	–
sestertius	AI-7484:23	87.0	12.7	–	–	0.2	
provincial	AI-7484:49	90.6	7.6	1.0	–	0.3	0.5
sestertius (or provincial)?	AI-7484:50	86.8	10.9	1.2	1.1	–	–
provincial	AI-7484:51	86.2	12.2	0.3	0.8	0.5	–
Caracalla, Tarsos, provincial	AI-7484:38	72.7	3.4	13.8	9.1	1.0	–
Caracalla, Tarsos, provincial	AI-7484:29	83.2	–	8.0	8.8	–	–
provincial	AI-7484:43	73.6	7.9	10.5	6.8	1.2	–
Faustina Younger, sestertius	AI-7484:37	87.0	7.0	4.6	–	0.7	0.7
provincial	AI-7484:28	88.8	10.6	–	0.3	0.3	–
Faustina Younger, sestertius (or provincial)?	AI-7484:34	86.5	8.7	3.9	–	0.4	0.5

* R. Koovit, M. Kiudsoo, Roman Age deposit from Varudi-Vanaküla, Archaeological Fieldwork in Estonia 2015, National Heritage Board of Estonia, Tallinn, 2016, pp. 71-79.

Figure 5. Comparison of the preservation of coins:
a, b – bronze (AI-7484:29), c, d – brass (AI-7484:28)

Summary

The conservation of a large part of the Varudi – Vanaküla coins turned out to be unexpectedly challenging. It required a number of tests and combining various methods. However, considering the state of the coins, the conservation can be considered as satisfactory (Fig. 6).

The analyses demonstrated clear connections between the state of the coins and the character of the corrosion layer on the one hand and their metal content on the other hand – the bronze coins had a strong protective patina layer and a good state of preservation, the brass coins lacked such layer and they were much more affected by corrosion (Fig. 5).