https://doi.org/10.12685/y96ewg92

Metal Ornaments in the Rural Sites of Northern Russia. Long Distance Trade or Local Metalwork?

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Rural sites, local craft, non-ferrous metalworking, workshops, copper alloys

Introduction

Beloozero-Kubenskoe region is the territory which formed the north-eastern boundary of the ancient Russian state in 900–1250 AD (fig. 1). Before the Slavonic expansion (the late 1st to early 2nd millennia AD) it belonged to the Finno-Ugrian region. Early medieval settlement organisation was dispersed. Large settlements were located on the Beloe lake and along the great rivers (Makarov 2000, 212). Slavonic and Finno-Ugrian elements of material culture mixed in various aspects.

According to the widespread concepts the economy of such distant rural sites was based on a combination of fur-hunting and forest agriculture. The abundance of glass beads and metal ornaments in graves and cultural deposits is usually interpreted as a result of long distance trade and exchange of furs (Makarov 2000, 215). The archaeological investigations of the past years carried out in north-eastern periphery of ancient Russia permits us to view the problem in question from a new standpoint.

The workshops at rural dwelling sites

Since the seventies of the 20th century mainly medieval ground cemeteries underwent excavations in Northern Russia. The graves contained numerous grave goods including metal ornaments. Beginning from the nineties till present the investigators have concentrated their attention at studying rural dwelling sites. Like the cemeteries, abundant collections of artefacts made of non-ferrous metals originate from the settlements. For instance, at the dwelling site of Minino-I situated on the lake Kubenskoe (from the late 10th to the first half of the 13th centuries), the excavated area of 240 square metres has delivered 880 artefacts of the kind. Over a quarter of them represented fragments of copper and bronze plates of small cauldrons that probably were widely used in everyday life of northern settlers. The remainder mainly represented pieces of jewellery. They comprised the ornaments of ancient Russian types: wire temporal rings, plate finger-rings and those imitating twisting, flat and wire bracelets, cross-pendants and metal belt fittings. The ornaments of Finno-Ugrian types included wire spirals, ring-shaped beads, jingling and zoomorphic pendants. By the way, not only ready-made artefacts were found.

An interesting and rather unexpected fact have become the discovery of remnants of production areas of ferrous and non-ferrous metalworking accounted for at numerous northern dwelling sites. Practically all settlements have yielded separate finds of manufacturing type (Kudryashov 2000, 46).

The largest number of producing zones was revealed at the Minino-I dwelling site. Four associations containing the remains of jewellery manufacturing were cleared. One assemblage dates from the 11th century and three from the 12th and the early 13th century. The sites are characterised by accumulations of copper plates' wastes, ingots, shapeless drops and shots of excess metal, as well as fragments of clay crucibles and casting ladles. In total, fragments of 32 crucibles and ladles were found. The sides of many crucibles were burnt and traces of metal was preserved on them. To identify the alloy formulas used by the local craftsmen X-ray-fluorescence analyses of 20 fragments of crucibles and ladles sides were executed.

The discovery of a jeweller's workshop at the site should be considered a real success. The association was cleared up in the deposit dated back to the 11th century, the construction was deliberately designed for non-ferrous metalworking. The log building was rectangular in shape, in its centre a large oven or hearth was built over a massive foundation of unbaked clay. The layer around the construction was rich in glassy slags. Fragments of crucibles and casting ladles were concentrated there, as well as copper drops and shots of melted metal, fused copper plates, a bar-shaped ingot of tin brass and a tablet-shaped ingot of 99% silver (6.57 g in weight). In the crucibles low-grade silver, lead-bronze and copper-zinc alloys were melted. Pure tin was discovered in two ladles.

The producing associations of the later period (the 12th and early 13th century) were related to the dwellings supplied with clay-and-stone ovens, where ornaments were manufactured. The cultural remains comprised drops and shots of melted copper and lead bronze, crucibles' fragments, two bar-shaped ingots partly used (pieces had been cut away), fused copper plates, a piece of pure tin, wastes and unfinished artefacts. The analyses of metal found in the crucibles evidence that the craftsmen used leaded and tin bronzes, alloys with high zinc content, and, to a lesser extent, low-grade silver. Processing fusible tin/lead alloys was rather widely practised by local jewellers in that period. Ornaments made of these alloys were silvery in colour and could easily imitate silver. Lead-tin shots of metal, wasted castings, wire fragments and finished artefacts were discovered there.

Raw materials and non-ferrous metal alloys in rural workshops

The find of jewellery manufacture in northern dwelling-sites leads to a conclusion that everyday economic activity of the inhabitants of the medieval remote outland was not confined to exploitation of woodlands only, and the items made of non-ferrous metals were partly produced locally. The study of finished artefacts metal formulas and waste permits us to evaluate the development and specifics of the local craft, its share in the total mass of metal ornaments functioning in the North. This kind of analysis gives an opportunity to characterise

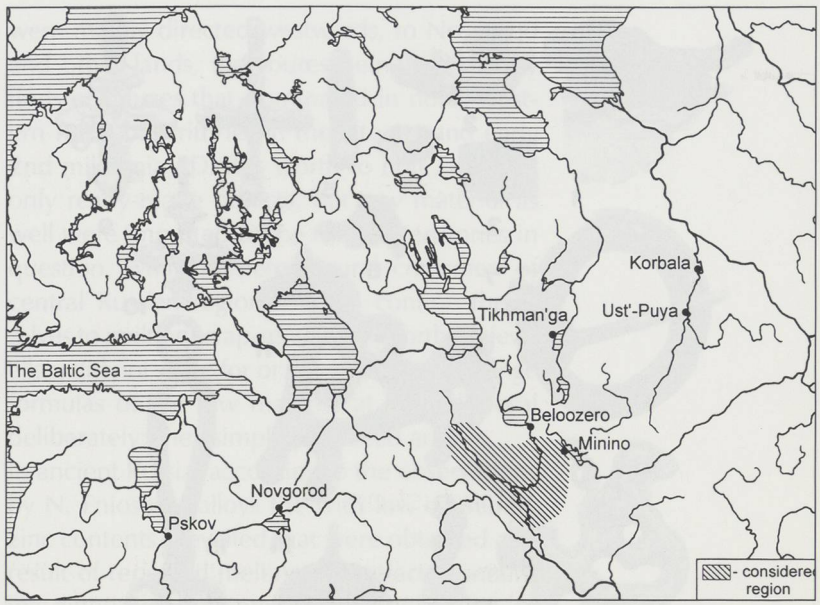

Fig. 1: Sites providing the samples for analytical study.

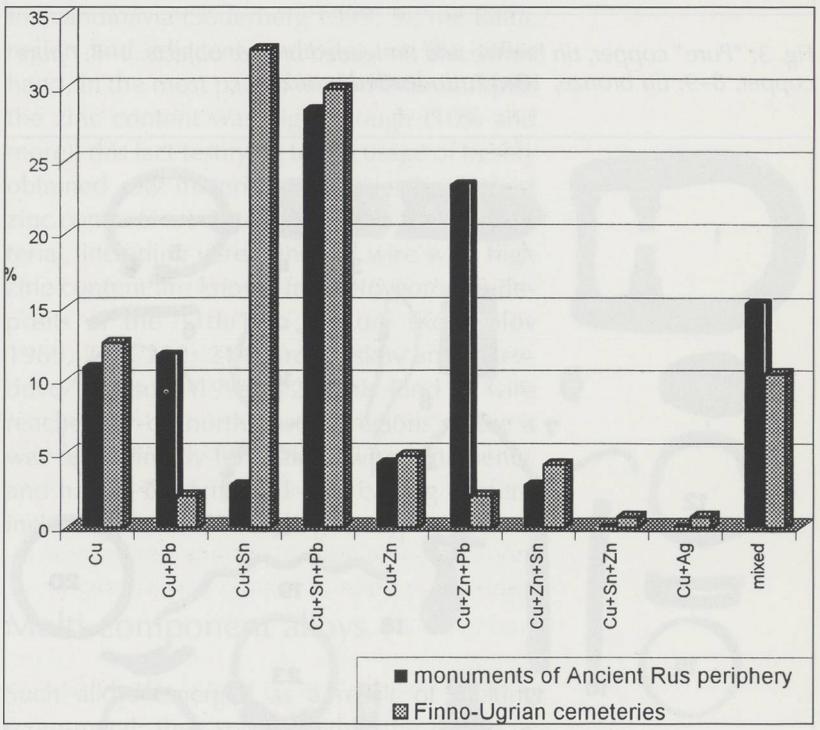

Fig. 2: Distribution of samples into alloys' groups.

the repertoire of raw material and alloys used by the local metalworking and to reveal the dynamics of the jeweller's raw material supply to the region during the 11th to the 13th century. The work is of importance for medieval Russian archaeology as a whole, but few rural jewellers workshops have been excavated as yet, and traditionally the characteristics of ancient Russian rural jeweller's craft are based mainly on indirect data.

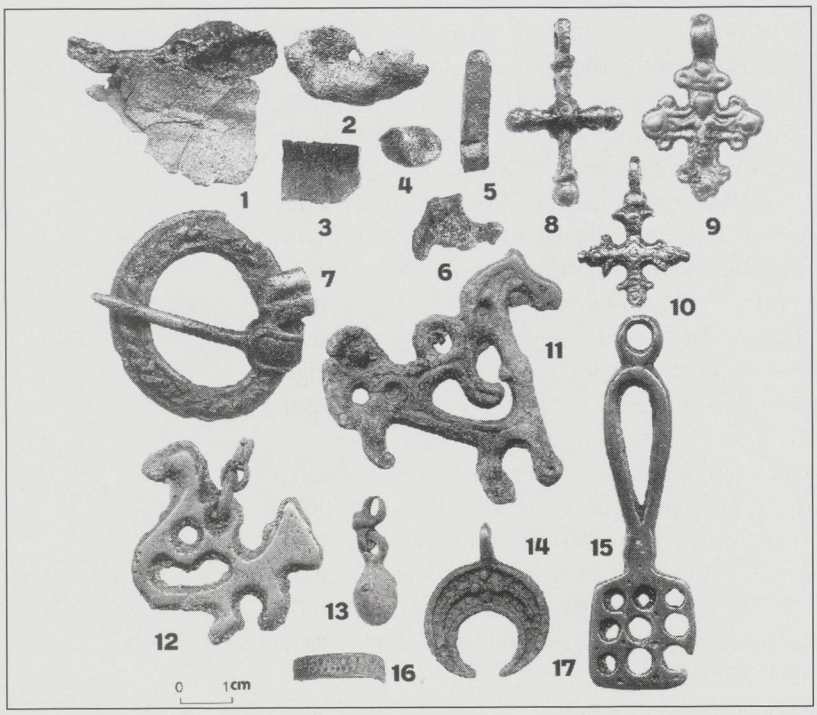

Fig. 3: "Pure" copper, tin bronze and tin-leaded bronze objects. 1–7: "pure" copper, 8–9: tin bronze, 10–17: tin-leaded bronze.

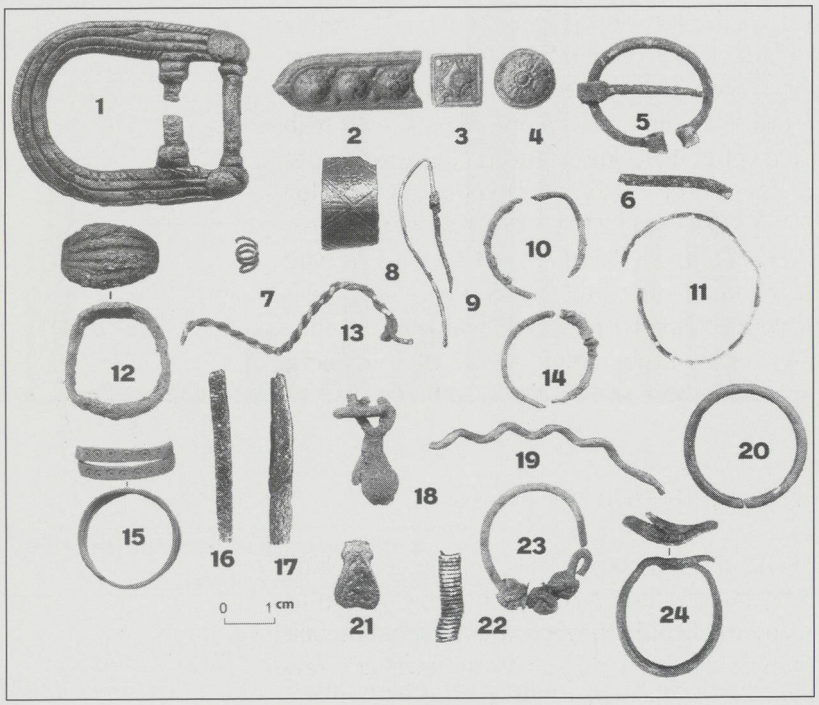

Fig. 4: Objects from brass and multi-component alloys. 1–6, 8–11, 13–15, 18–20: leaded brass; 7: copper-zinc alloy; 12,16: tin brass; 12,21–24: multi-component alloys.

Optical emission analysis was applied to solve the raised questions. The method of three standards was used for 112 samples taken on finished artefacts, raw material, and wastes originating from 7 rural dwelling sites in the north-eastern periphery of ancient Rus (fig. 1) and 25 samples from the cemetery Minino-II, dated from the late 10th to the first half of the 13th century. The articles made of copper alloys were examined only. The results were compared with those of spectral analyses carried out on 144 artefacts from three coeval Finno-Ugrian cemeteries, situated outside of ancient Rus' territory: Korbala and Tikhman'ga (both dated to the first half of the 12th century), and Ust'-Puya (second half of the 12th/first half of the 13th century) (Galibin et al. 1986).

The analyses results were clustered according to the parameters worked out in advance. The method of the classification applied was suggested by J. Riederer (Riederer 1969) and improved by N. Eniosova and T. Saracheva (Eniosova et al. 2001).

The diagrams of elements' unidimensional distribution demonstrate that the basic alloying components in the data under investigation were tin, lead, and zinc. The material was divided into several groups according to their presence. 1% concentration of each element was conditionally accepted as the lower limit of alloying. The alloys singled out are termed in accordance with their components:

- one-component alloys
  metallurgical "pure" copper (Cu);
- double-based alloys
  leaded copper (Cu+Pb), tin bronze (Cu+Sn), two-component brass (Cu+Zn);
- ternary alloys
  tin-lead bronze (Cu+Sn+Pb), tin-zinc bronze (Cu+Sn+Zn), leaded brass (Cu+Zn+Pb), tin brass (gunmetal) (Cu+Zn+Sn);
- multi-component alloys
  leaded gunmetal (Cu+Sn+Zn+Pb).

The results of the above work are shown in figure 2. Having analysed the diagrams of the elements' distribution within the groups, morphological repertoire of artefacts that constituted the groups, and the chronology of their functioning it became possible to put forward the following conclusions.

"Pure" copper and leaded copper (fig. 3)

The finds produced of "pure" copper and copper with lead impurities (up to 4.2% lead in mass) number about a quarter of the total ana-

lysed items from rural sites. The objects connected with manufacturing process prevail, such as ingots, shots of melted metal, fused pieces of metal and plates. Finished artefacts are exceptionally rare. In cemeteries copper ornaments are infrequent, except penannular brooches and their pins which make up a representative series. Similar indices are observed in distributions of non-ferrous artefacts from the major urban centres of north-western Russia like Novgorod, Pskov, and Russian fortresses in Karelia – Tiversk and Paaso. Ancient Russia lacked copper mines of its own, non-ferrous metals were imported. North-western Russian regions were supplied basically from German and Swedish copper mines (Konovalov 1974, 19–22). Copper ingots from Scandinavia, Gothland, and the Baltic region have been chemically tested; some of them appeared to be of "pure" copper, other ones contained lead admixture up to 6–16 % (Eniosova 1999, 96). Small copper ingots penetrated into the most distant territories of ancient Russia. Another source of copper used by the local jewellers as well as numerous craftsmen from urban and rural centres of medieval Russia alike were simple copper cauldrons especially popular in the North and transported probably from the Orient – the Volga Bulgaria. Worn out items were cut into plates and melted as scrap-metal. Copper used for the cauldrons' production was of high purity (admixtures reaching less than 1%), or with insignificant lead content.

Two-component and multi-component brasses (fig. 4)

Few objects made of pure copper-zinc and gun-metal were revealed. The group of leaded brass was better represented at the rural dwelling sites. In the selection under discussion, the samples with zinc content up to 10% and lead up to 2% prevailed. But more than a half of the samples displayed zinc concentration over 10%.

Nearly half of the artefacts manufactured of lead brass were made from wire: temporal rings, bracelets, finger-rings, and brooches. Belt fittings constitute a representative series of a full set. Some brass objects were clearly imported. But we can affirm that local jewellers processed the alloys with zinc. Raw materials were being transported in shape of ingots and wire.

The economic contacts developed by the region during the 11th and early 12th century were mainly directed westwards, to Novgorod and other lands, the routes being marked by finds of brasses that dominated in north-western Russian territories in the late 1st and early 2nd millennia AD. It is worth to note, that not only ready-made objects, but raw material as well were imported to the remote territories in question, while numerous rural craftsmen of central Russian regions had to confine themselves to melting scrap-metal. Still, northern jewellers did not strive for or were unable to change formulas of the raw material at their disposal deliberately: they simply produced articles.

In ancient Russia, according to the observations by N. Eniosova, alloys the with low or middle zinc contents prevailed that were obtained as a result of repeated melting of artefacts containing zinc. Consequently, the concentration of volatile zinc was reduced (Eniosova et al. 2000, 104–107).

In Scandinavia (Soderberg 1999, 5), the Baltic region and adjacent territories, on the other hand, in the most part of leaded brass samples the zinc content was high enough (10% and more), this fact testifying to the usage of freshly obtained raw material. In Russia the highest zinc contents are accounted for in the raw material, including wire. Finds of wire with high zinc content are known from Novgorodan deposits of the 11th/12th century (Konovalov 1969, 209; 212; 214), from Pskov and Gnezdovo (Eniosova 1999, 72). This kind of wire reached far-off north-eastern regions where it was used directly for making wire ornaments, and having been melted – for casting objects, including those of Finno-Ugrian types.

Multi-component alloys

Such alloys emerged as a result of melting scrap-metal; they spread within the region as ready-made objects (penannular brooches, belt fittings, temporal rings) and as jeweller's raw material (plates, small bar-shaped ingots), the latter were represented mostly by multi-component brasses with high zinc content. The share of multi-component alloys at the studied sites ranges from 10% to 15%.

During the 12th and the early 13th century brasses were regularly supplied to the region. A parallel rise of bronzes – copper alloyed with tin and lead – is recorded in the local metal-working.

Tin and lead-tin bronzes (fig. 3)

Artefacts made of tin bronze are practically unknown in the rural sites' material, but they are definitely represented among the finds from Finnish cemeteries (about a third of the total). The finds manufactured of lead-tin bronze are represented at the dwelling sites and in the cemeteries in equal shares – around one-third of the total. Artefacts with high tin content (over 10%) dominated at the majority of the sites. Tin alloys with low tin content (below 10%) were characteristic of the jeweller's traditions of Minino and Korbala only. Half of the samples included into this group displayed a lead content of 1–2%. This fact proves that the selection of lead-tin bronzes comprised also the objects manufactured of copper with lead impurities, but that they were not deliberately alloyed with this metal.

Finished artefacts strongly prevailed among the analysed samples, raw material consisted of few wire fragments. The major part of the ornaments produced of metal with high concentration of tin should be related to the Finno-Ugrian world. These are various zoomorphic and jingling pendants and long beads with additional double-loops. The ornaments displaying low tin content, as a rule, may be attributed to ancient Russian repertoire, or do not have any definite ethnic characteristics, like wire temporal rings, cross-pendants, various finger-rings, The tradition of producing bronzes with high tin content typical of the other sites in the region originated possibly from the east Finnish craft. The Minino tradition of manufacturing ornaments of low-tin bronzes can be seen in some specific details: four zoomorphic pendants of typical Finnish forms turned out to be cast of this alloy (fig. 3.11,12). It is of importance that cross-pendants usually viewed as the evidences of missionary activity in the far-off outland were apparently partly produced at the rural dwelling sites. Thus, 3 of 12 crosses discovered at Minino-I were found in the same workshop. In spite of their varied shapes the crosses displayed the closest similarity as far as chemical formula of the metal is concerned, this fact leading to the conclusion that the crosses were manufactured simultaniously at the dwelling site (fig. 3.8,9).

The rural craftsmen from Minino showed much more skill in producing bronze alloys than brasses. They could not only melt raw material, or add copper to it, but also were capable of mixing different components in order to obtain the alloy with the necessary concentrations of components. It can be clearly seen from their predilection for low-tin bronzes, very popular in north-western regions of ancient Russia and not typical of the local north-eastern non-ferrous metalworking. They used the raw material with high tin content, including scrap-metal from the ornaments, to reduce it to the concentration needed. Still, the most popular pattern of manufacturing ornaments of mass demand was application of raw material with unchanged composition. It was widely practised by the jewellers even in significant urban centres like Pskov (Koroleva 1997, 178).

Conclusion

Having considered in detail the copper alloys spread in remote north-eastern territories of ancient Russia in the 11th to the 13th century one can observe specific features in the sets of alloys used at different sites, in spite of certain similarities in the pattern they were used for. This should be interpreted as the evidence of numerous local centres of production, each characterised by the peculiarities of their own in alloy formulas, which is strongly confirmed by producing zones discovered at the rural dwelling sites.

Obviously, during the 11th–13th century production of the local craftsmen to great extent met the neighbouring villagers' demands for jewellery. The production under discussion was not aimed at serial output of few types of ornaments, on the contrary, the jewellers manufactured singular ones imitating imported originals according to customer order (imprint casting). This situation, in my opinion, accounts for the diversity of types of the ornaments originating from northern cemeteries. At the same time, standard ornaments produced for market by urban craftsmen and imported to the North played an important role in the local economy as well.

The presented investigation of non-ferrous artefacts' collections from rural dwelling sites situated in the ancient Russian northern outland

evidences convincingly that everyday life of its inhabitants was not confined to fur-hunting and life-subsistence only. Specialists in jeweller's craft also lived in northern hamlets. Their knowledge and skills provided the villagers with costume adornments made according to their liking, so as they had not to choose only from ones offered by their trade partners.

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